Temora Hospital Redevelopment

Schematic Design Report – Civil & Structural Engineering

NSW Health Infrastructure

HI22654T
29 January 2024
Ref: 222539_Temora_SchematicDesignRpt

Building exceptional outcomes together

Document History and Status

Rev	Description	Author	Reviewed	Approved	Date
0	Temora Schematic Design Report Civil / Structural - FINAL	JH / BO	AT	SC	29/1/2024

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Project: Temora Hospital Redevelopment | Schematic Design Report – Civil & Structural Engineering
Client: NSW Health Infrastructure
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1 Executive Summary

Structural Engineering

The structural schematic design of the main building was completed based upon the HDR architectural scheme dated 10 January 2024 with detailed spatial information provided. The information presented were sufficient for the determination of the structural members sizes for the building structure.

The new main hospital building as proposed will replace the existing hospital area. As such, a 2-stage construction and decanting strategy has been developed to ensure continuity of services to be maintained during construction. Stage 1 being the entire Eastern wing with external hardstand and Stage 2 being the remainder of the redevelopment on the Western wing.

For the structural system of the building, the hospital building consists of concrete slab on ground floors and structural steel framing as the main structural members for the external walls and roof, maximizing internal spatial and provide flexibility to future renovation works. Foundation piers may be required to some parts of the building subject to further design development and requirements for specialist medical equipment and external landscaping works. Generally, the slab on ground slabs are directly bearing on rock and therefore require the piers to be bearing on similar materials. The Southern and Western ends of the building have been designed as suspended floors on piers to rock as the natural ground falls away in respective directions.

Currently, the existing Temora Hospital is located towards the crest of a gently undulating slope, which grades towards the south-west at approximately 5°. Subject to final site levels and considering that the proposed new building will be located on this sloping site, retaining walls may be required. The retaining walls will either be constructed of blockwork or conventionally formed concrete walls. However, the requirements of these walls will depend on the transition between the internal floor levels and external landscaping areas.

Consistent with previous concept designs, the existing staff accommodation building to the South will be demolished and the existing piered foundation of the building is to be adopted as the foundation of a temporary demountable structure during construction. Suitability of the existing piered foundation to support the new demountable structure is subject to further site investigation. Options for these are still being considered by the wider design team and stakeholders.

Civil Engineering

The civil engineering concept design coordinates a combination of requirements including preliminary site grading, site access/egress, internal road and driveway design, parking arrangements, pedestrian access and drainage requirements to support the proposed redevelopment of the hospital.

Detailed survey (Walpole Surveying, July 2023) and concept architectural plans by (HDR, January 2024) were used as the basis for the schematic stormwater management plan, bulk earthworks assessment, sediment erosion control management and external works plan.

The proposed management of stormwater in the re-development aims to resemble the existing catchment split and re-use the existing discharge locations. A preliminary stormwater assessment was undertaken to inform the capacity of the existing system, its ability to cater for the re-development flows and estimate impacts to downstream public road reserve.

Early design coordination has been undertaken with the hydraulic consultant with respect to roof water connections and proposed external stormwater pit locations.

2 Introduction

Tonkin has been engaged by NSW Health Infrastructure to complete Parts 1 to 9 for Civil and Structural engineering services for Temora Hospital Development (Contract HI22654T). This is a schematic design report for civil and structural engineering services based on the demolition and rebuilding of a new single-storey hospital as per the current architectural drawings dated 10 January 2024.

Existing Temora Hospital (Eastern Elevation, viewing North)

Proposed Temora Hospital Re-development

3 Scope and Limitation

This report has been prepared by Tonkin for NSW Health Infrastructure and my only be used and relied on by NSW Health Infrastructure for the purpose agreed between Tonkin and NSW Health Infrastructure.

Tonkin disclaims responsibility to any person other than NSW Health Infrastructure arising in connection with this report. Tonkin also excludes implied warranties and conditions, to the extent of legally permissible.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. Tonkin has no responsibility or obligation to update this report to account for events or changes occurring after the date that the report was prepared.

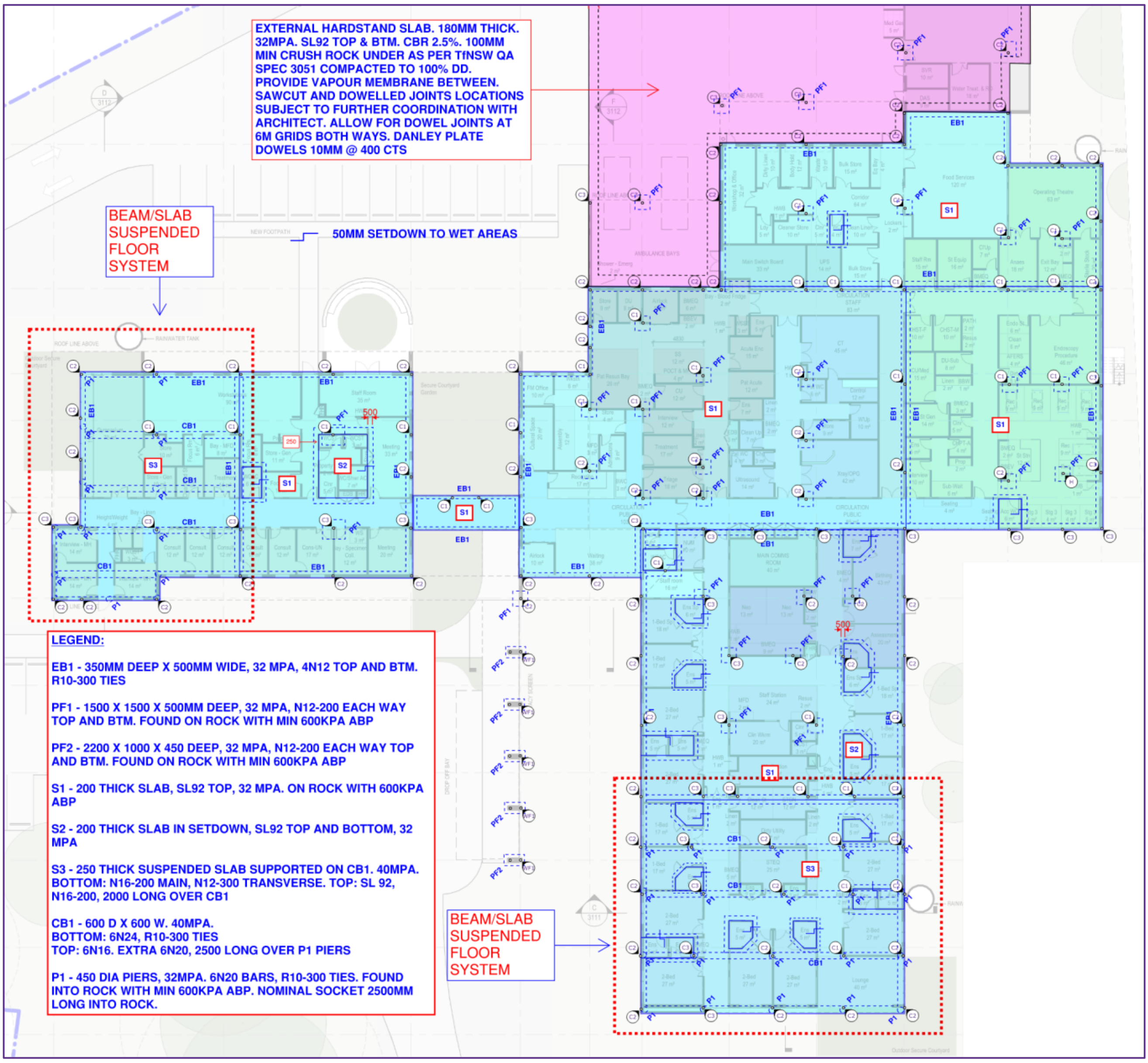
The opinions, conclusions and any recommendations in the report are based on information provided to us to date and assumptions made by Tonkin described in this report. Tonkin disclaims liability arising from any of the assumptions being incorrect.

4 Structural Engineering

4.1 Foundations

The foundation system for the main hospital building will typically consist of pad footings under columns and strip footings under walls. Pads and strip footings are to be founded on weathered rock (Andesite) that can be found between 0.5m to 2m below existing ground level. The pads and footings are designed as integrated structural elements to the slabs. The entire concrete slab floor system has been divided into 8 different segments to minimize the number of internal slab joints throughout the floor system. To minimize differential movement between the piered portions of the floor and the on-ground portions, both piered and on-ground portions are to be founded on similar rock materials.

Pads and strip footings are to be founded on weathered rock (Andesite) that can be found between 0.5m to 2m below existing ground level. Figure below shows the preliminary design of foundation and floor system of the building. The slab is predominantly a slab-on-ground system considering the relatively high rock level. Note that in the Western and Southern wings, a suspended concrete floor system, with supporting piers taken down to rock, was proposed as the natural ground levels falls in the respective directions. The suspended portions of the floor system consist of concrete that will be poured directly on a vapor barrier which is laid directly on loose fill as formwork for the slab and beam soffits.



Temora hospital proposed ground slab and foundation system.

For floor vibration assessment, the Footfall response will be assessed in accordance with the Concrete Centre Design Guide. The Footfall frequencies and corresponding response factors defined within the NSW Health Design Guidance Note No.1 which the different floor areas will be checked for compliance with the Concrete Centre Design Guide are given in the table below.

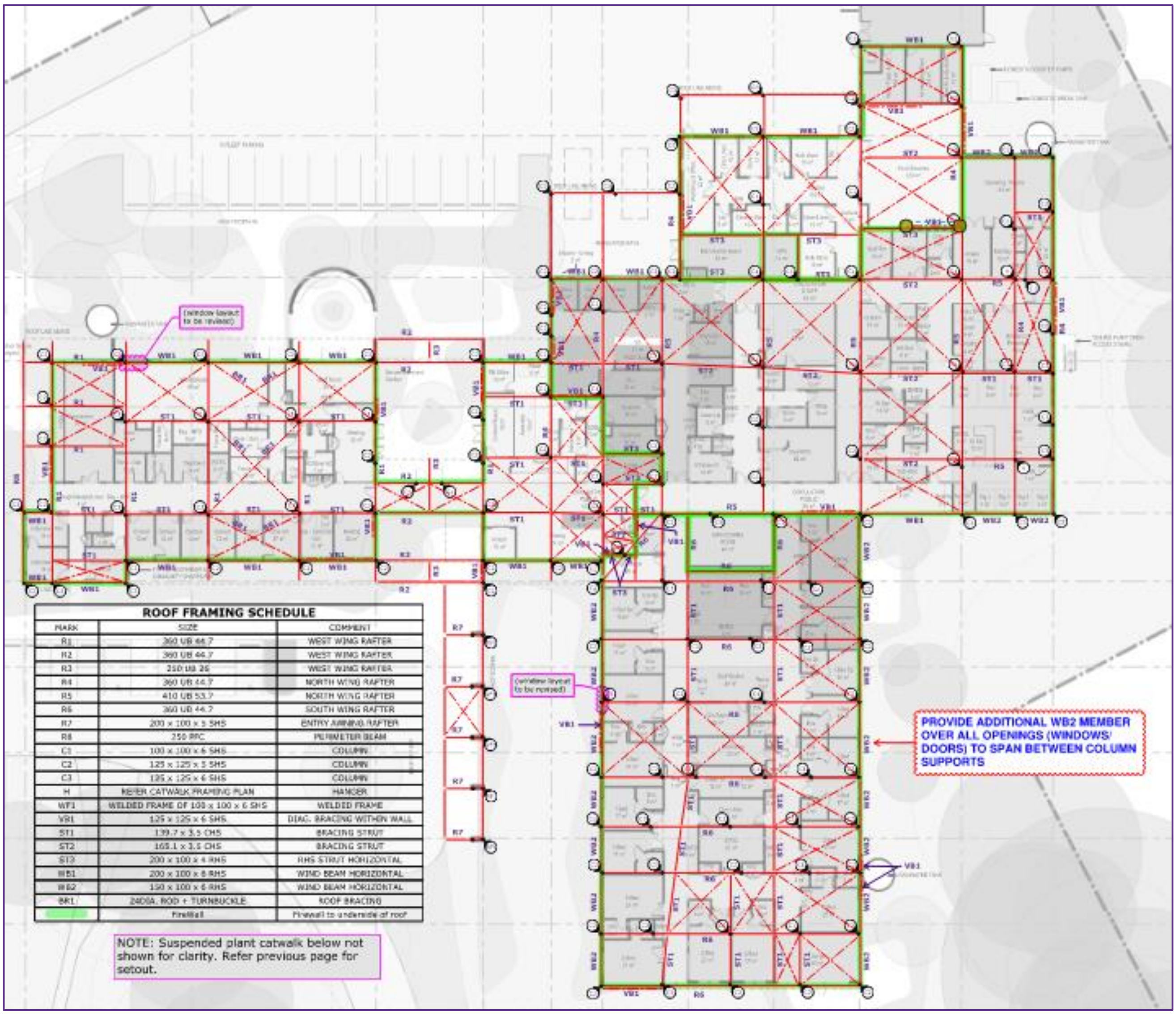
Facility/Equipment/Use	Design Response Factor	Footfall Frequency (Hz)
Generally procedure rooms, laboratories, and general surgery	2	2.2
Corridors, circulation spaces, offices, and other non-vibration sensitive areas	4	2.2
Imaging Suite and operating theatres	1	1.8
Plant areas	N/A	N/A
Roof areas	N/A	N/A

Footfall Response Factor Design Parameter – Concrete Centre Method

Floor slabs will be also dynamically reviewed when there is sensitive medical equipment on the floor which requires a minimum velocity threshold; active vibration control methods are to be implemented. Note however that the equipment will most likely be founded on slab on ground with dedicated dampener. Therefore reducing risk of excessive vibration.

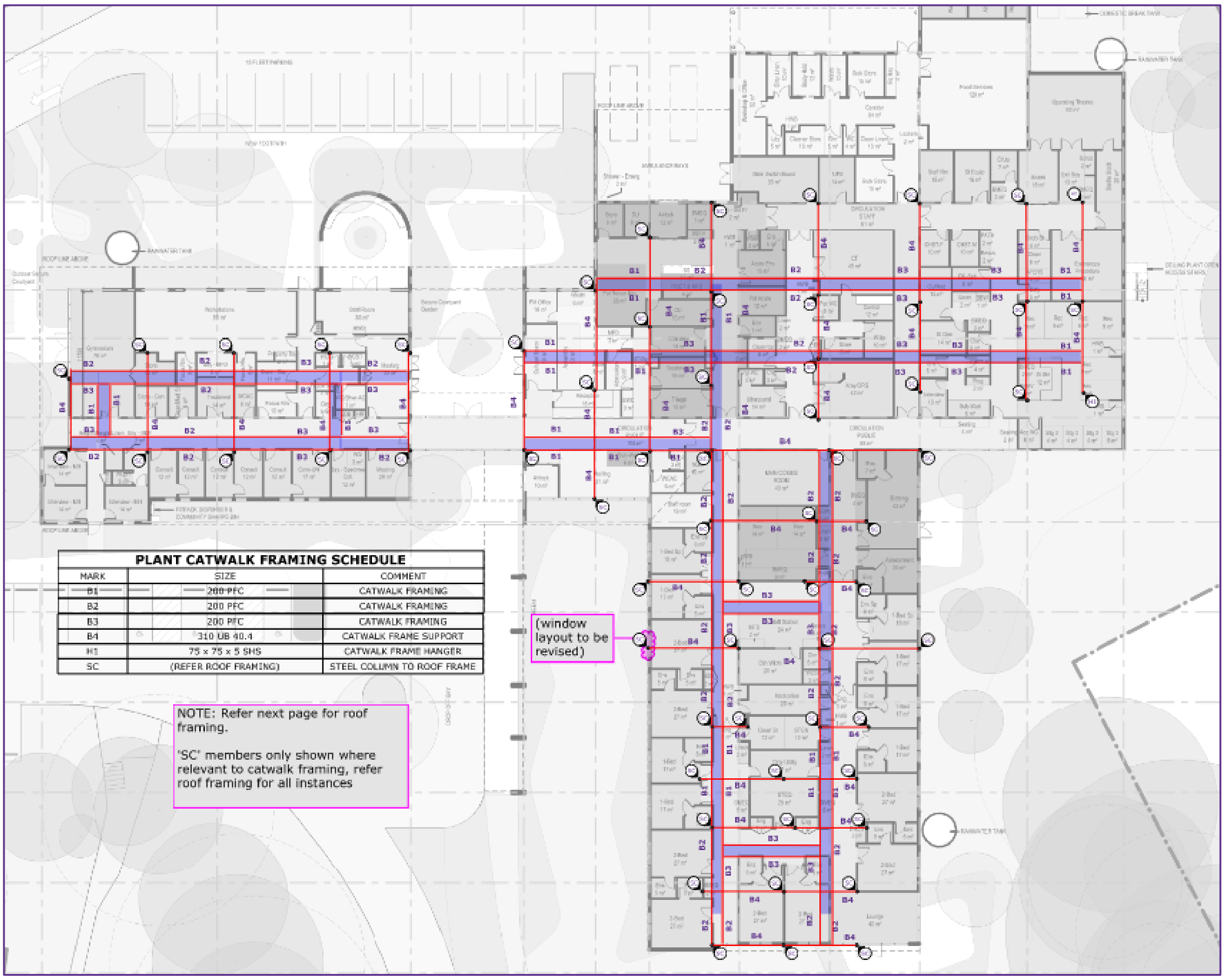
4.2 Superstructure

For the single level construction, the structural system for the building consists of structural steel framing as the main structural members for the external walls and roof, with several strategically placed internal steel columns within wall locations, to maximize internal spatial layouts and providing flexibility to future renovation works. Therefore, many of the internal walls will remain as light-weight non-loadbearing elements in order to provide this future flexibility. In addition, the use of strategically located internal steel columns enables the roof framing to be reduced in size, producing a cost-effective structure whilst balancing the requirements for future wall layout flexibility.



Building superstructure – Roof and Support columns

A catwalk system within the roof space has also been accounted for in the schematic design. The layout and requirements of these catwalks have been coordinated with the mechanical and electrical services for maintenance purposes. These catwalk systems will be supported of lower level transfer beams (below roof framing levels) that are connected to the steel columns and not hung from the roof framing.



Roof space maintenance catwalk system as per requirements from mechanical and electrical services.

A combination of internal and external steel vertical braced stud framing walls will be utilised as the main bracing system for the building to resist lateral loads such as wind and earthquake loads. Therefore, consideration should be given to having solid (braced) walls in certain strategic locations. We would envisage due to the low seismic weight of the structure that the wind loads will be the governing lateral load case for the buildings.

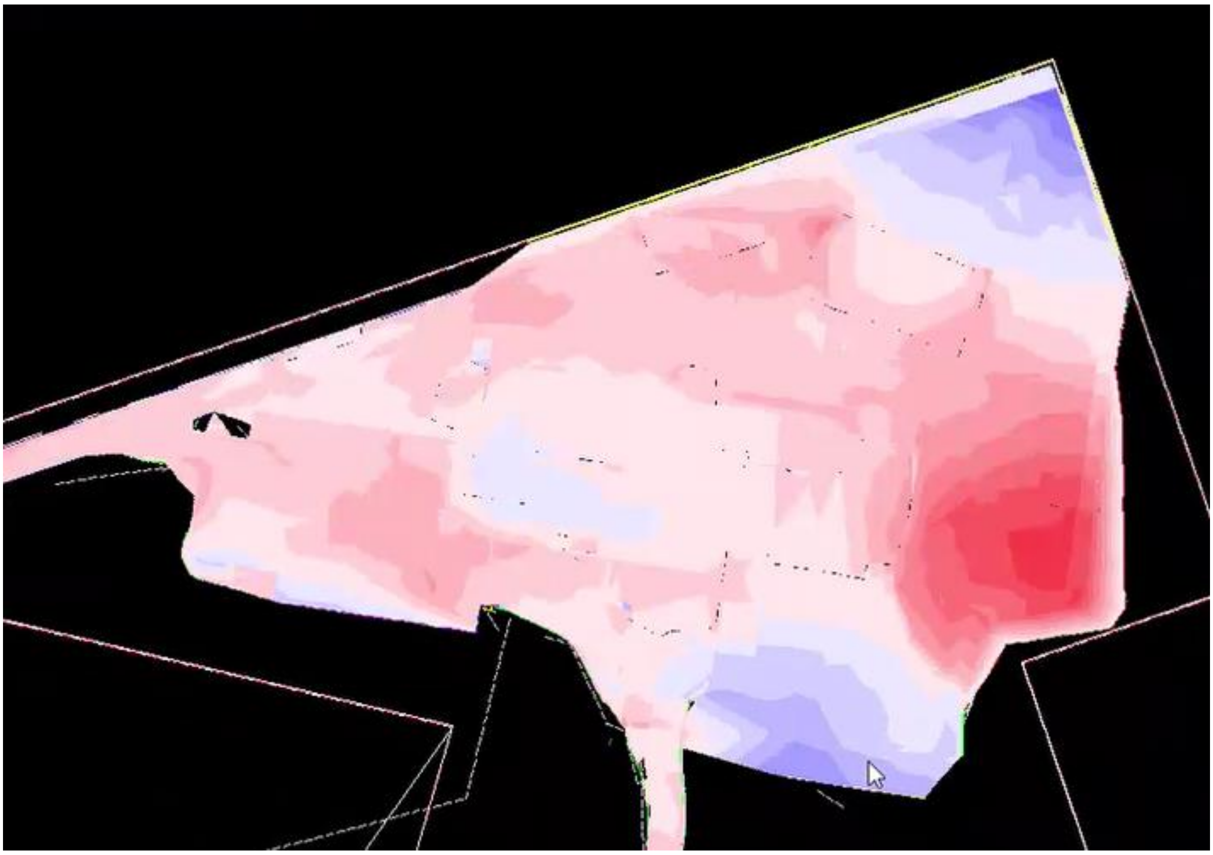
To suitably protect structural members against fire, all steel elements will be required to have additional vermiculite or intumescent paint applied. Alternatively, they can be cladded to achieve the required FRL in accordance to the National Construction Code (NCC)

Roof members to consist of structural steel rafters as primary members with cold formed purlin sections as secondary structural members. Roof framing elements to be designed to accommodate roof mounted solar panels.

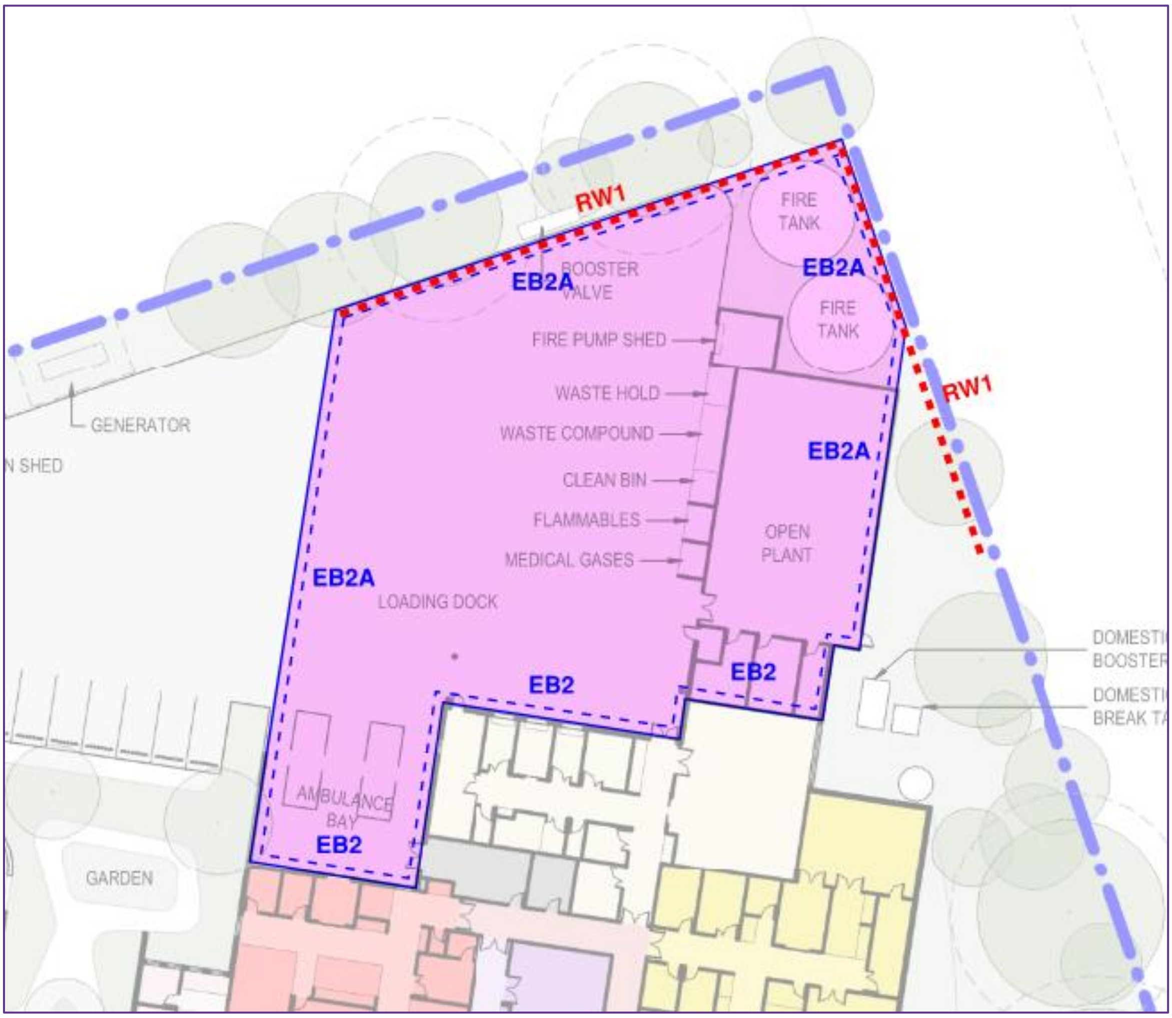
4.3 Retaining Walls

Temora Hospital is located towards the crest of a gently undulating slope, which grades towards the south-west at approximately 5°. Subject to final site levels and considering that the proposed buildings will be located on this sloping site, retaining walls will be required.

The cut/fill heat map shown below indicates that fill materials will be required to the North-East and South of the site. Therefore, retaining walls may be required in these areas. However, this will be dependent on the final landscaping design as preliminary design suggests a level entry into the hospital building from the South entrance. As such, retaining walls may not be required at this Southern location.

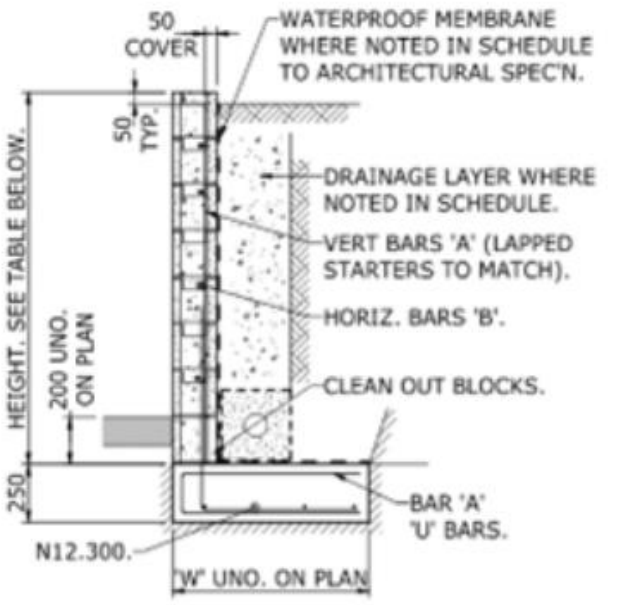


Project site cut and fill heat map. Red represents cut while blue shade represents fill.



Proposed retaining wall RW1 as shown along boundary in RED. Estimated total length of wall is 80m along the North-East corner of the site. Approximate height of wall is 1m.

It is anticipated that the base of these walls will be founded on Andesite rock and the retaining wall systems will consist of L-shaped retaining walls and footings. The retaining walls will either be constructed of blockwork or conventionally formed concrete walls. These walls are to be designed as drained to avoid hydrostatic pressures. These drainage pipes are to connect to an appropriate stormwater system by the civil engineer. From preliminary assessment and subject to final landscaping levels, the walls will not be any higher than 1.0m form their base foundation levels.



WALL SCHEDULE			
HEIGHT "H"	WIDTH "W"	"A" BARS	"B" BARS
800	900	N12.400	N12.400
1200	1100	N16.400	N12.400
1600	1200	N16.400	N12.400

Typical retaining wall (190mm thick blockwork) design

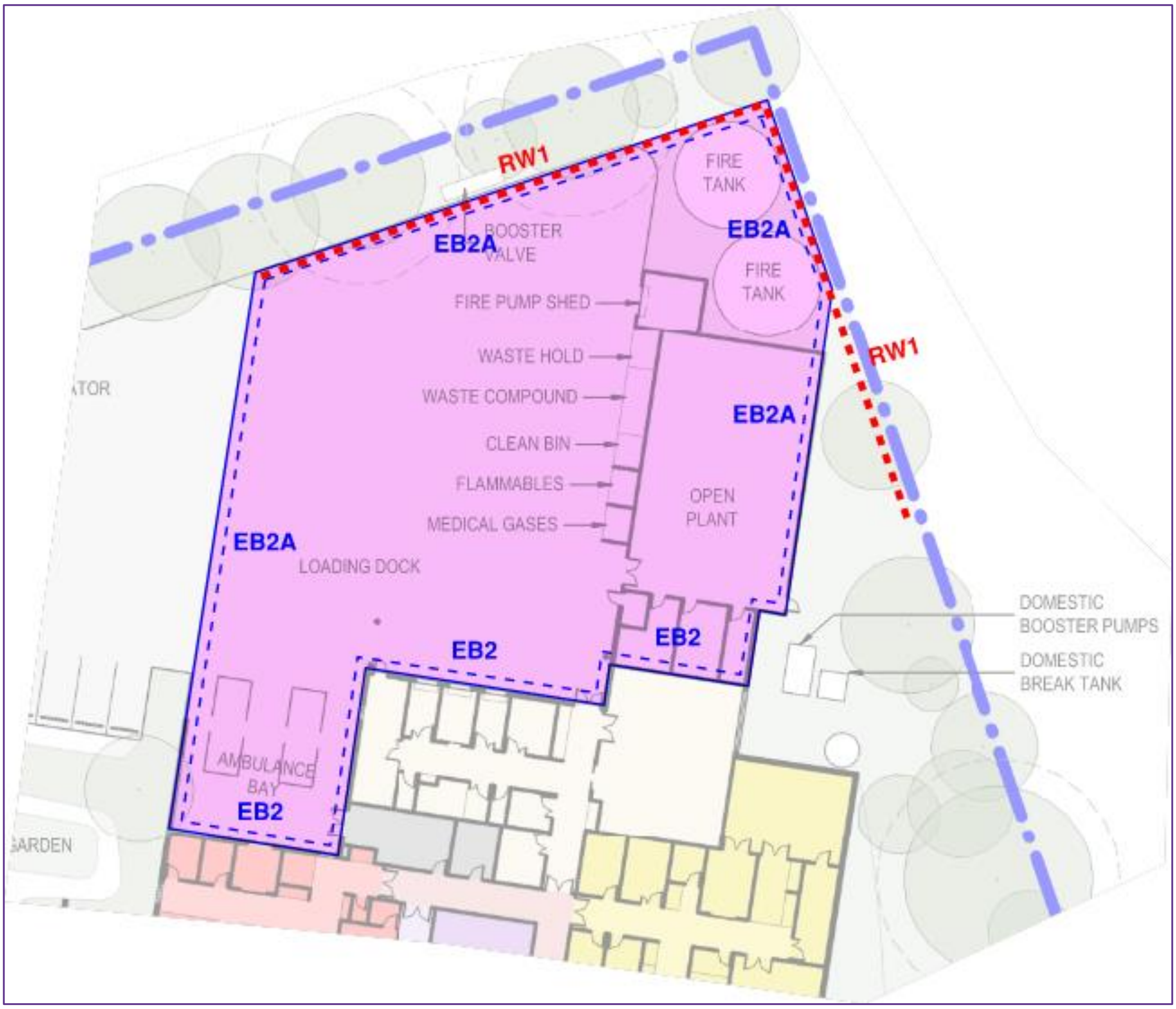
The following geotechnical parameters are to be used, as provided by the Geotechnical Engineer.

Retaining Wall Parameters for design			
Report Reference	**Bulk Density (kN/m^3)**	**Active Pressure (K_a*)**	**At Rest Pressure (K_0*)**
Clean In-situ Soil	20	0.35	0.55

*: K_a to be adopted when some wall movements are tolerable.
*: K_o to be adopted when wall movements must be limited

4.4 External hardstands

Based on current design, the external hardstand only extends to the area as highlighted below. The hardstand areas will consist reinforced concrete slab-on-ground subbase compacted to 100% dry density prior to placement. The slab will have both sawcut and dowelled joints subject to further coordination with architect and stakeholders.



External concrete hardstand areas to ambulance bay, loading dock, open plan and fire tanks

4.5 Sustainability

Together with all structural design works and specific material selection, embodied carbon calculations will also be undertaken to ensure that the total embodied carbon for the structural elements adopted for the new buildings satisfy the sustainability requirements of the project.

ESD Targets (provided by GHD)

Category	Code	Credit Criteria	Points Available	Points TBC	Points not targeted	Discipline
Life Cycle Impacts	13.2	Engineered Wood Products	1	1		Structural
Life Cycle Impacts	19B.1	Concrete	3	2		Structural

Life Cycle Impacts	19B.2	Steel	1	1	Structural
Life Cycle Impacts	19B.4	Structural Timber	4	2	Structural
Responsible Building Materials	20.1	Structural & Reinforcing Steel	1	1	Structural
Stormwater	26.1	Stormwater Peak Discharge	1	1	Civil
Stormwater	26.2	Stormwater Pollution Targets	1	1	Civil

4.6 Reference Data

Geotechnical (or other) reference data			
Report Reference	**Author**	**Date**	**Revision**
Geotechnical Report - 35822YFrpt2	JK Geotechnics	26.05.23	Final
Hazardous Buildings Materials Survey	JK Environmental	06.06.23	Final
HDR-AR-1302 Proposed Site Plan	HDR	15.08.23	1
HDR-AR-3100 Sections Sheet 1	HDR	15.08.23	1
HDR-AR-3101 Sections Sheet 2	HDR	15.08.23	1
SK002 – Proposed Ground Floor Plan	HDR	07.08.23	2
SK003 – Proposed Stage 1 Plan	HDR	07.08.23	2

4.7 Design Australian Standards

The structural design shall be in accordance with the latest issue of all relevant Australian Design Standards, Codes and other statutory requirements. As a minimum requirement, the design shall be based on, but not limited to:

AS/NZS 1170.0 – 2002	Structural Design Actions Part 0 General Principles
AS/NZS 1170.1 – 2002	Structural Design Actions Part 1 Permanent, Imposed and Other Actions
AS/NZS 1170.2 – 2021	Structural Design Actions Part 2 Wind Actions
AS 1170.4 – 2007	Structural Design Actions Part 4 Earthquake Actions in Australia
AS 1720.1– 2010	Timber Structures Part 1 Design Methods
AS 2159 – 2009	Piling – Design and Installation
AS 2312.1 - 2014	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings - Paint coatings

AS/NZS 2312.2 - 2014	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings - Hot dip galvanizing
AS 2870 – 2011	Residential Slabs and Footings
AS 3600 – 2018	Concrete Structures
AS 3700 – 2018	Masonry Structures
AS 4100 – 2020	Steel Structures
AS/NZS 4600 – 2005	Cold-Formed Steel Structures
AS 4678 – 2002	Earth Retaining Structures

Structural aspects of the Building Code of Australia

4.8 Importance Level

It is assumed that the structure will be required to fulfill a post disaster function (Importance Level 4)

4.9 Design Life

The structure elements of the building shall be designed to provide adequate performance for a minimum period of 50 years.

The structural design shall be based upon the building use as specifically set out in this design basis report.

Material selection, specifications, and detailing of the structural elements shall be in accordance with the design life and the relevant design standards.

4.10 Material Properties for Design

Generally the following minimum material grades shall be used:

4.10.1 Concrete

Strength Grade	Structural Item
32 MPa	Footings, Piles
40 MPa	Slabs on Grade, Suspended Slab
40/50 MPa	Transfer Slabs, Columns, Precast Concrete

4.10.2 Steel

Strength Grade	Structural Item
250 MPa	CHS (C250LO), Plates
300 MPa	Rolled sections, Welded Beams Grade 300
350 MPa	CHS (C350LO), RHS (C35OLO), SHS(C350LO)

400 MPa	Welded Beams Grade 400
450 MPa	RHS(C450LO), SHS(C450LO)
500 MPa	N-Grade Reinforcement

4.11 Design Loads

4.11.1 Design Loads

The floor slabs in the specifically designated areas shall be designed for the loads nominated below in accordance with AS1170.1 (2002):

Building Component	Uniformly Distributed imposed live load (kPa)	Imposed Point live load (kN)	Ceilings, Floor Finishes, services, partitions (kPa)
Stairs, Ramps	4.0	4.5	0.5
Lobby, corridors, circulation areas and foyer spaces	5.0	4.5	2.0
Wards (typical)	2.0	1.8	2.0
Clinical Areas	3.0	4.5	2.0
Plant Rooms	7.5	4.5	2.0
Catwalks	1.0	1.1kN over 1.2m length	0
Roof (typical) – inclusive of PV panels	0.25	1.4	1.0

4.11.2 Design Wind Loads

Design shall be in accordance with AS1170.2 – 2021 using the parameters set out below:

Region	A0
Importance Level	4
Annual probability of Exceedance	1/2000
V – Strength limit state	48 m/s
V – Serviceability limit state	37 m/s
Terrain Category	2.5

Terrain/Height Multiplier $M_{z,cat}$	0.92 (Z = 10m)
Shielding Multiplier M_s	1.0
Topographic Multiplier M_t	1.05
Hill-shape Multiplier M_h	1.1

The design of facade elements and their connections to the structure shall make provision for all local peak wind pressures effects, calculated using AS 1170.2 local pressure factors.

Projecting canopies and awnings, particularly at street level shall be designed to resist the wind forces caused by deflected pressure flows from the surrounding buildings, using the method nominated in AS1170.2 (2021).

4.11.3 Earthquake Loads

Design shall be in accordance with AS1170.4 using parameter set out below.

Probability Factor	Kp	1.5 (P=1/1500)
Hazard Factor	Z	0.09
Subsoil Classification		C_e – Shallow Soil
Earthquake Design Category	EDC	II
Structural Ductility	μ	2
Structural performance	Sp	0.77

4.11.4 Other Design Loadings

4.11.4.1 Internal Walls

Interior walls and permanent partitions and their fixings and supports, shall be designed to resist all loads to which they are subjected, but not less than a lateral force of 0.25 kPa (working), 0.50 kPa (ultimate) shall be applied perpendicular to the walls.

4.11.4.2 Temporary and Construction Loads

A minimum construction live load of 2.0 kPa shall be adopted for typical floor.

In all instances, the building components in their temporary partly constructed state shall remain structurally stable.

4.11.4.3 Horizontal Loads to Handrails and Balustrades

All handrails and balustrades shall be designed in accordance with AS1170 Part 1.

Where applicable, the design shall include for the effects of a crowd loading or impact. Under maximum load conditions, these elements shall deform by following a plastic deformation mechanism.

4.11.4.4 Earth Pressures

Earth retaining structures are to be designed in accordance with AS4678 -2002 for the earth pressures nominated in the geotechnical report.

- Structure classification (AS4678) C
- Minimum Design Surcharge 5.0kPa

4.11.4.5 Hail Loads

Major hail storm events to the East of the Great Dividing Range (GDR) can be a common occurrence throughout any given year, whereas these events in areas West of the GDR are much less frequent.

The preliminary architectural sections through the proposed development show a roof pitch much greater than 3°, which will reduce the hail loading on the roofs.

4.12 Serviceability

4.12.1 Deflection Limits

Deflection limits in accordance with AS/NZS1170.0 Table C1 shall apply unless more stringent deflection limits are required for special conditions:

Table C1 Suggested Serviceability Limit State Criteria

Element	Phenomenon controlled	Serviceability Parameter	Applied Action	Element Response (see Notes 1 and 2)
Roof cladding				
Metal roof cladding	Indentation	Residual deformation	Q = 1 kN	Span/600 but <0.5 mm
Concrete or ceramic roof cladding	De-coupling	Mid-span deflection	$[G, \psi_s Q]$	Span/120
	Cracking	Mid-span deflection	$[G, \psi_s Q]$	Span/400
Roof-supporting elements				
Roof members (trusses, rafters, etc.)	Sag	Mid-span deflection	$[G, \psi_l Q]$	Span/300
Roof elements supporting brittle claddings	Cracking	Mid-span deflection	$[G, \psi_s Q]$ or $[W_s]$	Span/400
Ceiling and ceiling supports				
Ceilings with matt or gloss paint finish	Ripple	Mid-span deflection	G	Span/500 (see Note 3)
Ceilings with textured finish	Ripple	Mid-span deflection	G	Span/300
Suspended ceilings	Ripple	Mid-span deflection	G	Span/360
Ceiling support framing	Sag	Mid-span deflection	G	Span/360
Ceilings with plaster finish	Cracking	Mid-span deflection	$[G, \psi_s Q]$ or $[W_s]$	Span/200
Wall elements				
Columns	Side sway	Deflection at top	W_s	Height/500
Portal frames (frame racking action)	Roof damage	Deflection at top	$[W_s]$ or $[E_s]$	Spacing/200 (Note 4)
Lintel beams (vertical sag)	Doors/windows jam	Mid-span deflection	W_s	Span/240 but <12 mm (see Note 5)
Walls—General (face loaded)	Discerned movement	Mid-height deflection	W_s	Height/150
	Impact: soft body (neighbours notice)	Mid-height deflection	Q = 0.7 kN	Height/200 but <12 mm (see Note 6)
	Supported elements rattle	Mid-height deflection	W_s	Height/1000
Walls—Specific claddings (see Note 7): Brittle cladding (ceramic) face loaded	Cracking	Mid-height deflection	W_s	Height/500
Masonry walls (in plane)	Noticeable cracking	Deflection at top	$[W_s]$ or $[E_s]$	Height/600
(face loading)	Noticeable cracking	Deflection at top	$[W_s]$ or $[E_s]$	Height/400
Plaster/gypsum walls (in plane)	Lining damage	Mid-height deflection	W_s	Height/300
(face loading)	Lining damage	Mid-height deflection	$[W_s]$ or $[E_s]$	Height/200
Movable partitions (soft body impact)	System damage	Deflection at top	Q = 0.7 kN	Height/160
Glazing systems	Bowing	Mid-span deflection	W_s	Span/400
Windows, facades, curtain walls	Facade damage	Mid-span deflection	$[W_s]$ or $[E_s]$	Span/250
Fixed glazing systems	Glass damage	Deflection	$[W_s]$ or $[E_s]$	2 × glass clearance (see Note 3)
Floors and floor supports				
Beams where line-of-sight is along invert	Sag	Mid-span deflection	$[G, \psi_l Q]$	Span/500 (see Notes 8, 9)
Beams where line-of-sight is across soffit	Sag	Mid-span deflection	$[G, \psi_l Q]$	Span/250
Flooring	Ripple	Mid-span deflection	$[G, \psi_l Q]$	Span/300
Floor joists/beams	Sag	Mid-span deflection	$[G, \psi_l Q]$	Span/300
Floors	Vibration	Static midspan deflection	Q = 1.0 kN	less than 1 to 2 mm (see Note 10)
Normal floor systems	Noticeable sag	Mid-span deflection	$[G, \psi_l Q]$	Span/400
Specialist floor systems	Noticeable sag	Mid-span deflection	$[G, \psi_l Q]$	Span/600
Floors—Side-sway (acceleration)	Sway	Acceleration at floor	W_s (P=5)	<0.01g (see Note 11)
Floors—Supporting masonry walls	Wall cracking	Mid-span deflection	$[G, \psi_l Q]$	Span/500
Floors—Supporting plaster lined walls	Cracks in lining	Mid-span deflection	$[G, \psi_l Q]$	Span/300
Floors supporting existing masonry walls—Underpinning floors	Wall cracking	Mid-span deflection	$[G, \psi_l Q]$	Span/750
Floors—For access for working by operators and maintenance	Sag	Midspan deflection	Q = 1 kN	Span/250
Handrails—Post and rail system	Side sway	Mid-span system deflection	Q = 1.5 kN/m	Height/60 + Span/240

5 Durability

5.1.1 Concrete

The structure shall be designed given due consideration to durability and the functionality of the building and its components. All concrete elements shall be designed for the following exposure classifications in accordance with AS3600

Interior A1

Exterior A2

5.1.2 Steelwork

Steelwork protection shall give due consideration to 'time to first maintenance' based on AS 2312.1 – 2014: Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings - Paint coatings and 2312.2 – 2014: Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings - Hot dip galvanizing.

Time to first maintenance: 25 years

5.2 Regulatory

5.2.1 BCA

This is a preliminary assessment conducted by Tonkin, as the BCA report is not completed at the time of writing. This will be updated once the BCA report is received.

In summary the structural requirements are:

Classification	Building
Class of Building	9a
Rise in Stories	1
Type of Construction	C
Fire Rating	
External Columns	90/-/-
External Wall	90/90/90
Internal Columns	-/-/- (>3m from fire source)
Floors	90/90/90
Roof	-/-/-

5.3 Temporary Works During Construction

It is envisaged that temporary works support to existing structures will be required to the main hospital building during staged demolition. As is the case with all works on existing structures, that until construction works are commenced and the existing structures are fully exposed, there remain risks of additional temporary structural works being required during construction due to unexpected deterioration or arrangement of existing structures. The considerations will extend to vertical support and lateral stability of existing building.

To minimise this risk, ongoing investigation into the existing structures will need to be undertaken during the following planning and delivery phases of the works however the risk cannot be eliminated until such time as the structure is completely exposed during construction works.

5.4 Work by Others

5.4.1 Waterproofing

Waterproofing details shall be provided by a waterproofing specialist. Structural drawings may include details as provided by the specialist.

5.4.2 Temporary Shoring

Tonkin may provide high level advice that we think is required to support the building during construction. However, details surrounding the specifications, configuration and arrangement will be by others.

5.4.3 Vehicular Barriers

These are proprietary elements. Tonkin will assess the suitability of this and impact they have on the structural base elements designed by us.

5.4.4 Non Load Bearing Walls

Proprietary elements normally procured by the contractors.

5.4.5 Facades

Primary support members will be documented in the structural package, secondary support members and façade fixing details will be documented by the façade engineer or subcontractor. Façade consultants to provide advice on loadings imposed by the façade on the primary façade support members.

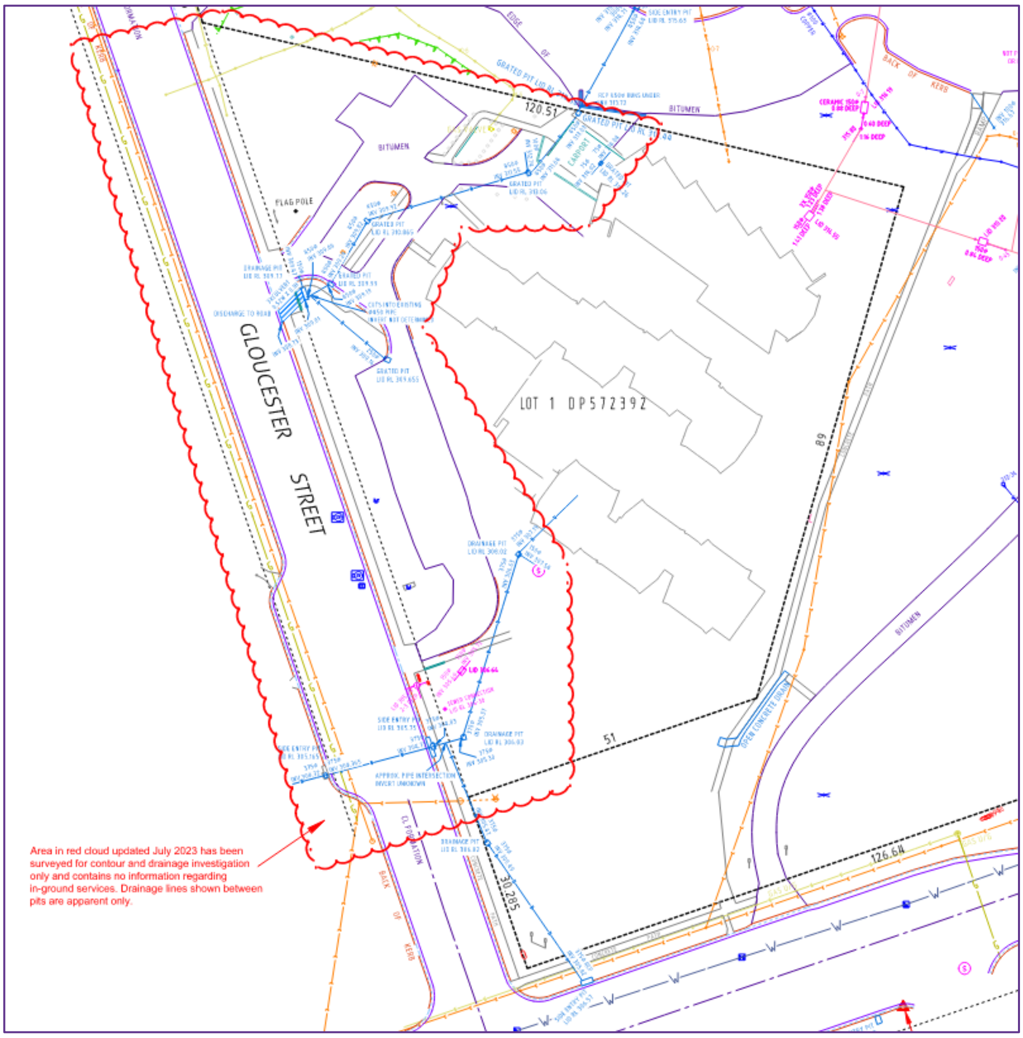
6 Civil Engineering

6.1 Site Survey

Detailed site survey undertaken by Walpole Surveying dated October 2022 informed the existing topography, general site features and services within the site.

Additional requested drainage survey was provided in July 2023 which informed the drainage crossings within Gloucester Street and the existing stormwater infrastructure withing the drainage easement through downstream neighbour, Whiddon Temora.

Detailed Survey of Temora Hospital Site (Walpole Surveying)



Additional Drainage Survey of Easement and Gloucester Street (Walpole Surveying)

6.2 Existing Site Conditions

A site investigation undertaken in March 2023 of Temora Hospital informed the condition of asphaltic pavement, internal road and carparking layouts, existing drainage infrastructure, stormwater connection points and overall topography and imperviousness of the site.

6.2.1 Existing Topography and Overland Flow

The main hospital building and immediate surrounds (excluding carpark and access roads) are typically asphalted hardstand and concrete areas with flatter surface grades ranging from 0 to 5%.

External to the hardstand, roof areas and main circulation areas; the terrain presents as natural undulating hills with established trees, vegetation and planting. The landscaped areas may be serviced by subsoil lines but do not appear to have formal underground drainage.

Stormwater runoff predominantly conveys as sheet flow with some instances of swale flow within gentle depressions out to the southern and western site boundaries.

At the rear of the site, there is a landscaped garden which exhibits 5% longitudinal fall to the northern boundary and neighbouring property.

6.2.2 Existing Carpark Facilities

Existing DDA carparking spaces are noted to be at the flatter grades immediately adjacent to the building. Concrete pedestrian walkways, steps, access ramps and handrails are present on site and assist in navigating the steeper grades in the north-south direction.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DDA Carparking spaces and Existing Pedestrian Access (North-South)

There is an offline gravel public carpark adjacent to the asphalt internal access roads with steeper gradients ranging between 5-12% that do not present as DDA compliant. The existing trees within the carpark are likely to limit the manoeuvrability of vehicles and adversely impact the carparking layout and spacing. The pavement condition of the gravel carpark is noted to be in poor pavement condition with heavily silted underground drainage infrastructure.


Asphalt/Gravel carpark West of Internal Access Road

Behind the main hospital to the north-east of the site, there is additional staff parking in a mix of asphalt and gravel surfaces.

Asphalt/Gravel carpark in the North-East (L-Eastern End, R-Western End)

6.2.3 Adjacent Road Network and Vehicular Access

The site is bounded by Loftus Street to the south which exhibits a longitudinal fall of 7% from east to west.

The existing kerb treatment of Loftus Street at the street interface, on the eastern upstream side is a wide dish drain. This dish drain gradually transitions into the current layback of the existing VC. Downstream and to the west of this VC, the kerb then transitions immediately into upright kerb and gutter treatment which continues down to the intersection.

Vehicles currently enter the hospital via the access off the southern driveway at Loftus Street.

Driveway Entry and Loftus Street looking east

Gloucester Street bounds the site to the west and presents 4% longitudinal falls from north to south with kerb and gutter treatment within the half-road.

There is a neighbouring aged care facility to the west (Whiddon Temora) which sits between the hospital site boundary and Gloucester Street.

Driveway Exit at Gloucester Street looking south

The internal driveway of the hospital site is generally circulated by a 4 to 4.5 metre wide road that leads up to the main hospital with grades of approximately 6-7% fall longitudinally from Loftus Street. Circulation continues to the north and west adjacent the gravel public carpark.

To exit, vehicles can continue north and to the west of the site in one direction to the western vehicular access off Gloucester Street.

Internal Roads (L-South view to Loftus Street, R-West view to Gloucester Street)

L-Elevation of Pedestrian Access, R-Existing Steep Batters near Former Tennis Court

6.2.4 Existing Stormwater

Topographically, the existing hospital facilities sit atop a local crest and thus exhibits multiple discharge locations in all directions towards the site boundaries.

The formal drainage connection for the existing hardstand and roof areas is through stormwater infrastructure within an easement in the western neighbouring property and outlet directly to the kerb via a series of 3 x 500mm wide x 100mm high within the Gloucester Street road reserve.

The site drainage comprises of a series of 300 mm to 450 mm diameter reinforced concrete pipes. The upstream end of the easement location is recognized by a series of perimeter grated drains arriving perpendicularly to a grated inlet square pit.

Drainage Connection at the upstream end of easement

Adjacent to the existing buildings, smaller PVC pipes for roof and downpipe reticulation connect into the external stormwater pit outlets to discharge.

The silting and blockage conditions of the pits are poor in the vicinity of the public parking area and upstream end of the easement.

Heavily silted carpark drainage inlets

6.3 Bulk Earthworks

A preliminary bulk earthworks assessment has been undertaken based on a nominal set down from finished floor levels and a nominal boxing depth from the preliminary road layout.

The current balance as depicted is an estimation only and subject to change.

Earthworks	Volume (m^3)
Cut	-5200
Fill	900
Cut/Fill Balance	4300 in cut

The earthworks balance will be refined in the detailed design phases to account for detailed batters, level differences including retaining structures, additional footpaths, setdown depths in coordination with structural, architectural and geotechnical design development.

Bulk Earthworks Plan

6.4 Sediment Erosion Controls

The siteworks will be supported by sediment erosion controls in accordance with the Blue Book – Managing Urban Stormwater: Soils and Construction (Landcom, 2004). An indicative layout of the sediment fence layout, vehicle shaker grid and geotextile inlet filter locations have been illustrated in the figure below. Requirements for a temporary sediment basin is to be confirmed during detailed design upon review of the disturbed siteworks area.

Proposed Sediment Erosion Controls

6.5 External Works Design

Road grading, internal vehicular access, driveways, laybacks and flexible pavement design will be undertaken in accordance with Austroads, Temora Shire Council Standards, Health Infrastructure standards and advice from the project traffic consultant.

Road grading will consider the existing overland flow and catchment split to resemble to maintain existing stormwater behaviour where possible.

The access driveway road running along the northern boundary will be widened to 6 metre minimum width for 2-way traffic as per Temora Shire Council DCP requirements.

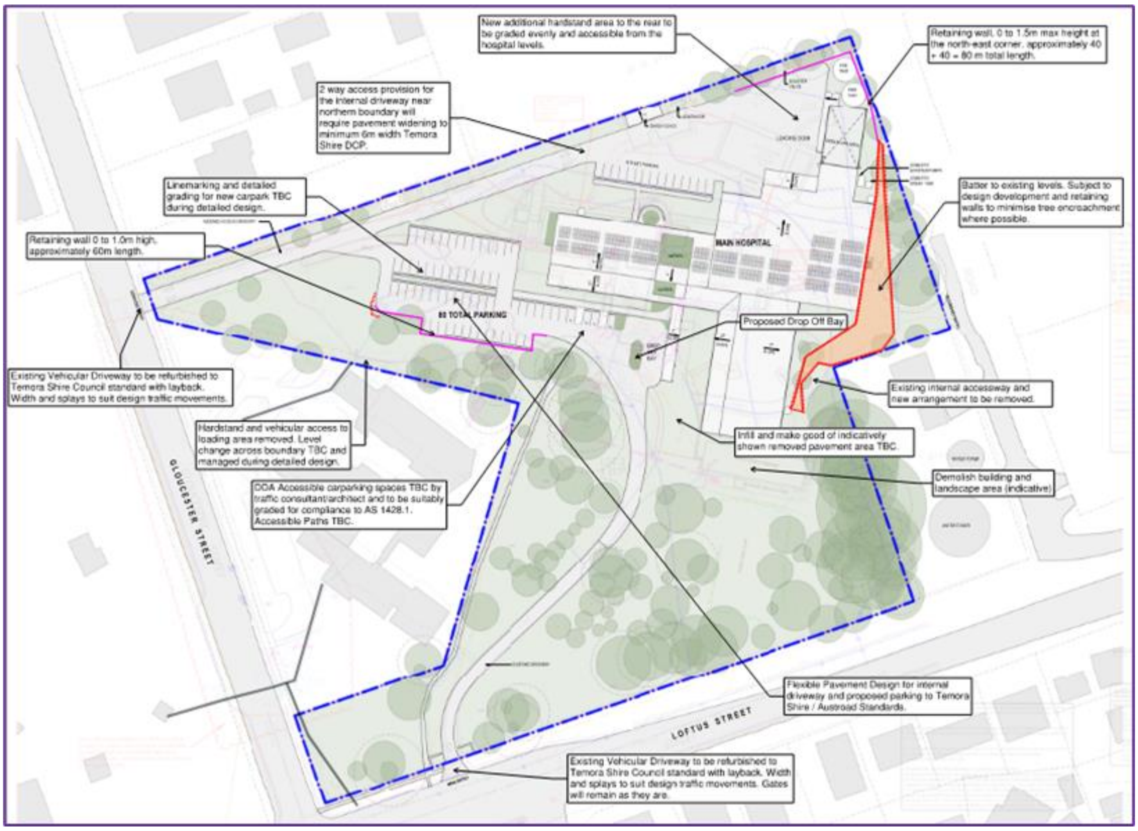
DDA accessible carparking spaces and pathways will be suitably graded to ensure compliance in coordination with the traffic consultant and architectural intent. The 80 space carpark at the front will be refurbished to complaint grades. As the existing levels fall away in the south-western direction, a retaining wall along the south-western end of the carpark of approximately 60m length is required to both meet the 1m level difference to natural, and also to prevent encroachment into existing trees on location.

To the north-eastern corner of the site: fire tanks, plant room and additional hardstand area is proposed to be at an accessible level to the rear of hospital. As such, the new hardstand area will be at a higher level than to existing ground, meaning a retaining wall of approximately 40m + 40m (in the east-west and north-south directions) totalling 80m length is required to elevate this level from the natural ground (1.5m level difference maximum). To the eastern face of the proposed hospital – the finished floor level of the hospital will mean that the build will generally be in cut at this location. A 1 in 4 batter extent is indicated that resembles a cut bank that diverts runoff (generated by non-hardstand areas) to the eastern face.

Existing vehicular driveways at Loftus and Gloucester street will be refurbished to Temora Shire Council standards with suitable layback, footpath continuation and splay/widths to suit the design traffic movements. Traffic movements, swept paths and vertical clearances (to avoid vehicle bottoming) are to be checked in the detailed design phase.

The existing parking facilities and roadways to the rear (eastern end) of hospital are denoted to be redundant and will require further investigation during detailed design. Construction vehicles, heritage and tree clearance requirements and temporary measures should also be considered.

Signage and linemarking will be provided to guide patrons with respect to legal traffic movements, location of carparking, DDA carspaces. Removal of existing signs may be required where redundant (e.g. No-Entry, Entry / Exit Only).



Schematic Siteworks Plan

6.6 Proposed Stormwater Management

6.6.1 Stormwater Assessment

Design of the site stormwater for the hospital re-development was based on a minor/major design storm approach. The assumed design storms are 5% AEP and 1% AEP respectively.

A preliminary stormwater assessment was completed with hydrological inputs sourced by the Bureau of Meteorology (BoM) and ARR Data Hub, and developed catchment delineation e.g. building footprint, carpark areas based on the architectural plans.

The hydraulic network of the downstream network within Whiddon as per the geometries and invert information from the detailed survey modelled.

Both existing and re-development scenarios were investigated to understand and compare the capacity performance of the downstream infrastructure and the overland flow impact on the half-road within Gloucester Street.

Overall, the results indicated that the overall site – had a slight increase of imperviousness from pre (approx. 35% impervious percentage) to post (approx. 45% impervious percentage) generated similar levels of runoff. However, the re-development causes slight catchment modifications that meant that a greater proportion of the total flows were being directed specifically to the existing drainage easement.

The overall catchment flow in the 1% AEP arriving to Gloucester through the easement generated by the subject site is approximated to be about 270L/s. On-site detention is provided within the proposed carpark to ensure that the post-development flow in the 5% and 1% AEP do not exceed the pre-development flow at this location. Other catchments (draining to the eastern, northern and southern boundaries) were noted to not be in excess of pre-development flow.

Further, it is noted that:

- The existing drainage network and infrastructure within the easement can cater for the re-development flows, as the proposed on-site detention is able to attenuate the increased proportion of site catchment flow discharging to this location.
- The direct outlet configuration (3 x 500mm wide x 100mm high channels) creates a downstream tailwater control for the development in that the captured stormwater is held temporarily within the network and released – controlled by the outlet capacity of the channels at Gloucester Street kerb.

6.6.2 Council Requirements

The layout and design of the site drainage system is required to be approved by Council prior to construction.

All rainwater tank overflow and surface stormwater will be directed to Council's stormwater system. Early civil and hydraulic coordination has been undertaken to ensure the preliminary location of stormwater is within connection distance to the overflow from rainwater tanks.

An interceptor drain is proposed within the Loftus Street driveway as per Temora Shire Council DCP guidelines. This drain is proposed to be connected directed to the existing kerb inlet pit further downstream near the kerb return with Gloucester Street.

At the Gloucester street exit, there is no existing stormwater connection and as such, part of the internal driveway that is located downstream of the existing connection point will discharge overland to the road reserve, as per the existing condition. The driveway will be graded suitably so that stormwater is not directed into adjoining property.

6.7 Proposed Stormwater Design

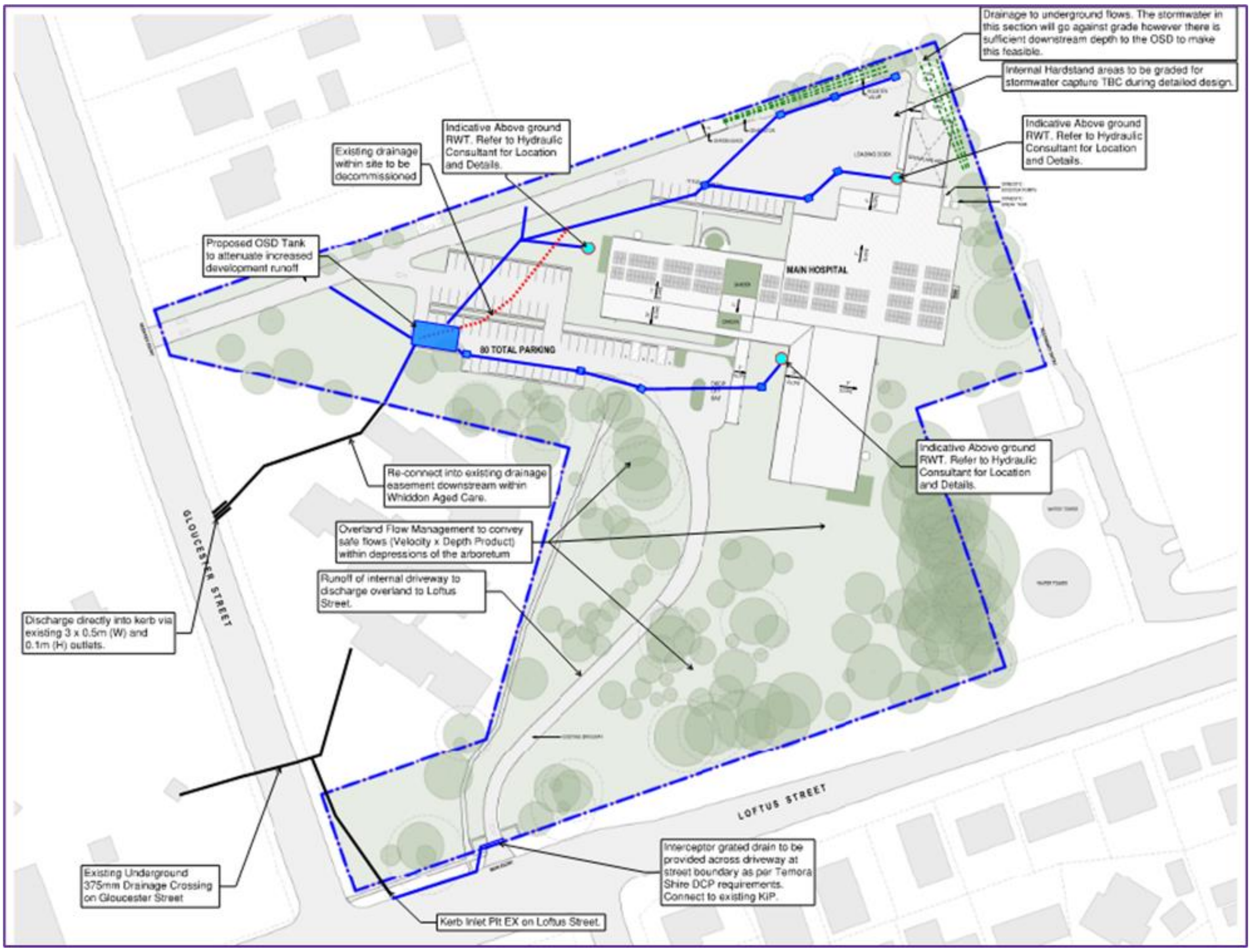
The overall site grading aims to facilitate resemblance to pre-development catchment split, overland flow runoff patterns and discharge locations.

The building footprint of the hospital re-development is approximated to 4500 m^2 of which the majority of roof runoff will be directed to rainwater tanks as nominated by the hydraulic consultant. A sensitivity check can be completed during detailed design to understand the ability of these tanks to provide additional attenuation and any opportunities to offset the OSD volume (during dry-season or half-full assumptions).

The roof water will be conveyed through the RWT overflow with majority of the hardstand drainage network designed to drain underground to the proposed OSD and ultimately to discharge into the existing drainage easement within Whiddon Aged Care.

Overland flow paths will be assessed to ensure safe velocity depth products (VxD) and containment for the design storm where possible.

Refer to the below image for a summary of the concept stormwater management plan.

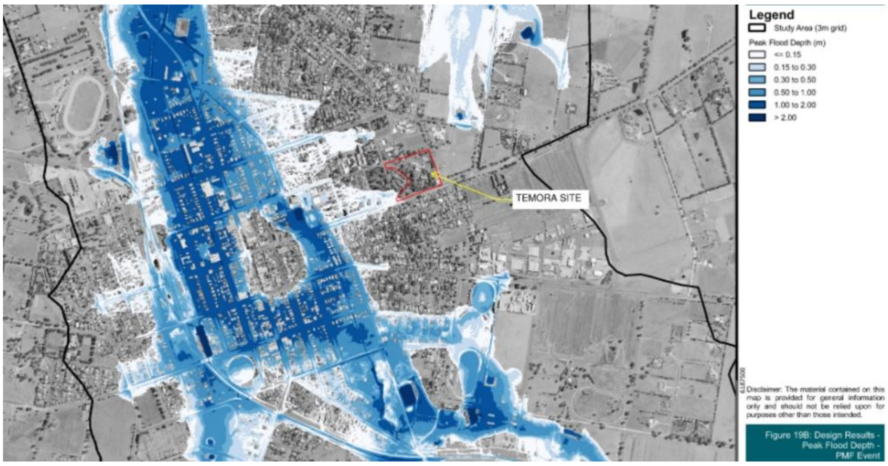


Schematic Stormwater Management Plan

6.8 Flooding

Temora hospital sits on a higher elevation area within the LGA and is generally not affected by the 1% AEP or the PMF Flood as per the Temora Flood Study (February 2019, Water Modelling Solutions). Overland flow conveyance in the proposed development should ensure no trapped low points and grade away from building entries and faces.

Excerpt – Temora Flood Study – 1% AEP Event (by Water Modelling Solutions)



Excerpt – Temora Flood Study – PMF Event (by Water Modelling Solutions)