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CIVIL ENGINEERING STATE SIGNIFICANT DEVELOPMENT APPLICATION STAGE 1 – CONCEPT

HI21250 - Ryde Hospital Redevelopment Project

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1 Introduction

1.1 Project Scope

The Ryde Hospital site is located at 1 Denistone Road, Denistone and comprises Lots 10-11 DP 1183279 and Lots A-B DP 323458. It has an area of approximately 7.69Ha and currently accommodates the existing Ryde Hospital Campus.

This report accompanies a State Significant Development Application that seeks approval for the establishment of a maximum building envelope and gross floor area for the future new hospital buildings, and physical Stage 1 Early Works to prepare the site for the future development.

For a detailed project description refer to the Environmental Impact Statement prepared by Ethos Urban.



1.2 SEARs Requirements

The SEAR's requirements for the Ryde Hospital Redevelopment the State Significant Development (SSD-36778089) have been received, with the applicable items for Civil are addressed in this report and are summarised in Table 1 below.

Table 1 - SEAR's Requirements

ltem	SEARs Requirements – Concept Proposal	Relevant Section	
		of Report	
13	Stormwater and Wastewater		
	 Provide an overarching Integrated Water Management Plan for the concept development that: 		
	 is prepared in consultation with the local council and any other relevant drainage or water authority. 	Section 2.1	
	 details the proposed drainage design for the site including any on-site treatment, reuse and detention facilities, water quality management measures, and the nominated discharge points. 	Section 2.3	
	 demonstrates compliance with the local council or other drainage or water authority requirements and avoids adverse impacts on any downstream properties. 	Section 2.3	
15	Flooding Risk		
	 Provide a flood impact and risk assessment prepared in accordance with the NSW Floodplain Development Manual, and existing councils and government studies and guidance. 	Section 3	
	 Identify flood behaviour, flood constraints and risks on the site and on the surroundings, including the potential impacts of climate change for the full range of events (i.e. up to and including the probable maximum flood (PMF)). 	Section 3	
	 Assess the impacts of the development, including any changes to flood behaviour and risk, impacts of flooding on the development and on the existing and the future community and for the full range of events. 	Section 3	
	 Propose management measures required to minimise the impacts of flooding on the development and minimise flood risks to the community, including emergency management measures to consider access and evacuation issues during significant flood events, including the PMF. 	Section 3	
	 Identify any flood risk on-site having regard to adopted flood studies, the potential effects of climate change, and any relevant provisions of the NSW Floodplain Development Manual. 	Section 3	
	 Assess the impacts of the development, including any changes to flood risk on-site or off-site, and detail design solutions and operational procedures to mitigate flood risk where required. 	Section 3	



ltem	SEARs Requirements – Stage 1	Relevant Section of Report
3	Sediment, Erosion and Dust Control	
	 Detail measures and procedures to minimise and manage the generation and off-site transmission of sediment, dust and fine particles. 	Section 5 & 6



2 Stormwater Drainage

2.1 Design Requirements

The following list indicates the relevant infrastructure design guides and standards considered through the Stormwater design:

- Australian Rainfall and Runoff (2019) with AR&R (2016) rainfall datasets sourced from the ARR Data Hub and Bureau of Meteorology (BOM);
- AS3500.3:2018 Plumbing and Drainage Part 3: Stormwater Drainage
- Ryde Council Development Control Plan (DCP) 2015
- Managing Urban Stormwater: Soils and Construction, "The Blue Book" 4th edition 2004.

2.1.1 Stormwater Quantity

Drainage designs for future works will follow the requirements set out in the City of Ryde Development Control Plan (DCP) 2014. In-ground pit and pipe systems will be designed to capture and convey all runoff for up to and including a 20-year ARI storm event. Overland flow paths will be designed to convey flows from all storms above a 20-year ARI event up to and including the 100-year ARI storm event. The IFD data extracted from the Bureau of Meteorology's IFD tool for the Ryde Hospital Site are presented in Table 2 below and will be used for future design development.

Storm Duration	5-year ARI (mm/hr)	20-year ARI (mm/hr)	100-year ARI (mm/hr)
5 min	137	184	242
1 hour	39.5	53.0	69.7
12 hour	9.08	12.8	17.4
72 hour	3.33	4.08	6.46

Table 2 – Ryde Hospital Site IFD Data (Source: BOM)

2.1.1.1 Surface Runoff

Property drainage systems must be designed to reduce the extent and level of ponded water on the property, prevent concentrated stormwater runoff entering neighbouring sites and reduce erosion. All rainfall runoff from impervious areas is to be collected by the stormwater infrastructure.

2.1.1.2 Rainwater Tanks

Rainwater tanks are to be installed in accordance with the manufacturer's specification and the latest edition of AS3500.3 National Plumbing and Drainage Code Part 3: Stormwater Drainage.

2.1.1.3 Stormwater Discharge from Property

Generally, there shall be only a single drainage discharge point from a site per allotment. The only exceptions to this are:

- a) When a property is across two sub-catchments (e.g., at the crest of a hill) and the drainage from the site is being directed towards two separate drainage systems and no water is being redirected from one sub-catchment to another.
- b) To disperse the discharge of stormwater from a large site to the public drainage network in order to mitigate or prevent localised flooding effects.



Methods of stormwater discharge:

- Directly discharge to public drainage infrastructure (in-ground pit and pipe system):
 - Where existing inground public drainage infrastructure is available, the development must connect directly to it.
 - For large developments where the site is located within 30m of inground public drainage, the public infrastructure must be extended to the site frontage.
- Directly discharge to Public Drainage infrastructure (kerb and gutter):
 - Discharge during the 100-year ARI is limited to 30l/s.
 - The peak velocity of water being discharged to the kerb must not exceed 2.0m/s.

2.1.1.4 Onsite Stormwater Detention (OSD) Systems

City of Ryde DCP provides a detailed design method for determining the Permissible Site Discharge (PSD) and Site Storage Requirement (SSR) for large sites (>3000m²). A runoff routing modelling software such as DRAINS shall be used to model the post-development scenario and size the required on-site detention to restrict post development flows as required. Model parameters for City of Ryde are shown in Figure 1 below.

The OSD must be designed to ensure the level of stormwater runoff discharged from the area of development must not to exceed the peak stormwater discharge arising from the post-developed works, during a 5-year ARI storm event.

The following general items shall be adhered to in the design of OSD systems:

- a) Freeboard for any building adjacent to the detention structure shall be at least 200mm.
- b) Suitable scour protection in accordance with Landcom's "Managing Urban Stormwater Soil and Conservation – Volume 1" 4th Edition 2004 (Blue Book) or similarly recognised publications shall be used over any spillway.
- c) All OSD storage must be located above the flood level or downstream water level to provide effective storage. Where there is a submerged outlet, it shall be modelled with a computer program to ensure it functions hydraulically as intended to limit post development flows to pre-development levels. Submerged outlet will require HGL analysis.

Drains Model			
Parameter	Description	Value	Unit
Model	Rational Method Procedure	ARR 98	
	Soil Type - Normal	3.0	
	Paved (impervious) Area Depression Storage	1	mm
	Supplementary Area Depression Storage	1	mm
	Grassed (Pervious) Area Depression Storage	5	mm
AMC	Antecedent Moisture Condition	2.5	
	Minimum Pit freeboard	150	mm

Figure 1 - City of Ryde DRAINS Model Parameters (Source: City of Ryde DCP Part: 8.2 - Appendix 4)



2.1.2 Stormwater Quality

The City of Ryde DCP 2014 Part 8.2 outlines the water quality requirements for proposed developments.

Development of a Water Sensitive Urban Design (WSUD) strategy must meet the stormwater quality objectives set out in the DCP. WSUD Measures incorporated into the development must satisfy the pollutant target controls given in the Table 3 below.

Table 3 - WSUD Reduction Targets

Pollutant	Annual Load Reduction Target	
Gross Pollutants	90%	
Total Suspended Solids (TSS)	85%	
Total Phosphorus (TP)	65%	
Total Nitrogen (TN)	45%	

A WSUD treatment modelling program (such as MUSIC) shall be used to efficiently calculate the required treatment devices to achieve the required numerical stormwater quality objectives.



2.2 Existing Stormwater Infrastructure

The stormwater system has been constructed progressively as the site has been developed. Downpipes from roofs are either connected to inground stormwater drainage or discharged to the surface where it becomes overland flow. Overland flow and surface runoff around the site are directed to in-ground pit and pipe networks which convey stormwater to various discharge locations around the extent of the site. Refer to the Figure below.



Figure 2 - Existing internal and external stormwater infrastructure at Ryde Hospital

The external Council drainage network is generally as follows:

- Denistone Road There are no kerb inlet pits along Denistone Road however there are several kerb outlets intermittently along the Hospital frontage. It is assumed that several of the buildings along Denistone Road discharge directly to the kerb.
- Fourth Avenue There is only one kerb inlet pit along Fourth Avenue with an in-ground stormwater pipe which runs north, away from the hospital. The kerb inlet pit is located central along Fourth Avenue in front of the Graythwaite Rehab Centre.
- Ryedale Road There are no kerb inlet pits along the hospital frontage on Ryedale Road the first Council pit is adjacent to the Blue Gum High Forest, approximately 50m south of the driveway entrance to the Camelia Cottage.
- Florence Avenue There are kerb inlet pits intermittently along the northern side of Florence Avenue.

There are several discharge methods and locations on the site, including uncontrolled discharge directly to kerb and in-ground Council infrastructure as well as controlled discharge via Onsite Detention systems.



The existing Hospital site discharge locations are as follows:

- Onsite detention has been provided on a building-by-building basis using in-ground tanks or above ground storage (e.g., by ponding in the carpark under the perioperative building). Below ground tanks have been provided at the front of the Graythwaite and Mental Health Buildings.
- The buildings along the Denistone Road frontage seem to be uncontrolled and directly connected to the kerb and gutter.
- Downpipes for the buildings at the centre of the site seem to discharge to the surrounding surface and travels overland to the stormwater pit and pipe network catering for the internal roads and carpark.
- The site stormwater drainage drains to the south through several discharge points along the southern carpark that exits the site under the retaining wall towards the bushland.

2.3 Proposed Stormwater Drainage

2.3.1 Stormwater Quantity

The Ryde Hospital is located at the top of a crest and is situated across two defined catchments with multiple discharge locations across the site. The intent for the development is to utilise the existing discharge points where possible, however, rainfall runoff from one catchment must not be redirected to the other catchment.

The new hospital building is proposed to be drained via a conventional roof drainage system connecting to a new inground pit and pipe network. Roof water along with surface runoff will be directed to inground Onsite Detention storage tanks before being discharged directly to Council infrastructure through the existing pipework. The stormwater will be required to be treated to meet Council stormwater quality requirements.

Onsite Stormwater Detention (OSD) Systems

Preliminary modelling of the stormwater network and OSD through the design program DRAINS has been undertaken, to provide initial PSD values and indicative OSD sizing. As the design and building forms are developed further through the detailed design phase, these models will be updated to rationalise the OSD sizing and confirm any assumptions made for the concept design.

Based on the proposed building configurations and site layouts, the site has been split into two catchments (north and south), positioning the catchment delineation line as close as possible to the existing topographical ridgeline through the site.

Based on the current design and typical land use of Hospital sites, we have assumed that the north and south catchments will have a post-development impervious areas of 80% and 90% respectively. This will be confirmed during detailed design and the PSD rate and OSD volumes will be adjusted accordingly. Table 4 below provides modelling results for both catchments including the calculated PSD and a preliminary OSD tank volume.

Catchment	Area (m²)	Impervious Area (%)	PSD – 5 year ARI (I/s)	SSR (m³)
North	12,000	80 (TBC)	374	210
South	15,700	90 (TBC)	514	250

Table 4 - Indicative Catchment PSD Rate and Detention Volume

OSD tanks shall be located near the low point of the catchment, adjacent to the proposed outlet location. For the northern catchment this is proposed to be adjacent to the Stables, such that we can make use of the existing outlet pipe running between the Stables and Graythwaite building which ultimately discharges to the Council kerb inlet pit on Fourth Avenue. The southern catchment is proposed to discharge to the Council kerb inlet pit on Ryedale Road, so the OSD will be located adjacent to the multideck carpark with a new outlet pipe to Council's street drainage.



2.3.2 Stormwater Quality

A summary of the City of Ryde WSUD requirements as described in the Development Control Plan (DCP) and the City of Ryde Water Sensitive Urban Design Guidelines has been provided in Section 2.1.2.

Due to the limited surface area available on the site, water quality treatment devices will be limited to propriety products such as Gross Pollutant Traps and filter cartridges able to be installed below ground and within OSD tanks. Further review will be undertaken during the detail design phase to determine if natural filtration such as bio retention basins can be incorporated into the landscape design.

These measures will be confirmed and incorporated into the stormwater drainage design during the detail design phase of the project.



3 Flooding

The Ryde Hospital site is located on a crest at Denistone Road and has not been identified as within a Flood Planning Area on the Flood Planning Map Sheet FLD_002 in the Ryde Local Environmental Plan 2014.

The existing site is not subject to flooding during the Probable Maximum Flood (PMF) however flooding does occur to the surrounding neighbouring properties in both the north and south.

The northern half of the site is within the Terry's Creek Catchment and flooding within this catchment is the subject of 'Eastwood and Terrys Creek Floodplain Risk Management Study and Plan' prepared by Bewsher dated November 2008. The Figure below shows that the extent of overland flow flooding during the PMF is restricted to Fourth Avenue and residential properties to the north.



Figure 3 - Ryde Hospital North Catchment PMF Flood Depths Map (Source: Bewsher 'Eastwood and Terrys Creek Floodplain Risk Management Study and Plan' Figure 8, Sheet 2)

The southern half of the site is within the Parramatta River Catchment and flooding within this catchment is the subject of 'Parramatta River – Ryde Sub-Catchment Flood Study and Floodplain Risk Management Plan' prepared by SKM dated 29 August 2013. The Figure below shows that the extent of overland flow flooding during the PMF is restricted to small patches within the Blue Gum High Forest and along Florence Avenue.





Figure 4 - Ryde Hospital South Catchment PMF Flood Depths Map (Source: SKM 'Parramatta River – Ryde Sub-Catchments Flood Study and Floodplain Risk Management Plan' Denistone Catchment Sheet 1)

Rainfall runoff generated on the site due to the proposed development will need to be controlled to ensure there are no adverse effects on downstream properties due to the proposed development for storms up to and including the 1% Annual Exceedance Probability (AEP). This will be undertaken through the use of Onsite Detention systems to limit the stormwater discharge to acceptable discharge requirements as stated in Ryde City Council DCP.



4 Civil Works

4.1 Design Requirements

The following list indicates the relevant infrastructure design guides and standards considered through the Civil Engineering design:

- Austroads: Guide to Road Design
- Austroads: Guide to Pavement Technology
- Austroads: Guide to Traffic Engineering Practice Parts 1 14
- Austroads: Guide to the Geometric Design of Urban Roads
- AS1428.1 Design for Access & Mobility
- AS2890.1 Parking Facilities: Off-street car parking
- AS2890.2 Parking Facilities: Off-street commercial parking
- AS2890.5 Parking Facilities: On-street parking
- AS2890.6 Parking Facilities: Off-street for people with disabilities
- AS3798 Guidelines on Earthworks for Commercial and Residential Developments
- Relevant RMS Technical Directions and Guidelines
- City of Ryde Development Control Plan 2014

4.2 Earthworks

A geotechnical investigation has been undertaken for the site by PSM Consultants and the findings are presented in the report detailed below:

Name:	Ryde Hospital, Eastwood Geotechnical Investigations
Contact Details:	Pells Sullivan Meynink (PSM) G3, 56 Delhi Rd, North Ryde, 2113 Ph: (02) 9812 5000
Job Reference:	PSM3838-002R
Report Date:	14 June 2019

Generally, the subsoil conditions comprise filling of depths varying from 0.9m to 4.5m over residual clay. Bedrock (laminate/siltstone) was encountered at depths varying from 1.2m to 5.5m.

Due to the topography of the existing site and the extent of the proposed development, there is approximately 5 metres of level difference across the site that will need to be managed as part of the redevelopment. As such the proposed building will predominately be in cut in the north and fill in the south to be able to match into surrounding building floor levels and existing road features.

The existing hospital is also required to remain operational during the construction of the new buildings and as such the staging of the works will impact how the earthworks will be completed. Shoring will likely be required as the proposed excavation will be in close proximity to existing operational buildings. The shoring system is proposed to be a concrete contiguous or secant piling wall.

When in fill, retaining walls will be required along some of the proposed building extents and at the interface between the proposed development and existing structures to be retained.



4.3 Roads, Pavements and Signage and Linemarking

All access roads will be designed in accordance with Australian Standards for parking and road designs as stated in section 4.1.1 below. Access roads for the site will typically grade between 1% and 10% longitudinal fall and will be designed to prevent scrapping on the underside of vehicles including ambulances and trucks. Cross fall for road lanes will generally be between 2-3% to prevent ponding water and allow it to drain away to the kerbs for collection by the inground stormwater drainage.

Generally new access roads throughout the site will match the existing surrounding pavement and will be constructed in flexible asphalt pavement. Loading dock areas are proposed to be rigid concrete pavements as asphalt pavement is prone to deformation in the form of rutting due to turning of heavy vehicles. The concrete pavement will provide a long-lasting pavement that will require less future maintenance.

Pavement designs will be chosen to ensure long life, compatibility with existing road construction and to minimise long term maintenance. Subgrade strengths forming the basis of pavement designs will be obtained from the results of the site Geotechnical investigations. All pavements will be designed in accordance with RMS and Austroads design standards including Guide to Pavement Technology.

Signposting and linemarking for the proposed development will be designed to ensure clear and defined wayfinding for all users, including emergency vehicles, patients and visitors, along with providing the relevant regulatory frameworks for enforcement of errant vehicles/parking. Signage and linemarking will be designed in accordance with RMS standards and AS 1742, with supplementary non-standard linemarking and directional signage as required.



5 Sediment, Erosion and Dust Control

5.1 General Principles

The following general principles of soil and water management have been developed and will be applied to the future re-development works:

- Minimise the area of soil disturbed and exposed to erosion
- Conserve topsoil for later site rehabilitation/revegetation
- Control water flow from the top of, and through the development area
- Rehabilitate disturbed lands quickly
- Maintain soil and water management measures appropriately during the construction phase

5.2 Sources of Pollution

Based on the proposed development activities, the following sources of pollution during construction that could lead to earthworks erosion, sediment and silt transportation and contamination of downstream stormwater systems have been considered:

- Earthworks undertaken prior to rainfall events without sufficient auxiliary measures to manage drainage
- Earthworks areas that have not been stabilised or are exposed prior to temporary or permanent ground cover
- Establishment time for rehabilitation / revegetation of exposed earthworks
- Localised groundwater dewatering activities during earthworks excavations
- Construction works to existing stormwater pipelines and overland flow paths
- Vehicle entry and exit to the construction site and associated tracking of debris out of the site
- Clearing and grubbing of vegetation / organic matter and stripping of topsoil
- Stockpiling of excavated materials or construction materials (e.g. road base, ordinary and select fill, etc)
- Re-fuelling and general maintenance of construction plant and equipment
- Storage of chemicals, fuel and other hazardous materials
- Ineffective / incorrect installation or maintenance of soil erosion and sedimentation control measures

5.3 Soil and Water Management Strategy

The following construction management methodology has been developed for the re-development works and should be included in the soil erosion and sediment control for the site:

- Establish sediment fencing to the downstream perimeter of the zone of disturbed works to protect downstream assets and properties
- Installation of stabilised construction entry and exit grids to prevent construction vehicles tracking debris into adjacent Authority roadways and stormwater systems
- Construction of "clean water" diversion drains with rock check dams to divert unpolluted water to the existing stormwater system in a controlled manner
- Construction of "dirty water" catch drains with rock check dams to divert sediment-laden and silt-laden water to proposed sedimentation basins
- Construction of appropriately sized and maintained sedimentation basins to promote settling of gross pollutants and suspended solids. Dosing and flocculation of fine suspended particulates will also be undertaken depending on tested water quality profiles within the sedimentation basin



- Protection of materials stockpiles by suitable wind protection fencing and / or temporary covering of stockpiles
- Protection of existing and recently constructed surface inlet pits with temporary sediment traps using geotextile filter fabric and sandbags
- Protection of existing and recently constructed overland flow paths with vegetated ground cover
- General expedited revegetation and stabilisation of exposed earthworks to prevent sedimentation of stormwater runoff



6 Stage 1 – Early Works

The Stage 1 Early Works is for enabling works to prepare the development site for the construction of the proposed stage 1 building works.

This stage 1 early works includes;

- Demolition of the existing buildings
- Diversion of inground service infrastructure to unencumber the site
- Sediment, Erosion and Dust Control
- Bulk earthworks in preparation for the main building works

The below describes how the proposed stage 1 early works civil design is responding to the SEAR's requirements as stated in the section 1.2 above.

6.1 Stormwater Drainage

6.1.1 Stormwater Quantity

The proposed stage 1 development site is located at the crest of the site and as such stormwater overland flows will directed away from the bulk earthworks excavation. The existing drainage network will be utilised to convey stormwater around the site. No diversion or temporary works are anticipated to be required to meet this requirement.

Onsite detention will not be implemented as part of the Stage 1 Early Works phase of works and instead will be designed and installed as part of the future main building works.

6.1.2 Stormwater Quality

A summary of the City of Ryde WSUD requirements as described in the Development Control Plan (DCP) and the City of Ryde Water Sensitive Urban Design Guidelines has been provided in Section 2.1.2.

Stormwater quality requirements will not be implemented as part of the Stage 1 Early Works phase of works and instead will be designed and installed as part of the future main building works. Refer to section 2.3.2 for the future WSUD strategy.

6.2 Flooding

The Ryde Hospital site is not subject to flooding, refer to section 2 above, and as such there are no flood mitigation measures proposed.

6.3 Earthworks

A bulk excavation level of RL96.7 has been proposed, which allows for a finished floor level of RL97.0 and an allowance for a 300mm thick ground floor structural slab. This will be further refined and the bulk earthwork level confirmed during detailed design.

The bulk excavation results in a maximum cut of approx. 2.4m in the south-east corner of the stage 1 development area and a fill of approx. 0.6m in the north-west corner.

Temporary shoring will likely be required as the proposed excavation will be adjacent to existing operational buildings. The shoring system is proposed to be a concrete contiguous or secant piling wall.

It is proposed to utilise the existing driveway to the Camelia Cottage carpark on Ryedale Road as the construction access to the site during stage 1.



6.4 Sediment, Erosion and Dust Control

Sediment, erosion and dust control measures are proposed to be undertaken in accordance with Council requirements and industry standards including the Managing Urban Stormwater: Soils and Construction, "The Blue Book" – 4th edition 2004.

The sediment, erosion and dust control protection measures for stage 1 will be undertaken as per the works described in section 5 above. This includes;

- Sediment fencing to the downstream perimeter of the zone of disturbed works
- Installation of stabilised construction entry and exit grids
- Construction of diversion and catch drains
- Construction of a sedimentation basin
- Protection of existing and recently constructed surface inlet pits with temporary sediment traps using geotextile filter fabric and sandbags
- General expedited revegetation and stabilisation of exposed earthworks to prevent sedimentation of stormwater runoff

Further to this, a sediment basin will be installed at the low point of the site to capture any runoff from the earthwork excavation prior to discharge to the Council stormwater drainage network. Refer to the soil erosion and sediment control plan for further details.



Appendix A - Stage 1 – Early Works Civil Drawings

RYDE HOSPITAL REDEVELOPMENT DENISTONE ROAD, DENISTONE STAGE 1 - EARLY WORKS



LOCALITY PLAN N.T.S.

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SK1.01	COVER SHEET, LOCALITY PLAN AND DRAWING SCHEDUL
SK1.05	DETAILS SHEET 1
SK2.01	BULK EARTHWORKS PLAN
SK3.01	STORMWATER MANAGEMENT PLAN
SK5.01	SOIL EROSION AND SEDIMENT CONTROL PLAN



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