NSW HEALTH

PENRITH HEALTH CAMPUS REDEVELOPMENT

STRUCTURAL AND CIVIL SCHEME DESIGN REPORT

ICU REDEVELOPMENT AND EAST BLOCK BUILDING

AUGUST 2009

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SCHEME DESIGN REPORT

PHCR

ICU Redevelopment and East Block Building

COMMERCIAL IN CONFIDENCE

1.0 INTRODUCTION

The purpose of this report is to define the structural and civil design parameters adopted for the preparation of design documentation.

2.0 SITE DATA

2.1 GEOTECHNICAL REPORT

A draft geotechnical investigation report has been prepared by Golder Associates Pty Ltd covering the proposed "East Block" building for the Penrith Health Campus Redevelopment project. The report is dated 17th July 2009. The report reference number is 097622055_002 Rev0.

2.1.1 Site Classification

The geotechnical report classifies the subsurface profile in accordance with AS2870 "Residential Slabs and Footings – Construction". The site has been given a Class H classification due to the presence of residual soils with a high potential for shrink/swell behaviour.

2.1.2 Foundations

The building foundations will generally be piles founding in the low to medium strength bedrock. Piles will be designed adopting the end bearing and shaft adhesion values detailed in Table 2.1.

Table 2.1: Design Serviceability End Bearing Pressure and Shaft Adhesion Values

Soil/Rock Type	Depth to Base of Unit (m)	Unit Weight (kN/m3)	End Bearing Capacity (kPa)	Shaft Adhesion (kPa)
Topsoil/Fill (BH01 only)	0.9	18	0	0
Topsoil (BH02 to BH07)	0.1-0.2	16	0	0
Residual Soil	1.4-2.7	20	200	15
Extremely Weathered Bedrock (Class V)	2.7-5.6	21	700	50
Extremely to Highly Weathered Bedrock (Class IV)	10.3-11.4	22	1000	75
Moderately Weathered Bedrock (Class IV-III)	-	24	1500	100

Note: This table has been adapted from Table 3 presented in the referenced Golder geotechnical report

Pad or strip footings founding on the residual clay materials may be adopted for lightly loaded elements such as water tanks and access ramps. These will be designed using a serviceability bearing pressure of 150 kPa. To achieve this pressure, footings will have an embedment depth of at least 500mm below adjacent ground surface levels.

2.1.3 Unsupported Cut Slopes

Batter slopes are to be as detailed in Table 2.2.

Table 2.2: Recommended Cut Slope Batters

Material	Temporary Batter	Permanent Batter*
Residual soils (mainly gravelly silt/clay soils of firm to stiff consistency)	1.5H:1V	2.5H:1V
Residual soils (mainly gravelly silt/clay soils of very stiff to hard consistency) or Extremely weathered shale of very low strength	1.5H:1V	2H:1V
Highly weathered shale of low to medium strength	1H:1V	1.5H:1V

** Permanent batters are to be protected against erosion by grassing, stone pitching or other suitable methods*
Note: This table has been adapted from Table 4 presented in the referenced Golder geotechnical report

2.1.4 Retaining Walls and Excavation Retention

Design of retaining walls will be based on the following earth pressure distributions:

For flexible walls $\sigma_z = K_a\gamma z + K_a q$ kPa

For rigid or propped walls $\sigma_z = 6H + K_a q$ kPa

where:

σ_z horizontal earth pressure at depth z (measured from the top of the retaining wall), kPa

K_a dimensionless coefficient of active earth pressure

γ bulk unit weight of soil, kN/m^3

q uniform distributed vertical surcharge acting on the top of the soil, kPa

H effective vertical wall height, m

Design values for the required earth pressure parameters are given in Table 2.3.

Table 2.3: Earth Pressure Parameters

Material	K_a	γ (kN/m^3)	C (kPa)
Residual soils and extremely weathered sandstone	0.4	20	5
Weathered shale	0.32	24	10

If compacted fill is to be placed behind walls, a minimum lateral earth pressure of 20 kPa is to be applied in conjunction with the above earth pressures.

2.1.5 Soil Salinity

The geotechnical report highlights the detection of saline soils in soil 1.5m below ground level. Saline soils may potentially be even shallower in low lying areas. The possible encounter of saline soils will be considered in the design of steel and concrete elements where appropriate.

2.2 EXISTING CONDITIONS

2.2.1 Detail Survey

A surface and underground services survey of the site and road reserves surrounding the site was undertaken by Vince Morgan Surveyors as part of the project investigation. This survey includes details of the road network and trunk stormwater lines and local street drainage.

2.2.2 Stormwater

Existing stormwater pipes and pits are located within the footprint of the proposed East Block building. Where the stormwater system served the existing Nurses Accommodation building which is to be demolished, then this stormwater system will be made redundant. Where it serves other existing buildings on the site, then it will be relocated to suit the proposed new development.

2.2.3 Road Network

The proposed East Block building will result in the demolition of the existing access road to the west of the existing Nurses Accommodation building. The existing road will be replaced with a road which will be located to the south and east of the proposed building.

3.0 LOADINGS

3.1 FLOOR LOADS

Floor loadings will be taken from AS/NZS 1170.1:2002. The loads for particular floor types are given in Table 3.1.

Table 3.1: Floor Loads

Floor Type	Live Load (kPa)	Superimposed Dead Load (kPa)
Laboratories, offices	3	2
Stairs, ramps	4	0.5
Corridors and foyer areas	5	2.5
Operating theatres, x-ray rooms	3	2
Wards	2	2
Plant rooms, freezer rooms	5	2
Kitchens	5	2
Loading docks/stores on suspended slabs	7.5	2

3.2 EARTH PRESSURES

Refer to section 2.1.5

3.3 HYDROSTATIC PRESSURES

Ground slabs and lift pits are above any ground water level and need not be designed to resist hydrostatic uplift pressures.

3.4 WIND LOADS

The overall wind pressures will be calculated using AS1170.2:2002. Relevant information has been outlined in Table 3.2.

Table 3.2: Wind Load Parameters

Location	Region A2
Vu	48m/s
Vs	37m/s
Ms	1.0
Mt	1.0
Md	1.0
Terrain Category	3

3.5 EARTHQUAKE LOADS

The overall earthquake loads will be calculated using AS1170.4:2007 and the Building Code of Australia. Relevant information has been outlined in Table 3.3.

Table 3.3: Earthquake Load Parameters

Importance Level	4
Probability Factor, kp	1.5
Hazard Factor, Z	0.08
Sub-Soil Class	C_e
Earthquake Design Category	III

3.6 SNOW LOADS

Snow loadings are not applicable.

3.7 LATERAL LOADING SYSTEM

It is intended that lateral loads resulting from wind will be resisted by shear walls or similar vertical concrete elements.

3.8 VIBRATION OF SLABS

AISC, 2003 proposes vibration criteria considered suitable for various types of sensitive equipment. This information is reproduced in Table 3.4.

Table 3.4: Vibration Criteria for Sensitive Equipment

Category	Facility/Equipment/Use	Vibrational Velocity	
		(μ in./sec)	(μm/sec)
1	Computer systems; Operating Rooms; Surgery; Bench microscopes at up to 100x magnification	8,000	200
2	Laboratory robots	4,000	100
3	Bench microscopes at up to 400x magnification; Optical and other precision balances; Coordinate measuring machines; Metrology laboratories; Optical comparators; Microelectronics manufacturing equipment – Class A***	2,000	50
4	Micro surgery, eye surgery, neuro-surgery; Bench microscopes at magnification greater than 400x; Optical equipment on isolation tables; Microelectronics manufacturing equipment – Class B***	1,000	25
5	Electron microscopes at up to 30,000x magnification; Microtomes; Magnetic resonance imagers; Microelectronics manufacturing equipment – Class C***	500	12
6	Electron microscopes at greater than 30,000x magnification; Mass spectrometers; Cell implant equipment; Microelectronoids manufacturing equipment Class D***	250	6
7	Microelectronics Manufacturing equipment – Class E***; Unisolated laser and optical research systems	130	3
	*** Class A: Inspection, probe test and other manufacturing support equipment Class B: with line Aligners, steppers and other critical equipment for photolithography widths of 3 microns or more Class C: with line Aligners, steppers and other critical equipment for photolithography widths of 1micron Class D: with line Aligners, steppers and other critical equipment for photolithography widths of ½ micron; includes electron-beam systems Class E: with line Aligners, steppers and other critical equipment for photolithography widths of ¼ micron; includes electron-beam systems		

Following the guidelines given in the AISC table, the operating theatre areas will be designed to meet the Category 1 vibration criteria of 200μm/sec.

The following sources of vibration will be considered:

- Footfall
- Equipment and plant

3.8.1 Footfall

Footfall design parameters have been taken from the recommendations made by Murray, Allen and Ungar in the AISC, 2003.

Table 3.5: Footfall Design Parameters

Walking Type	Rate (steps per minute)	Dynamic force Fm (kN)	$1/t_o$ (HZ)	Location for application of load
Fast	100	1.4	5.0	Major thoroughfares
Medium	75	1.25	2.5	Operating theatres

The idealised footfall impulse is defined as:

$$F(t) = \frac{F_m}{2}\left[1 - \cos\left(\frac{\pi t}{t_0}\right)\right] \qquad \text{for } t < t_0$$

$$F(t) = F_m \qquad \text{for } t_0 < t < t_p$$

3.8.2 Equipment and Plant

Machinery and equipment that emits vibration is either to:

(a) be supported on mounts which reduce vibrations emitted to acceptable levels; or

(b) be located at a sufficient distance from the operating theatres to prevent disturbance to the equipment

Levels of vibration cannot be quantified accurately. It is recommended that after commissioning of the base building plant, prior to occupation, on-site vibration testing be undertaken to determine levels of vibration produced by the different types of mechanical plant and equipment.

4.0 REGULATORY

4.1 BCA

The BCA report gives the provisions listed in Sections 4.1.1 and 4.1.2.

4.1.1 East Block Building

Construction type – Type A

Table 4.1: Building Classification

Floor Level	Use	BCA Class
Level 1	Carpark	Class 7a
Level 2	Operating Theatres and Outpatient Clinics	Class 9a and 5
Level 3	Inpatient Wards	Class 9a

Table 4.2: Minimum FRL as specified by BCA

Building Element	FRL
External Walls (load-bearing)	120/120/120
External Columns	120/-/-
Fire Walls	120/120/120
Shafts (non load-bearing)	-/120/120
Other load-bearing walls/beams/trusses/columns	120/-/-
Floors	120/120/120
Roofs	N/A

4.1.2 ICU Redevelopment

Construction type – Type A

Table 4.3: Building Classification

Floor Level	Use	BCA Class
Level 2	Intensive Care and Cardiovascular Ultrasound	Class 9a and 5
Level 3	Research and Training	Class 9b

Table 4.4: Minimum FRL as specified by BCA

Building Element	FRL
External Walls (load-bearing)	120/120/120
External Columns	120/-/-
Fire Walls	120/120/120
Shafts (non load-bearing)	-/120/120
Other load-bearing walls/beams/trusses/columns	120/-/-
Floors	120/120/120
Roofs	N/A

5.0 BUILDING CONSTRUCTION

5.1 EAST BLOCK BUILDING

Item	Type of Construction
Footings	Piles to rock
Level 1	AC pavement
Suspended slabs	Post-tensioned concrete, FRL 120/120/120
Lift, stair and shear walls	In-situ concrete, FRL 120/120/120
Columns	Reinforced concrete, FRL 120/-/-
External walls	Non-load bearing lightweight
Internal walls	Non-load bearing lightweight
Roof over operating theatres	Post-tensioned concrete with metal deck roof over
Roof over wards and offices	Metal deck

5.2 ICU REDEVELOPMENT

Item	Type of Construction
Level 2 slabs	Existing
Level 3 suspended slabs	Concrete slabs on bondek sheeting
Columns	Structural steel
External walls	Brick veneer
Internal walls	Non-load bearing lightweight
Roof	Metal deck

6.0 PROPOSED DEVELOPMENT

6.1 SITE GRADING

The western end of the building will be excavated below the existing natural surface to allow for the Basement construction. Generally the proposed roads around the building will be at existing natural surface.

6.2 ROAD NETWORK

The proposed access road will connect to the existing road network on the northern and southern sides of the proposed building. The proposed road will be graded from the vicinity of the existing carpark to the south of the proposed building to the existing roundabout to the north. It will fall in a continuous grade from west to east such that any stormwater overland flows will be diverted around the proposed building. Indicative road levels are shown on Drg No. 09S569-C10.

The proposed road will be graded at a maximum longitudinal grade of 5% in order to cater for disabled access. It will be 7.0 metres wide to accommodate service vehicle access through the site. Truck turning paths are shown on Drg No. 09S569-C12. Minor amendments to the proposed road edges as shown on this drawing may be required depending on the operational policies regarding whether this infrequent service vehicle traffic can be allowed to cross the road centreline.

The road pavement design will be undertaken in accordance with traffic figures and subgrade conditions provided by the Traffic Engineer and Geotechnical Engineer respectively.

6.3 STORMWATER

A conceptual stormwater drainage layout is shown on Drg No. 09S569-C10. In the preliminary investigation phase of the project, liaison was undertaken by the Department of Commerce with Penrith City Council. Council advised that on-site stormwater detention is required for the proposed development. Council also advised that some portion of this stormwater detention volume may be in the form of rainwater harvesting.

A preliminary investigation of the existing site stormwater system in the vicinity of the proposed building shows it is inadequate for the anticipated stormwater flows from the building. Therefore it is intended to connect the stormwater system for the proposed building to the stormwater system east of the existing carpark. This location has sufficient piped capacity for the proposed building. No allowance has currently been made in the proposed stormwater system for stormwater flows from other parts of the Nepean Hospital site.

All site stormwater will be designed in accordance with Penrith City Council's Stormwater Guidelines.

APPENDIX A – CIVIL SCHEME DESIGN DRAWINGS

PIT SCHEDULE

PIT No.	TYPE	SIZE	COVER TYPE	STEP IRONS	SURFACE LEVEL	PIT IL.	PIT DEPTH
A1	OSD TANK	-	-	-	-	-	-
A2	KERB INLET PIT-1.8m LINTEL	900x600	WELDLOK GRATE AND FRAME GG 78-57 AND LINTEL	-	56.52	55.62	0.90
A3	KERB INLET PIT-1.8m LINTEL	900x600	WELDLOK GRATE AND FRAME GG 78-57 AND LINTEL	-	56.30	55.38	0.92
A4	KERB INLET PIT-1.8m LINTEL	900x600	WELDLOK GRATE AND FRAME GG 78-57 AND LINTEL	-	56.23	55.26	0.97
A5	KERB INLET PIT-1.8m LINTEL	900x600	WELDLOK GRATE AND FRAME GG 78-57 AND LINTEL	-	53.55	52.65	0.90
A6	KERB INLET PIT-1.8m LINTEL	900x600	WELDLOK GRATE AND FRAME GG 78-57 AND LINTEL	-	53.25	52.35	0.90
A7	KERB INLET PIT-1.8m LINTEL	900x600	WELDLOK GRATE AND FRAME GG 78-57 AND LINTEL	-	52.10	51.20	0.90
B1	SURFACE INLET PIT	610x600	DURHAM MSC66LT GALVANIZED,HINGED WITH LOCKDOWN	-	52.40	51.65	0.75
B2	SURFACE INLET PIT	610x600	DURHAM MSC66LT GALVANIZED,HINGED WITH LOCKDOWN	-	53.05	52.30	0.75
B3	SURFACE INLET PIT	610x600	DURHAM MSC66LT GALVANIZED,HINGED WITH LOCKDOWN	-	53.70	52.95	0.75
C1	JUNCTION PIT	910x900	DURHAM CAC99B WITH CONCRETE INFILL & BOLTDOWN	YES	50.30	48.94	1.36
C2	JUNCTION PIT	910x900	DURHAM CAC99B WITH CONCRETE INFILL & BOLTDOWN	YES	50.55	49.15	1.40
C3	JUNCTION PIT	910x900	DURHAM CAC99B WITH CONCRETE INFILL & BOLTDOWN	YES	50.75	49.31	1.44
C4	JUNCTION PIT	910x900	DURHAM CAC99B WITH CONCRETE INFILL & BOLTDOWN	YES	51.21	49.51	1.70
C5	HUMECEPTOR	ST3	HUMECEPTOR CLASS D COVER AND SURROUND	YES	52.70	49.77	2.93

NOTES

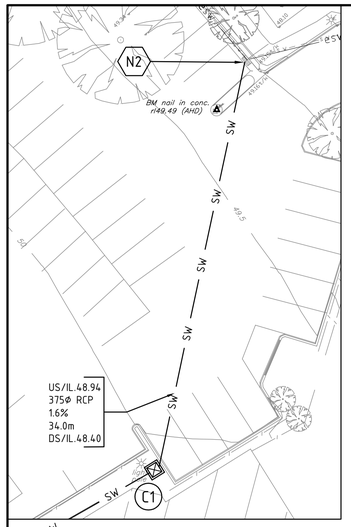
N1. MODIFICATIONS TO EXISTING BUILDING STORMWATER SYSTEM, IF REQUIRED BY HYDRAULIC CONSULTANT.

N2. CONNECT INTO EXISTING STORMWATER PIT AND MAKE GOOD.

N3. EXISTING STOMWATER SYSTEM UNDERCAPACITY FOR PROPOSED BUILDING.

N4. OSD TANK OUTLET TO BE CONFIRMED. NOTE: IMPACT ON EXISTING SERVICES TO BE ASSESSED.

N5. DEMOLISH EXISTING STORMWATER PIT AND PIPE (TYP.)



INSET A

Rev	Amendment / Reason For Issue	Date	Drawing Completed by	Designed & Checked by	Verified by X = Not verified	Issue Authorised (*)
A	ISSUED FOR REVIEW	17.08.09	RAS	RPH	X	

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North

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Project: NEPEAN HOSPITAL PENRITH
Client: PENRITH HEALTH CAMPUS REDEVELOPMENT
Architect/Project Manager: AURORA PROJECTS
Drawing Title: CONCEPT STORMWATER DRAINAGE PLAN
Drawing No.: 09S569C10
Sheet: 01 of 02
Rev: A

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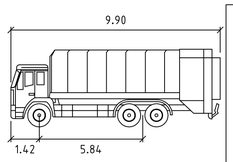

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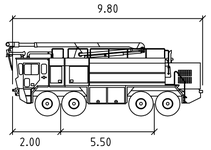

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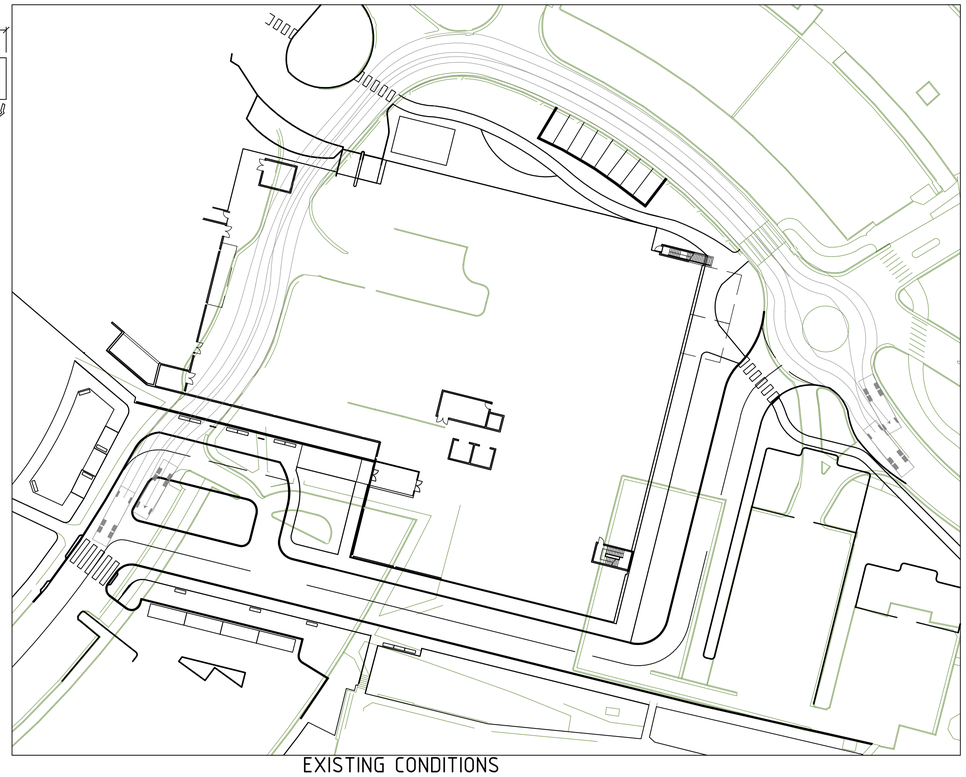

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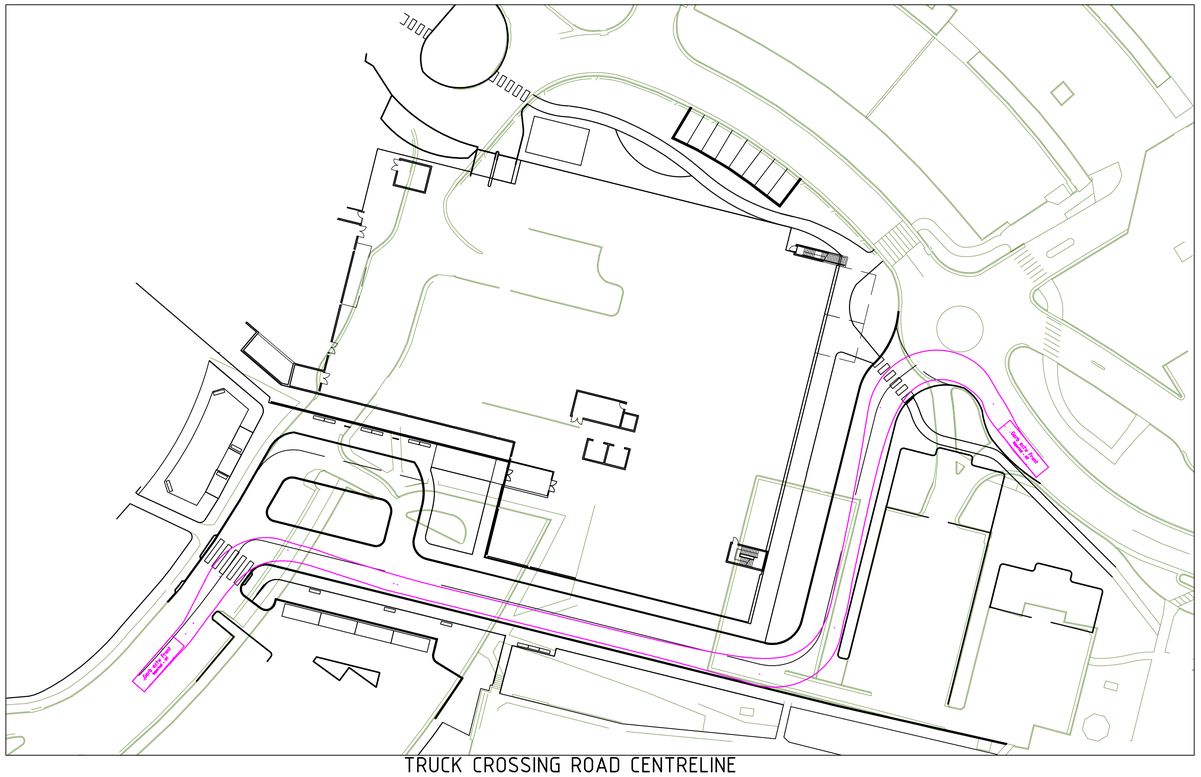

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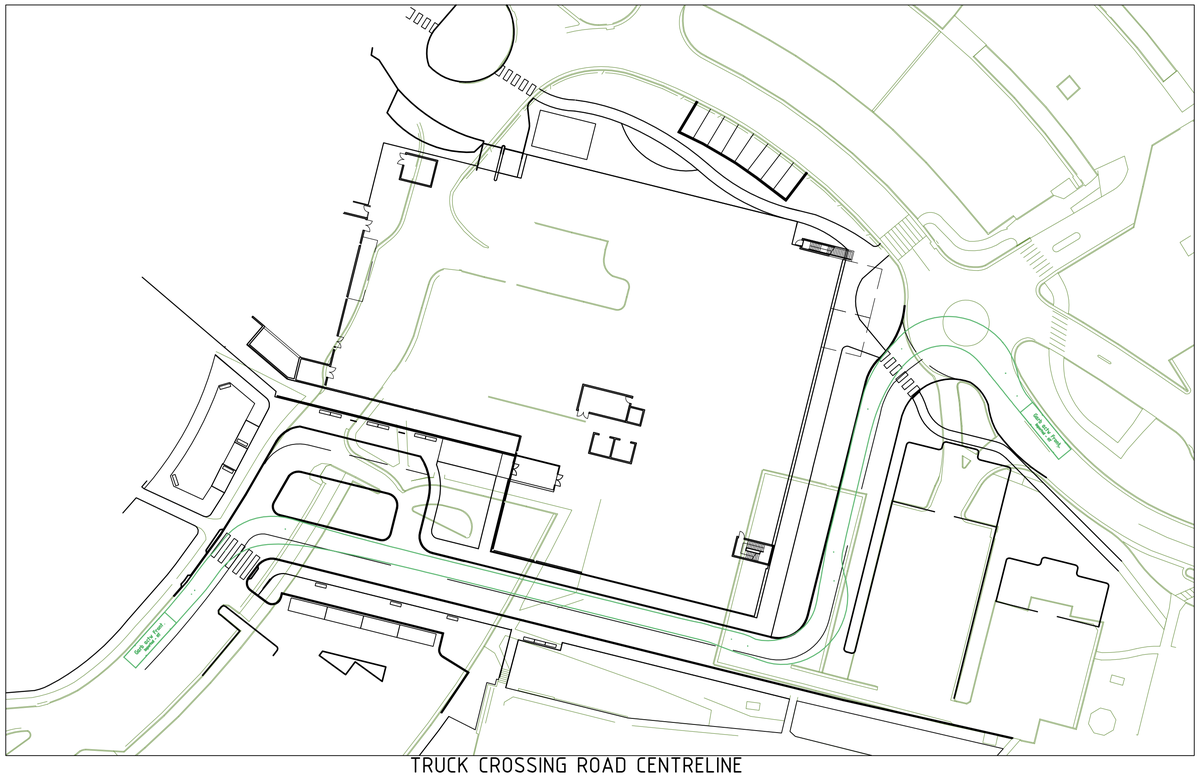

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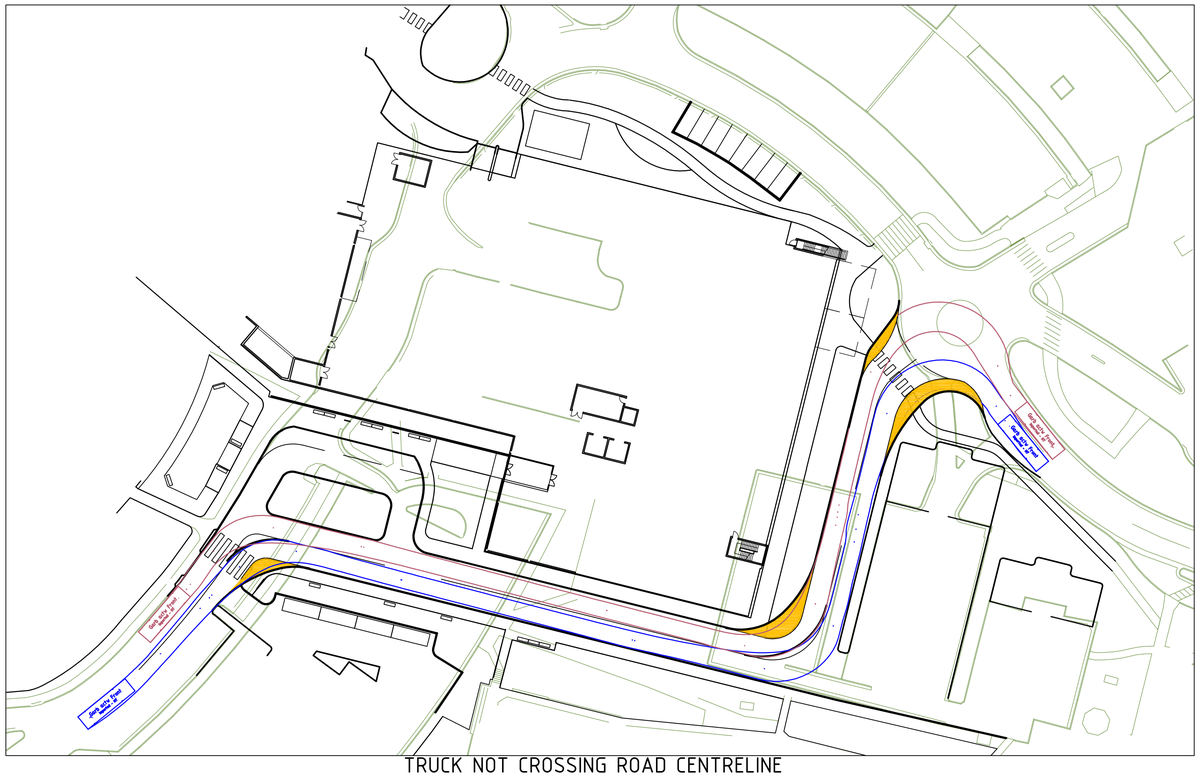

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Rev	Amendment / Reason For Issue	Date	Drawing Completed by	Designed & Checked by	Verified by X = Not verified	Issue Authorised (*)
A	ISSUED FOR REVIEW	27.08.09	RAS	RPH		

* Drawing Status Warning: Unless there is an authorised Hughes Trueman signature at *, this drawing is not authorised for issue.

This Drawing may have been prepared using COLOUR, and may be incomplete if copied to BLACK & WHITE

5 0 5 10 15
Plan Scale 1:250 @ A1

North

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Project: NEPEAN HOSPITAL PENRITH

Client: PENRITH HEALTH CAMPUS REDEVELOPMENT

Architect/Project Manager: AURORA PROJECTS

Drawing Title: TRUCK TURINING PATHS

Drawing No.: 09S569C12

Sheet: 1 Of 1

Rev: A

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