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BOWRAL & DISTRICT HOSPITAL REDEVELOPMENT

State Significant Development Application

Integrated Water Management Plan

HYDRAULIC SERVICES

Prepared by:

ACOR Consultants Pty Limited

ACOR Reference - SY160090

ACOR Consultants Pty Ltd ACN 079 306 246 ABN 81 40 079 306 246

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REVISIONS

Revision	Date	Purpose	Prepared By	Approved By
01	21/02/2018	For Review	Rhys Edwards	Rob Gruber

Review Panel	
Division/Office	**Name**
Sydney	George Pattalis

Unless otherwise advised, the parties who have undertaken the Review and Endorsement confirm that the information contained in this document adequately describes the conditions of the site located at Mona Road, Bowral, NSW, 2576.

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Appendices

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1 Project Details

Client Name:	NSW Health Infrastructure
ACOR Project Director:	Rob Gruber
ACOR Project Engineer:	Rhys Edwards

2 Executive Summary

This report addresses overall the waste water and potable systems for the proposed Bowral & District Hospital Redevelopment.

This report is based on Secretary's Environmental Assessment Requirements (SEARs) for application and the associated Schematic Design drawings, Health Infrastructure briefing documents and subsequent ancillary information provided.

Scope of services covered within the hydraulic services water management report include:

- Sanitary and trade waste discharge
- roof water plumbing and drainage systems connecting to existing civil trunk stormwater
- domestic potable water supply systems
- other related SEARs covered in other reports

The hydraulic services water management can be summarised as follows:

- Consultation with relevant utility supply agencies has been conducted to verify the condition, capacity, compliance reliability and efficiency of the existing sewer and water mains infrastructure and have found them to be acceptable for connection
- Sewer and trade waste water from the site to discharge to Wingecarribee Council sewer main via existing internal 'house drainage' system in accordance with AS.3500: 2015 and Wingecarribee Council requirements
- Water pressure/flow result was obtained from Wingecarribee Council
- Water supply provided will be in accordance with Australian drinking water guidelines
- Rainwater from roof areas will not be collected, stored and re-used
- Roofwater will drain/discharge through a series of rainwater outlets and eaves gutters systems designed in accordance with AS.3500: 2015 and siphonic drainage principals
- Environmental sensitive design (ESD) principles as nominated in Section 4.3 of this report will be incorporated within the hydraulic services

3 Key Design And Performance Principles

A major element of this report is to outline the minimum building services design criteria to deliver compliance with Health Infrastructure, NSW Department of Health Engineering guidelines, NSW Department of Health, Bowral & District Hospital briefing documents, user groups and all relevant statutory authority requirements, so that the most cost effective and energy efficient, maintainable solutions are achieved for the Project, with patient care and safety the main priority.

This report is to be read in conjunction with the Hydraulic Services Schematic Design drawings (Refer Appendix A for full list of available hydraulic services drawings)

- Building code compliance
- Health Infrastructure requirements
- Effective use and waste minimisation of limited water resource
- Authority infrastructure availability and capacity
- ESD principles

The hydraulic services systems currently documented will:

- Ensure the safety of building occupants and patients
- Minimize water wastage
- Minimize initial capital cost and ongoing maintenance and energy costs
- Ensure effective use of energy and resources

3.1 Standards And Codes

This report has used the following Australian Standards and Codes as references:

- National Construction Code – 2016 (being the current version at the time of writing this report)
- Building Code 2016
- AS 3500 Plumbing and Drainage Suite of standards – 2015 as ratified by the NCC
- AS 2419.1 Fire Hydrant Installations – 2005
- AS 2118.1 Fire Sprinkler Installations – 1999
- AS2118.6 Combined Sprinkler and hydrant systems - 2012

3.2 AUSHFG

- Australasian Health Facilities Guideline (AHFG)
- Hospital acquired infections – Engineering down the risk – Handbook – HB 260 – 2003

3.3 Relevant Authorities

Key authorities directly relating to the hydraulic and fire services design are (please see **Table 1** below):

Table 1 Utility Authorities

Authority	Asset
Wingecarribee Council	Water Supply / Sewer Drainage / Stormwater Drainage
NSW Fire and Rescue	Regulator for fire hydrants and automatic fire sprinklers

4 Introduction

ACOR Consultants Pty Ltd has been engaged by Health Infrastructure to design, document and construct building hydraulic engineering services for the new building at Bowral & District Hospital.

The report is based on hydraulic services schematic design drawings using the current architectural background plans. Refer Appendix A for full list of available hydraulic services drawings.

Scope of services covered within the hydraulic services water management report, include:

- Sanitary Plumbing and drainage
- Trade waste plumbing and drainage
- Roof water plumbing and drainage
- Domestic Potable Water
- Non-Potable water
- Fire Hydrants
- Fire Hose Reels

4.1 The Development Site

The existing hospital site is bounded by Bowral Street, Mona Road, Ascot Road and Sheffield Road in Bowral located in the Southwest Highlands of NSW. (Approx. 2hr southwest of Sydney).

Refer also Appendix B - Site Plan.

The new development site is located on the north side of the health campus and will be located in a large expanse of existing carparking and landscaped area.

4.2 Design Standards

All building services will be designed in compliance with the Building Code of Australia (prescriptive or performance based requirements), all relevant Australian Standards and local Authority requirements.

Hydraulic Services Systems will be designed and documented in accordance and fully comply with the requirements of the following client engineering briefing documents, guidelines and statutory bodies:

- NSW Health Department Engineering Guidelines
- Department of Energy, Utilities and Sustainability
- NSW Health Department policy directive PD2005_344 (Requirements for the provision of cold and heated water)
- Wingecarribee Council
- Department of Environment and Climate Change (DECC)
- Environment Protection Authority
- Building Code of Australia / National Construction Code
- Statutory Australian Standards
- WorkCover Authority
- Roads and Maritime Services

5 Outline Of Proposed Water Management Systems

5.1 Potable Water

Potable water systems for human consumption, hygiene purposes, cistern flushing and process equipment for the site will be supplied directly from Council main reticulation and designed and constructed in accordance with AS3500.1:2015 , AS3500.4: 2015, Council requirements and Australian Drinking Water Guidelines.

The existing main supply from Bowral Street, extending to the master meter on Yeoman ward will be upgraded. The existing master meter assembly (DN 80) be enlarged from DN80 to DN100 and relocated externally and to the north of the new building and within close proximity to the site boundary.

A new branch supply will be extended from the master meter to the new building, with provision of a sub meter located externally. The incoming water supply will be directed to a cold water plantroom which will comprise automatic backwash screen filter for the removal of particulates. Any particulates above 100 micron are removed. Potable water will be reticulated throughout the new building, above ground and typically within the corridor ceiling spaces. The potable water supplies will be segmented, with provision of isolation to suit departmental zones.

The water supply will be distributed to achieve:

- 350 kPa at the most disadvantaged outlet
- 1.5m/sec velocity through the pipes

Subsidiary meters will be provided to the large water uses such as:

- Cooling towers
- Hot water plant

In addition, each floor level will have a hydraulic services riser comprising subsidiary meters and isolation valves for floor level reticulation.

All subsidiary meters will be connected to the building management system for the monitoring of department and/or area water consumptions as well as to identify areas where non-standard usage occurs i.e. leak detection. The water metering helps to identify water usage so that non-critical areas of the facility can be manually isolated in a staged manner under a disaster scenario or failure of service(s).

Refer to Appendix F of this report for the schematic of the cold water system

5.2 Fire Hydrants and Fire Sprinklers

Fire hydrants compliant with AS2419.1 2005 will be provided throughout all new areas. Where located externally they will be 10 m away from any building.

The new fire hydrant water supply will extend from new infrastructure and will comprise fire brigade hydrant booster assembly.

The fire hydrant system utilises gravity pressures and flows from the water main in Bowral Street.

Automatic fire sprinklers compliant with AS2118.1 1999 will be provided throughout all new build areas. Note! The existing health campus does not have automatic fire sprinklers. Fire sprinklers therefore, won't be retrospectively installed throughout the

existing buildings. Space allocation within the Fire Pump House will be provided for future provisions if required.

The new fire sprinkler water supply will extend from new infrastructure and will comprise of pressure pumps and water storage tank.

Refer to Appendix E of this report for the schematic of the fire hydrant system

5.3 Sanitary Plumbing and Drainage

New sanitary drains will be constructed to the requirements of AS3500.2:2015 and Council requirements.

The Council has been advised of the additional loads expected from the new building. ACOR have lodged a formal application with the Council for them to assess the impact of the additional loads to determine if any augmentation to the Council's sewer network is required. The local council has advised in writing (via email dated 27 September 2016) that no augmentation is required as a result of this development.

The estimated fixture unit (FU) loading associated to the new building is 800 FUs, which equates to a DN150 mm pipe.

Vertical and horizontal pipework distribution will be based on an elevated drainage principle due to the building being no more than 4 levels. The main benefit of the elevated drainage system is that there is minimal venting compared to the fully vented modified systems.

The drainage systems will be designed for pipework to be constructed using uPVC. Any areas where pipework is to receive hot discharge or high acidity, HDPE will be used. Typically, the use of HDPE will be limited to Plantrooms and the CSSD.

Any drainage pipework traversing above sound sensitive areas will be acoustically treated.

It is also highly recommended that internal floor areas are laid out architecturally, so that wet areas are not located above sensitive areas such as Operating theatres / Rooms, electrical switchboards, distribution boards and communication hubs.

Trade waste plumbing and drainage

It is not envisaged that any trade waste plumbing will apply to this new building as there is no intent:

- for a commercial kitchen generating greasy waste
- Mechanical Boiler blow down
- Radioactive waste

Refer to Appendix C of this report for the schematic of the sanitary draiange system

5.4 Roof water plumbing and drainage

Roof water plumbing from new building roof areas will be designed to discharge the storm to surface level where it will be discharged into the main civil stormwater trunk main system. The roof drainage system will be based on an Annual Recurrence Interval (ARI) of 1 in 100years with a 5 minute duration. All roofed areas will have an independent overflow system which has 100% capacity of the primary downpipe system. This rainfall ARI is compatible for buildings with box gutters or flat roofs.

Major downpipes will be offset within ceiling spaces directly below the capture areas and drop within common services shafts where possible through the building. Pipes within the ceilings will be acoustically insulated where required to minimize noise transmission. It is

intended that a syphonic downpipe system will be incorporated. The benefits of the syphonic system compared with a conventional system are:

- Smaller sized pipes
- Fewer downpipe droppers
- Self-cleansing system
- Integral rated acoustic pipework

Roof water collection, treatment and re-use will not be incorporated into this project.

Generally NSW Health Infrastructure does not adopt rainwater harvesting and reuse for toilet flushing in their facilities due to a negative cost benefit analysis outcome.

As the site is located inland and stormwater is directed to the Wingecarribee River and Bong Bong Reservoir, maintenance of water flow to the river is more important to the ecosystem, than re-using water for landscape watering.

Refer to Appendix D of this report for the schematic of the stormwater draiange system

5.5 Domestic Potable Hot Water

New centralised hot water plant will be located on roof level and will consist of a manifolded, gas fired continuous hot water plant, coupled with storage cylinders. The use of storage cylinders will buffer the peak demand and will be able to provide a limited supply of hot water during any un-planned gas outages.

All hot water will be recirculated through the building on a distribution flow and return loop. All pipework shall be installed with thermal insulation of no less than 25 mm thickness.

Domestic hot water supply will follow the route of the cold water supply within the new building.

Generally it is expected that 43.5 deg C water will take 20 seconds in a 10 m section of DN20 mm pipe to arrive at the tap outlet. Contrary, it will take approx. 8 seconds in a 10 m section of DN15 mm pipe.

Refer to Appendix G of this report for the schematic of the hot water system

5.6 Non Potable water

Non potable water within the new building will be fed from the proposed potable water mains via approved backflow prevention devices in accordance with AS3500.1:2015, Council and Health Infrastructure requirements.

- High hazard Zone: RPZD (Reduced Pressure Zone Device)
- Medium Hazard Zone: DCV (double check valve)

Generally the above devices will be supplied to plantrooms for connections to mechanical services plant and the dirty utility rooms.

5.7 Reverse Osmosis Water (RO) – Batch Washers

Reverse Osmosis water supply for this project will only be required for the batch washers associated with the Operating Theatres due to the water quality. The RO plant will be designed in accordance with AS 4187:2014.

A typical RO plant has approximately 75% efficiency. Or rather 25% of the water going into the plant is wasted. The water being discharged from the RO plant has the ability to be collected and

reused. We would expect that the discharge from the RO plant will be in the vicinity of 600 L per day.

The suitability of the captured RO waste water for reuse for landscape irrigation is to be assessed by a landscape architect. At this stage of the project it is not desirable to implement water reuse in this project due to capital cost, ongoing maintenance costs and little or no return on investment.

As there is no Renal Haemodialysis ward in this project, RO water supply will limited to the batch washer feed.

6 Advantages and Disadvantages

6.1 Advantages of current design

1. Nil additional capital construction cost
2. Nil Maintenance of pumps, tanks, filter equipment and piping systems
3. Nil energy consumption by pumps and filter equipment
4. Nil risk of contaminated water affecting patients and building occupants

6.2 Disadvantages of current design

1. Community expectations to include rainwater re-use for government buildings
2. Limited contribution to overall building environmentally sustainable design

7 Fixtures, Fittings And Tapware

Sanitary fixtures, fittings and tapware where nominated on architectural plans and room data sheets will be in accordance with NSW Department of Health. Final selections will be based on whole of life cost, water/energy efficiency, W.E.L.S registration (4 star minimum except showers to be minimum 3 star), availability, ease of maintenance, aesthetic appearance and durability.

8 Additional ESD Initiatives

The following ESD measures are to be implemented into the design:

- Metering of water supplies including hot water metering
- Increased thickness of thermal insulation on all hot water supplies
- Recyclable materials selection

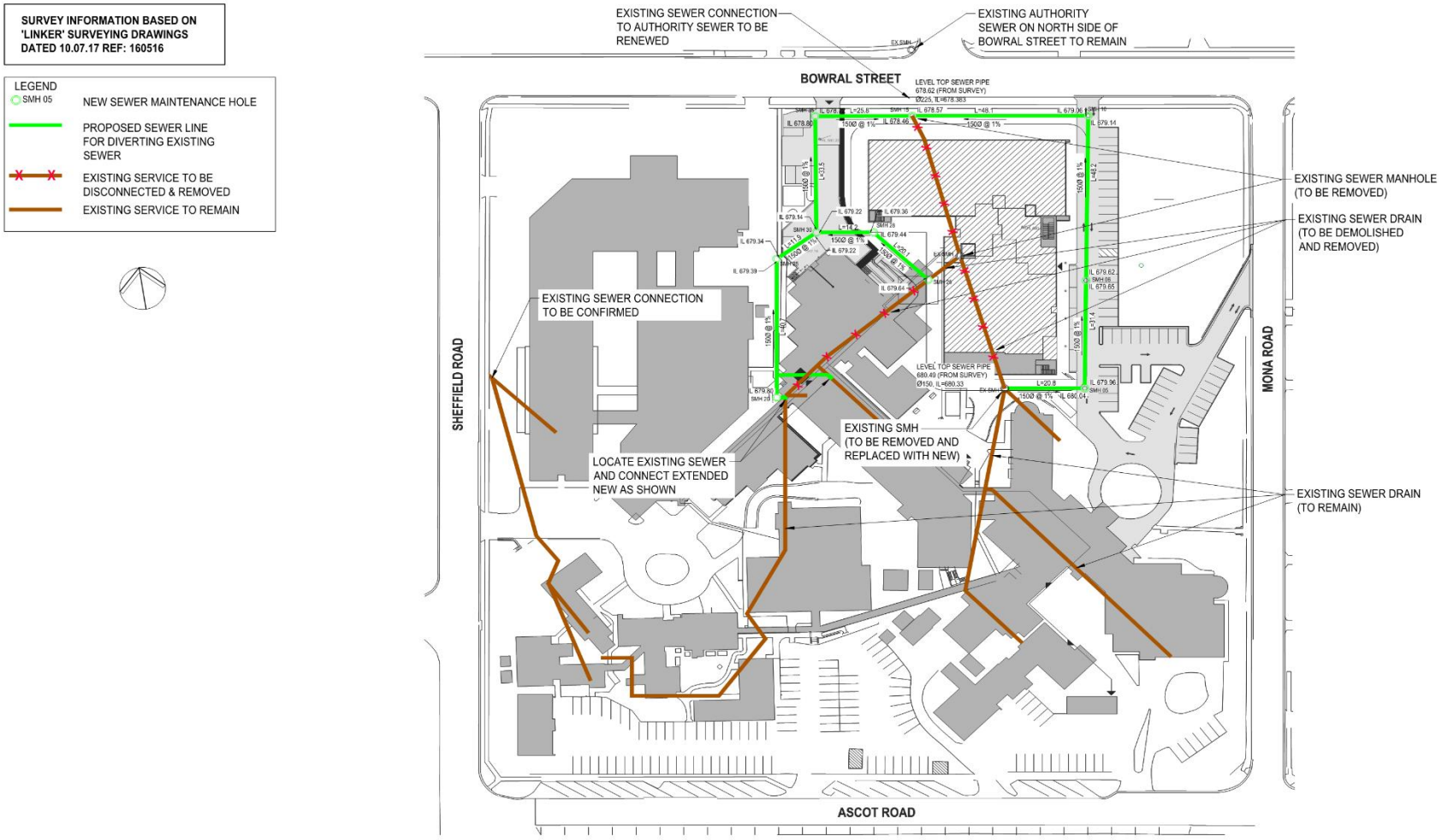
Additional measures that may be considered include:

- Solar contribution for water heating (minimum target to be a 50% annual solar gain)
- Capture of mechanical plant waste heat for input into domestic water heating plant
- Rainwater harvesting for mains water supply sustainability for reticulation to landscape irrigation
- Reverse Osmosis waste water collection and reuse. For reticulation to landscape irrigation
- Selection of local manufacturers for pipe material and fittings, where appropriate.
- Recycling of the fire test water back into emergency fire water storage tank(s).

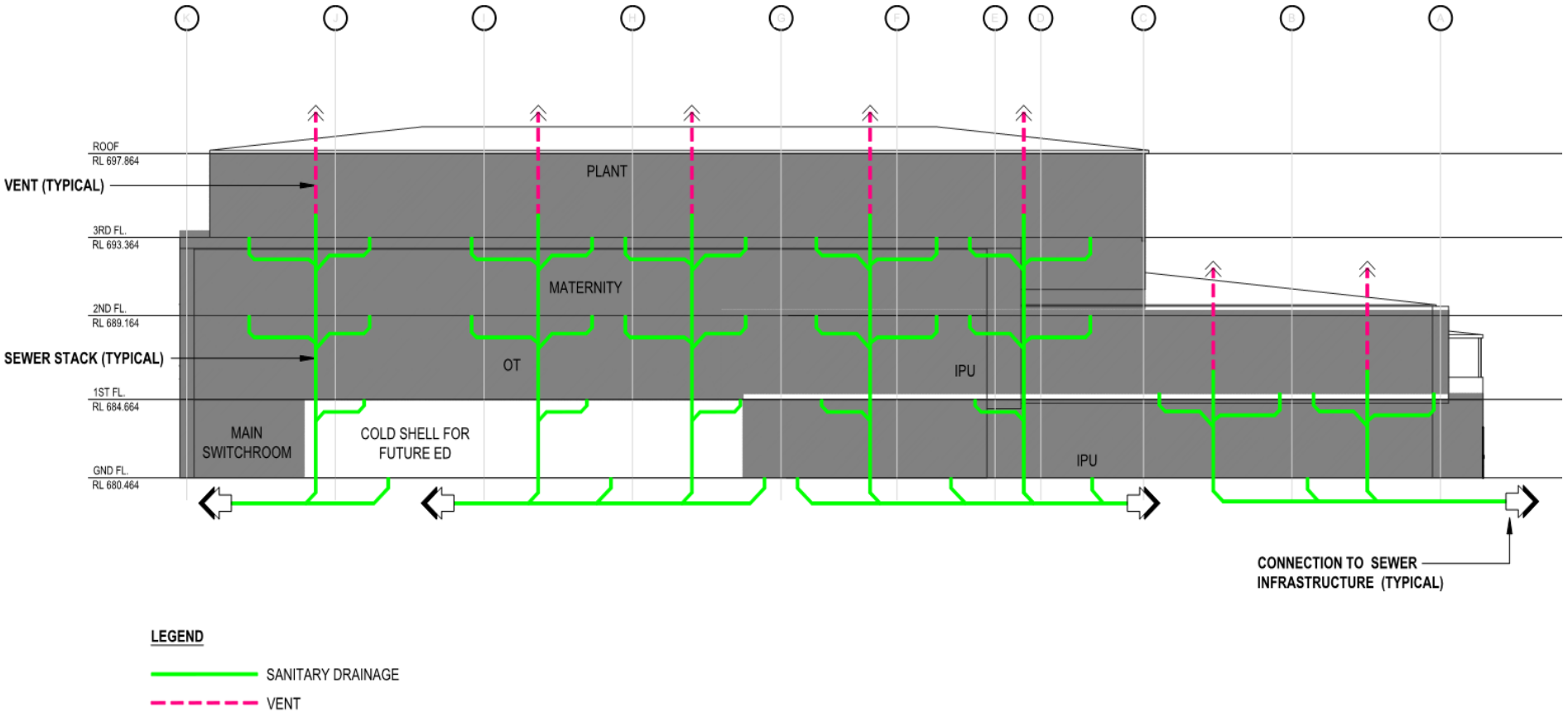
Appendix A - Hydraulic Services Reference Drawings

DRAWING No.	DRAWING NAME
ACR-HY-DWG-MW0000	COVER SHEET
ACR-HY-DWG-MW0100	GROUND FLOOR DRAINAGE
ACR-HY-DWG-MW0110	LEVEL 1 DRAINAGE
ACR-HY-DWG-MW0120	LEVEL 2 DRAINAGE
ACR-HY-DWG-MW0130	LEVEL 3 DRAINAGE
ACR-HY-DWG-MW0140	ROOF LAYOUT
ACR-HY-DWG-MW0200	GROUND FLOOR COLD WATER & GAS
ACR-HY-DWG-MW0210	LEVEL 1 COLD WATER & GAS
ACR-HY-DWG-MW0220	LEVEL 2 COLD WATER & GAS
ACR-HY-DWG-MW0230	LEVEL 3 COLD WATER & GAS
ACR-HY-DWG-MW0300	GROUND FLOOR HOT WATER
ACR-HY-DWG-MW0310	LEVEL 1 HOT WATER
ACR-HY-DWG-MW0320	LEVEL 2 HOT WATER
ACR-HY-DWG-MW0330	LEVEL 3 HOT WATER

Appendix B - Site Plan

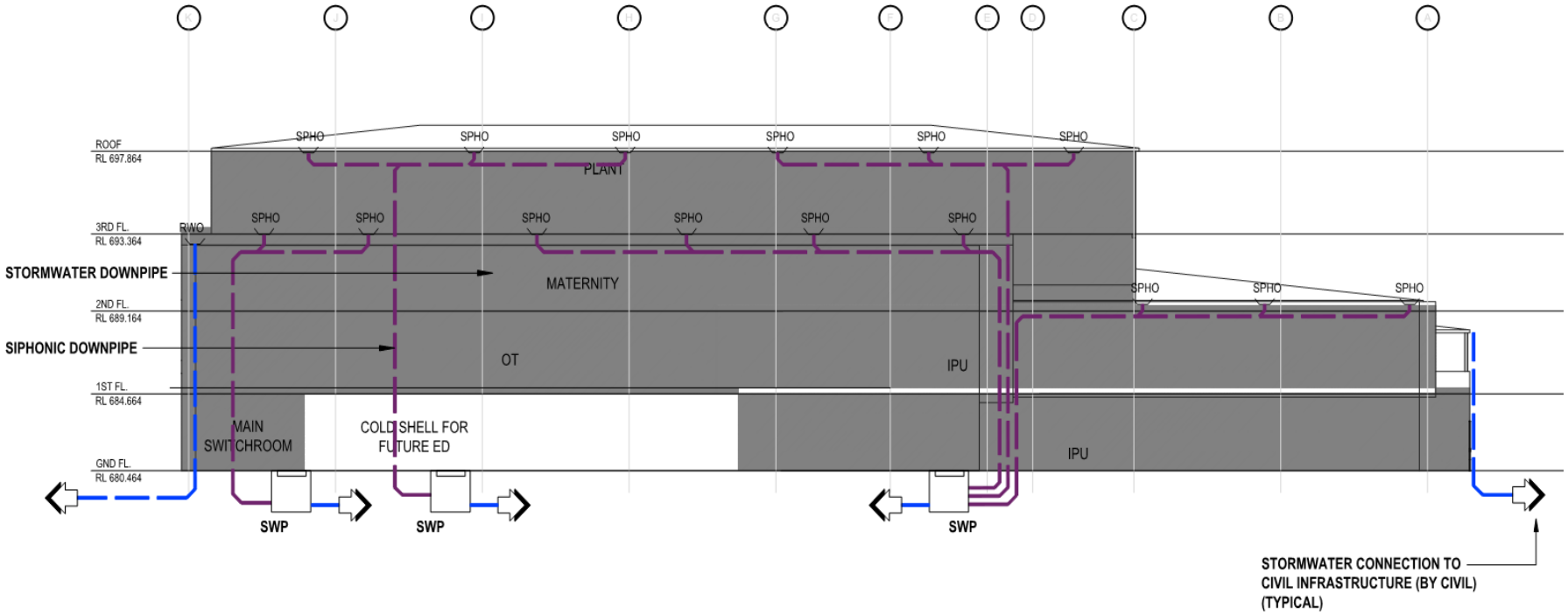


Appendix C - Sanitary Plumbing Schematic



SANITARY DRAINAGE SCHEMATIC

Appendix D - Stormwater Schematic

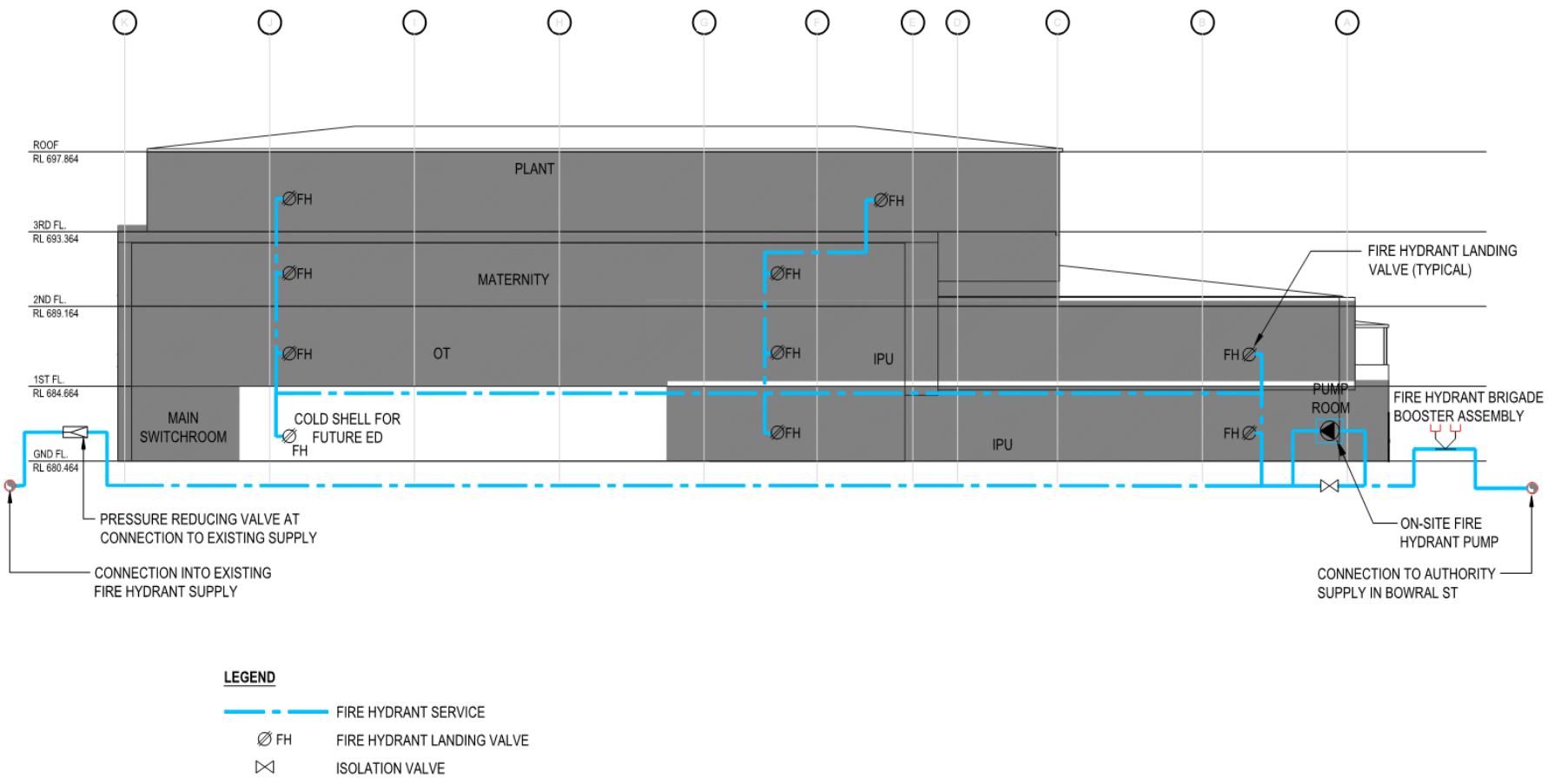


LEGEND

- STORMWATER
- SIPHONIC DRAINAGE
- SPHO — SIPHONIC OUTLET
- RWO — RAINWATER OUTLET (CONVENT.)
- SWP — STORMWATER PIT

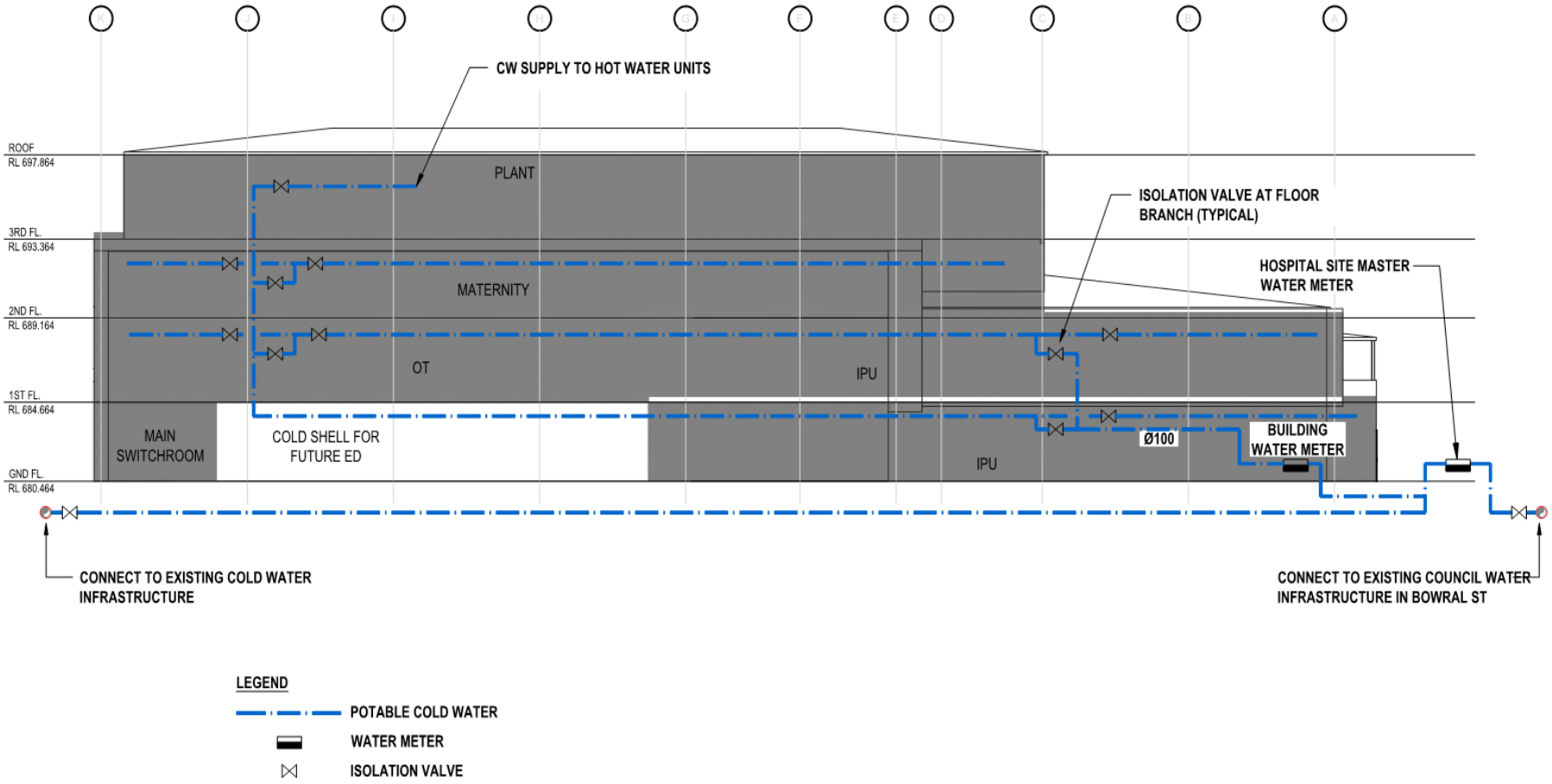
STORMWATER DRAINAGE SCHEMATIC

Appendix E - Fire Hydrant Schematic



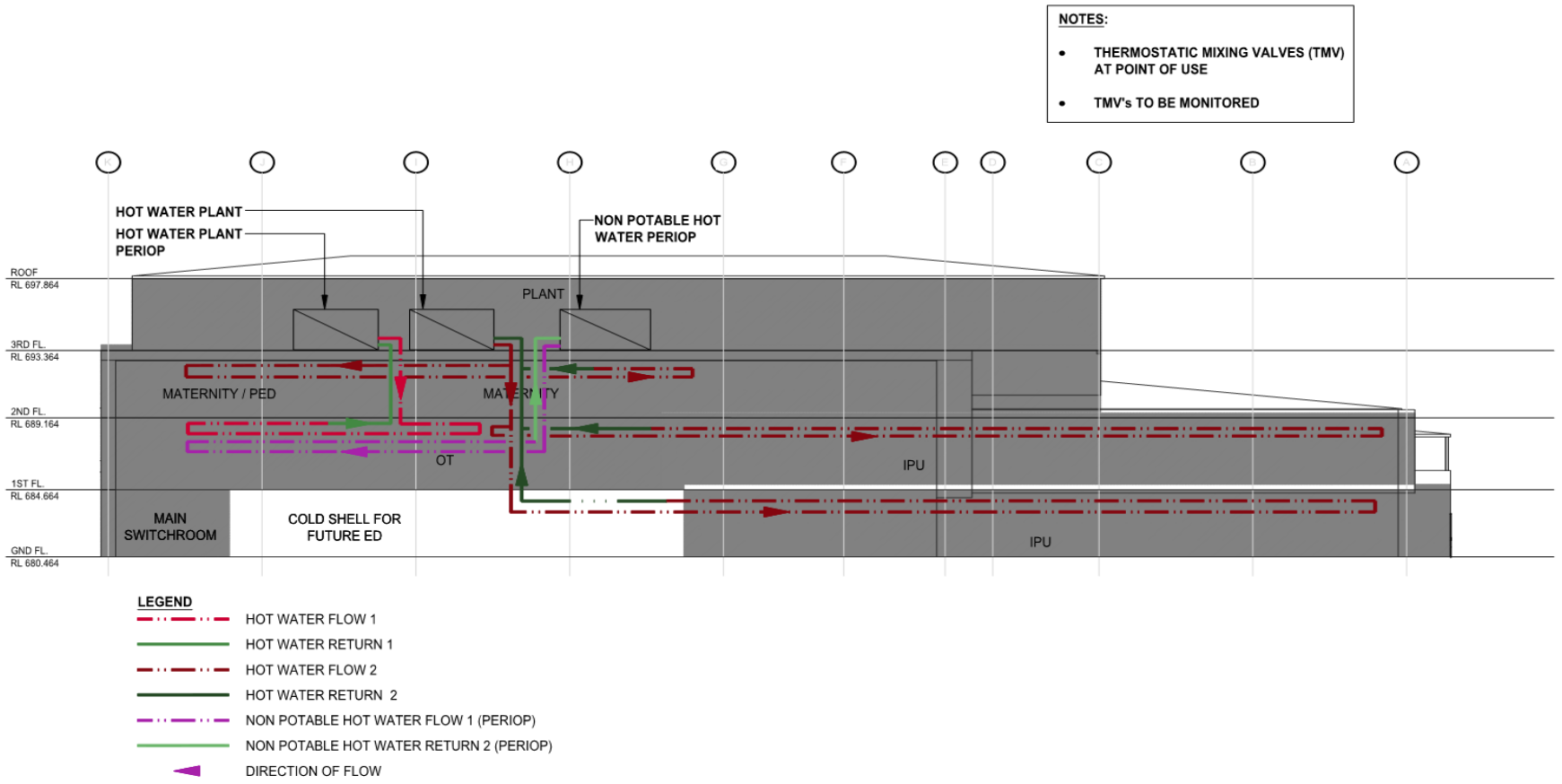
FIRE HYDRANT SCHEMATIC

Appendix F - Cold Water Supply Schematic



COLD WATER SUPPLY SCHEMATIC

Appendix G - Hot Water Schematic



HOT WATER SUPPLY SCHEMATIC