

NSW Forensic Pathology and Coroner's Court

Structural & Civil Services Scheme Design Report

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Prepared for
Health Infrastructure

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Contact Information

Cardno Pty Ltd

ABN 41 919 674 323

Level 9, 203 Pacific Highway
St Leonards NSW 2065

Telephone: 02 9496 7700

Facsimile: 02 9439 5170

International: +612 9496 7700

peter.waugh@cardno.com.au

www.cardno.com.au

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1 INTRODUCTION

The new Forensic Pathology and Coroner's Court will occupy approximately 1.76 of a 7.7ha site which currently houses Forensic and Analytical science Services, the Office of Environment and Heritage and the Department of Mines. The first Stage of the precinct development will be located in the North western portion of the site, currently occupied by the doctor's residences and bounded by Main Avenue (Botanica Residential development entrance) and Joseph Street. The development is within Auburn Council municipality.

Cardno has performed infrastructure investigation, overland flow flood studies and concept design of the proposed building and road infrastructure.

2 BUILDING CLASSIFICATION

The building has been classified as a Type 5, 8 and 9b building with a rise in storeys of 3. It has been conceptualised as a Type A construction with an effective height less than 25m.

The BCA consultant MBC Modern Building Certifiers has noted fire rating concession exist for buildings 3 storeys or less, in terms of roof cladding type (non-combustible metal deck acceptable), and internal columns supporting the roof.

3 DESIGN STANDARDS AND REPORTS

The appropriate standards the building has been conceptualised to include the following:

- AS 1170.0 Structural Design Principles
- AS 1170.1 Structural Design Actions (Dead and Live)
- AS 1170.2 Structural Design Actions (Wind)
- AS 1170.3 Structural Design Actions (Snow)
- AS 1170.4 Structural Design Actions (Earthquake)
- AS 1288 Glazing Code
- AS 1657 Fixed Platforms, Walkways, Stairways and Ladders – Design, Construction and Installation Code
- AS 2159 Piling Code
- AS 2870 Residential Slabs and Footings
- AS 2890 Off Street Car Parking Code
- AS 3500.3 Plumbing and Drainage Part 3 Stormwater Drainage
- AS 3600 Concrete Structures Code
- AS 3500 SAA Plumbing Code
- AS 3700 Masonry Structures
- AS 3798 Guidelines for Earthworks for Commercial and Residential Developments
- AS 4100 Structural Steel Code
- AS 4678 Earth Retaining Structures
- BCA Australia – Structural Provision
- BCA –Section B – Structure
- BCA – Section C – Fire Resistance
- BCA – Section F1.1 – Stormwater Drainage

The survey of the existing site includes the following:

- Cardno plan showing Levels Details and Contour 117680500 sheets 1 to 5 dated 21 October 2015.
The Building Code of Australia Assessment Data has not been referenced from:
 - MBC Modern Building Certifiers Report No. 1160000109 EM02 dated 5 April 2016
- The Geotechnical Report prepared by Coffey dated 31 March 2016 Report No. GEOJLCOV 25551AA-A5 Rev 1 and Contamination Report prepared by Coffey dated 18 March 2016 Report No. GEOJLCOV25551AA.
- Auburn Council Stormwater Policy Intent
- Austroads Guide to the Design of the New Pavements for Light Traffic.

4 DESIGN CRITERIA

4.1 Building Structure Loading

The general load design principles to comply with AS1170.0 wind, AS1170.1, AS1170.2, AS1170.3 and AS1170.4. Design wind loading to satisfy the minimum provisions of AS1170.20. Design Seismic loading to satisfy the minimum provisions of AS1170.4.

The concept design assumes no additional floor levels and the building is not an essential post disaster facility.

General earthquake parameters adopted to be confirmed once Geotechnical available are as follows;

- Hazard Factor 0.08
- Probability factor 1.3
- Sub soil Class Be (building on rock)
- Ductility factor 2
- Performance Factor 0.77
- Civil Engineering to principles to comply with AS 3500 (SAA Plumbing Code) and Auburn Council Stormwater Policy Intent.

4.2 Floor Live Loading

Design floor live loadings are to generally satisfy the minimum provisions of AS 1170.1 for the proposed usages. A superimposed dead load of 1.0 kpa has been allowed for services and movable partitions.

Ground Floor (excluding car park)

- 4.0 kpa Uniformly distributed Live Load (UDL)
- 1kpa Services dead load/partitions
- 4.5kN Concentrated Point or as advised by specialist room consultant

First Floor and Second Floor

- 4.0 kpa Uniformly distributed Live Load (UDL)
- 1kpa Services dead load/partitions
- 4.5kN Concentrated Point or as advised by specialist room consultant

Stairs and Lobby

- 4.0kPa UDL
- 4.5kN Concentrated Point Load

Plant Areas

To be ascertained in design development but not less than 5.0 kpa and 4.5 kN concentrated point load or as advised by specialist room consultant.

No live load reductions are to be applied to any floor system elements unless agreed with the client.

External Roads and Internal Garage

- Car parking and car driveway 2,500kg tare
- Truck turning area and container storage
15 tonne axle loads. 25kPa distributed live load
Exact repetition to be ascertained in design development

4.3 Occupant Perceptions of Motion

Floor vibration design response to occupant activity is to generally comply with the recommendations of AS2670.

4.4 Floor Deflection Criteria

Design floor deflection in the short and long term is to generally comply with the recommendations of AS3600, but total slab and beam long term deflection must not exceed 25mm in any cumulative span position.

Floor areas supporting the façade shall be designed for a maximum long term differential deflection under live load of 10mm nominal with appropriate detailing to accommodate any non-moving façade supports with deflecting superstructure supports.

4.5 Cracking

Post-tensioning steel and reinforcement shall be designed to provide at least a 'moderate' degree of crack control in accordance with Clause 9.4.3 of AS3600.

4.6 Durability

All concrete elements shall have a design durability which complies with the recommendations of AS3600 for a 60 year design life.

For painted elements refer to the structural steel section of this specification. A 15 year period to first maintenance is required for the façade and all galvanizing will be to 650g/m².

4.7 Fire Rating

The fire resistance of the floor structure is to be in accordance with BCA requirements and not less than 120 FRL.

5 CIVIL SERVICES INFRASTRUCTURE

5.1 Civil Infrastructure

The 7.71 ha site is currently serviced by aged open channel drainage infrastructure which discharges under Joseph Street into Carnarvon Golf Course. The proposed FPCC site is 1.75ha of which 1.3ha is developed with approximately 125m for the access road off Weeroona Road.

- The site is not flood affected as advised by others but has significant overland flow traversing through it. It is within the Haslams Creek Catchment Creek which is locally flood affected closer to its outlet and has been subject to a number of flood assessments so development upstream is sensitive to downstream flooding impacts. PMF flood level has been estimated as RL24.98 at Carnarvon Golf Course Basin from flood contour maps developed by Bewsher Consulting Pty Ltd, and unverified Council update by Haskoning Australia.
- Storm water to be collected and controlled within the development property for major and minor events prior to entering Council system. Detention requested by Council *"to ensure peak flow rates at any point within the downstream drainage system do not increase as a result of the development during all storm events up to the 100 year ARI"*. As the site is to be consolidated, drainage easements and/or controls would be limited to inter-allotment flows and ultimate discharge point(s).
- The site drains to Nottingham Road local drainage system via the Carnarvon Golf Course where a detention pond exists. A critical culvert under Joseph Street exists which our new drainage will be directed to and we will ensure the culvert does not need to be upgraded. Detailed survey and hydraulic analysis has confirmed capacity and performance in the design events of 1 in 20 year and 1 in 100 year AEP storms
- Cardno Water Engineering consultants have performed an overland flow flood analysis for the 1 in 20, 1 in 100 years and PMF flows for the catchment upstream of Joseph Street which includes the following contributory areas:
 - > Botanica site immediately to the East of the precinct
 - > Weeroona Road pit inlet discharge
 - > Juniperina Juvenile Justice Centre and Sunning Hill School
 - > Portion of adjacent railway corridor.

Both existing and future conditions have been checked and the results of this analysis are appendix to this report.

The recommendations of this overland flow flood study note that after extension of the existing RMS box culvert underneath Joseph Street (existing 1500 x 600) with a 1500mm wide x 450mm high (clear) box culvert within the site, no significant alteration in overland flow flood levels exist at the southern end of the FPCC development provided it is not filled. The future precinct stormwater strategy is to be ascertained with options presented to check extent of future proofing in the current stage to facilitate the next stages with minimal or no disruption to the FPCC drainage infrastructure. Detention maybe required for the full Stage 3 Precinct development.

Overland flow from the north of the site for events up to the 1:100 year storm will be diverted around the new development building and carpark with the help of drainage kerbs, swales and diversion channels to ensure overland flow protection up to extreme events for the adopted building level of RL35.85.

The Staged Precinct Infrastructure Plan would dictate the following civil stormwater approach:

- **Stage 1**
Constructing an underground pipe network from the FPCC development site via a stormwater quality treatment discharge device to the new 1500mm x 450mm deep box culvert extension from Joseph Street box culvert inlet.

The treatment device would reduce gross pollutants suspended solids, total phosphorus and total nitrogen and to acceptable council requirements. Maintenance access to the device is required to remove and clean collected solids.

The new culvert will have 2 or 3 connection points and overland flow inlet pits incorporated for this and future development.

- **Future Stages**

Construction of a network of drainage pits and pipes as the development proceeds with amplification of the proposed culvert on a pre-determined route and detention as required for the future impermeable areas.

A treatment device would form part of the layout servicing total precinct inflows. Maintenance access to the device is also required as noted in Stage 1.

The remaining portions of the aged open channel drainage infrastructure would be renewed as a box culvert and covered designed for a 1% average exceedance probability storm (1 in 100 year recurrence interval) and overland flow strategy for blockage and extreme events including ponding areas or enclosed storage .

5.2 Roads

Roads and carpark will be engineered flexible pavements, (asphalt wearing surface and unbound/bound base courses) bearing on compacted subgrade with select concrete areas or asphalt covered concrete sub bases. They will be graded to drain to kerb, gutters and pits to the precinct drainage network.

A commercial crossover at the boundary will be required with general internal private road width 6.5 m suitable for cars, rigid trucks and occasional 19m long semi-trailers. Reusing the existing Department of Mines crossover is recommended to avoid any in ground services rerouting if the cross over is compliant. Heavy Vehicle 12.5 m long truck access and occasional 19 m long semi-trailer usage. This assumes two way and inter-visibility possible throughout with nominal road widening to 7.4 m (or larger) for radius curves less than 49 m .

A pavement plan is appended to this report noting preliminary design thickness for the intended usage.

5.3 Carparking and Back of House (BOH)

The public carpark will be compliant with AS 2890.1 Off Street Carparking Code and will be a Class 3 carpark (short term city and town centre parking, parking stations, hospitals and medical centres) for 90 degree car parking 2.6 m wide spaces x 5.4 m long with 5.8 m wide aisles. Disabled spaces to comply with AS 2890.6. Envisaged usage of up to 100 cars per day.

Dedicated staff car parking can be Class 1 with 2.4 m wide spaces x 5.4 m long with 6.2 m wide aisles.

The Staff carpark driveway and spaces immediately adjacent to the BOH area will be used temporarily for semi-trailer turning paths and therefore this pavement is locally upgraded for this proposed function.

The container storage area will be broom finished concrete to receive container foot seats to maximum 2% gradients.

Edge protection of all roads and carparking areas will be provided for vertical drops in excess of 600mm.

Disabled access will be compliant with the provisions of AS 2890.6. All pavements to be designed in accordance with Austroads guidelines

5.4 Stormwater

Pipework pits and kerbs will be designed for a minimum return period of 5% ARI to rainfall intensities noted in Auburn council stormwater guidelines and Australia Rainfall and Runoff.

Stormwater network design to Auburn Council Engineering standards (i.e. pit blockage, pit losses, minimum pipe cover). All grated drains to be 'heel proof'

Overflow paths within site will softly convey the 1% AEP storm event storm even

6 STRUCTURAL INFRASTRUCTURE

The Geotechnical Report prepared by Coffey has confirmed the following stratum depths:

Topsoil – Average 100mm across site

Fill – 0.3m to 2.0m

Residual Soil – 0.1m to 1.1m

Extremely Weathered to Highly Weathered Shale – 1.5m to 2.5m

Moderately to Fresh Weathered Shale – 2.7m to 6.9m

The site is within the area of 'no known occurrence of acid sulfate soils'. Coffey have confirmed that soil aggressivity test indicate 'non-aggressive' for concrete piles. Coffey contamination testings has confirmed.

- All samples collected during the investigation returned results below human and environmental assessment criteria for commercial/industrial land use
- Asbestos was not detected in soil samples collected from around the cottage structures though asbestos containing material (one fibro fragment) was observed on ground surface near one sample SS01.

Coffey concluded:

"On the basis of the above, it can be concluded that the site will be suitable for the proposed development subject to certain precautionary activities outlined in their report.

6.1 Foundations

The superstructure is proposed to found on shale (Class V, IV), for lighter point loads and to the moderately to fresh weathered rock (Class III) for main building column loads. Reinforced bored piers of varying diameters are proposed.

Bored piers of diameter 300mm, 450mm and 600mm diameter piles are conceptualised with pier caps for column starters. Concrete $f_c = 32\text{MPa}$ as non-aggressive site. A geotechnical reduction factor of 0.65 has been used with implied quality assurance by piling contractor to justify same.

6.2 Ground Floor

- Reinforced concrete slab - Slab on Grade (SOG)
- 140mm post tensioned under mortuary and extensive wet areas for waterproofing with minimal joints
- 120mm thick entrance area jointed SOG.
- 150mm Back of House slab on grade jointed SOG.

6.3 First and Second Floors

A post tensioned formed concrete slab and band is envisaged for these levels. The building will be a moment resisting frame for the purposes of earthquake and wind analysis. Preliminary analysis for the grids which are up to 10.0m span has dictated a 200mm or 250mm slab and 500mm overall by 1800mm or 2400mm wide band beams. A major building expansion joint at Grid D is proposed reflected throughout the structure and walls, floor, finishes, ceilings and roof.

Other elements are:

- Columns 600mm x 600mm diameter below Level 1 in Mortuary and front foyer. Concrete $f_c = 40\text{MPa}$
- Columns 500mm x 500mm or 500mm diameter where FRL 120 minutes. Concrete $f_c = 40\text{MPa}$ (Ground to Level 1 and 32MPa above).
- Lifts and Stair Wells 190mm reinforced isolate by corbels from the floor plates

- Concrete $F_c = 32\text{MPa}$ internally and $F_c = 40\text{MPa}$ where exposed
- Stairs 230mm reinforced concrete

6.4 Roof

As roof does not require a fire rating provided it is no-combustible metal deck roof sheeting supported by purlins and rafters.

All court rooms will be column free.

Perimeter columns as determined by the BCA will require a fire rating up to 120 minutes.

6.5 Earthworks

General recommendations in accordance with referenced reports are:

- All topsoil will be stripped and either stockpiled for reuse or exported.
- All fill is suitable for reuse and it is envisaged it is relocated to the stripped (and proof rolled) surface areas to be deep filled. Spot checks for contamination required but none discovered to date with current spot tests
- Large elements ($>800\text{mm}$) to be removed and maximum particle size of 100mm diameter to be used as fill provided non deleterious or will not degrade
- All existing fill, excavated clays and imported fill to be compacted in accordance with engineering guidelines to ensure uniform long term support and to minimise reactivity. Lime stabilisation has been recommended to enhance structural bearing capability. (CBR ratio).
- Testing has been recommended to comply with Level 1 Geotechnical testing in accordance with AS 3798 'Guidelines on earthworks for commercial and residential developments'

6.6 External Roads, Carparks and Drainage

Asphalt construction on compacted base course is envisaged for the car parks and access road with formed concrete kerbs, open channels and concrete pipes.

In the external truck and container parking area, we are proposing jointed reinforced concrete on compacted fill supported by compacted fill. On the external slab edge, a vertical dry pitch retaining wall or equivalent is envisaged for the 2 to 2.5m vertical height.

Cardno scheme design drawings are appended.

7 CONCLUSION

The enclosed brief is based on architectural documents produced by SJH Cox, dated 1 April 2016. It is subject to ongoing design development as the individual client and engineering disciplines confirm input.

Yours faithfully

Peter Waugh FIE Aust.
Senior Partner
Structural Discipline Leader
For Cardno