North Penrith - Stages 2B & 2C, 2D, 3B

Civil engineering report

Summary

Objectives

J Wyndham Prince has prepared drawings that describe the civil engineering design of the development proposed in this State Significant Development Application. The drawings include:

- bulk earthworks
- central water feature and wetland
- roads
- drainage
- soil & water management

This report supports the engineering drawings and provides further information to respond to the Director-General's Requirements (DGRs).

The objective of the drawings and this report is to show the proposed works that are consistent with the requirements of Penrith City Council, providing the infrastructure required to support the development of the site in accordance with the overall Major Project Approval issued by the Minister for Planning dated 9 November 2011 under reference 10-0075.

Methods and findings

A 3D model of the site has been created using the software "12D Model". This model has then been used to prepare drawings that describe the civil infrastructure required to support the development of North Penrith for Stages 2B & 2C, 2D, 3A (bulk earthworks only) and 3B.

Consultation

Consultation was completed as part of this scope of services with:

- Penrith City Council in the design of the water feature and wetland
- Penrith City Council in the design of the road and drainage infrastructure
- Roads and Maritime Services in the design of the Castlereagh Road/Thornton Drive intersection

Conclusions

The designs of the civil infrastructure for Stage 2B & 2C, 2D and 3B are consistent with the requirements of Penrith City Council and the Roads and Maritime Services. The designs have been prepared generally in accordance with the approved Concept Plan (noting the minor layout amendments in Stages 2C and 2D), and to respond to the DGRs. The water feature has been designed to not only provide efficient drainage of the site, but also to improve the quality of water that leaves the site.

Recommendations

It is recommended that the drawings prepared by J Wyndham Prince be approved and then used to fully develop designs for Construction Certificate and utility servicing.

Contents

1. Objectives of assessment

At a glance

J Wyndham Prince was commissioned by Landcom to prepare DA designs of civil works for Stages 2B, 2C, 2D, 3A and 3B of the North Penrith development site. This chapter sets out the context of the design and the associated objectives.

Design Context

J Wyndham Prince has been commissioned by Landcom to prepare DA designs of civil works for Stages 2B, 2C, 2D, 3A and 3B (2B-3B) of the development site at North Penrith. These stages of the site will complete the development of the site from an infrastructure perspective. Previously Landcom has retained consulting firms to design the site infrastructure as follows:

Stage 1 - Worley Parsons (under construction)

Stage 2A - Brown Consulting (application submitted)

Water management
Stages 2B & 2C contain the core of the site water management facilities, with stages 2D, 3A and 3B linking into these water management facilities. These are covered in detail in the report prepared by J Wyndham Prince entitled, *North Penrith Stages 2B-3B Water Cycle Management Strategy Report Incorporating Water Sensitive Urban Design Techniques* dated October 2012 that accompanies this development application. The core of the water management consists of a central water feature that accepts stormwater drainage from the entire North Penrith site and conveys this to a wetland. This water feature and wetland then act as a treatment train that is used to achieve the water quality outcomes for the site. Additionally the water feature and wetland provide for a recreational and aesthetic focus for the site.

Bulk earthworks
Stages 2B-3B will complete the site works and therefore it is important to complete the bulk earthworks strategy for the site. The design of this aspect of the site is also addressed in this report. The objective of this bulk earthworks design is to minimise as far as possible the export of material off site. The design covers all remaining stages including Stage 3A, however, the design of Stage 3A beyond simply bulk earthworks is subject to a separate application.

Road grading
Grades on roads are to respond to the existing character of the landform as far as possible whilst allowing the minimum longitudinal grading of roads providing for construction tolerances and meeting the requirements of Penrith City Council.

Road drainage
The road drainage system is designed to convey stormwater through the site to the central water feature. The objective is to provide a safe and efficient system that conveys flows in pipes generally up to the 5 year Average Recurrence Interval (ARI) event, but with some reaches of 100 year pipe where required due to surface grading issues.

Soil and water

Measures are to be documented to provide guidance with the objective to limit as far as possible the impact of sediment laden stormwater on receiving waters. The Landcom document "*Soils and Construction*" has been used to inform the soil and water measures.

2. Site analysis

At a glance

The site of Stage 2B-3B is extremely flat which provides challenges to site grading, road grading and drainage solutions.

Stage 2B-3B is an extremely flat area with minimal fall and areas of depressions that need to be graded out to transform the land to an efficient urban area. As part of the Stage 1 works at temporary sediment basin has been excavated to convey stormwater through the site pending the construction of the proposed water feature and wetland.

Stockpiles of material from Stage 1 construction have also been created on the site of Stage 2B-3B and need to be considered in finalising the bulk earthworks for Stages 2B-3B.

The site is extremely flat with extremely limited fall from the top end of the water feature to the outlet. The fall is only 330mm over a distance of approximately 600m. This creates challenges in the design which are overcome by the combined water feature and wetland design.

Figure 1 Site

3. Regulatory context

At a glance

The civil infrastructure (roads & drainage) for the site is being created as an asset for Penrith City Council. Servicing infrastructure will be created to the requirements of Sydney Water (sewer & water supply), Endeavour Energy (electricity), National Broadband Network (NBN) Company (telecommunications) and Jemena (gas).

Civil design (roads & drainage)

Penrith City Council has published, "*Guidelines for Engineering Works for Subdivisions and Developments, Part 1 - Design*" to assist in the design of the civil infrastructure for the all developments within the City of Penrith. This has been used where appropriate to guide the DA design. Some aspects of the Guideline have been superseded by the Concept Approval, mainly concerning road and verge widths.

Sewer & water

The authority for sewer and water infrastructure is Sydney Water Corporation (SWC). No applications have yet been made to SWC but will be made upon receipt of a development application number from the consent authority. This will enable a preliminary application for a certificate of compliance under Division 9 of the Sydney Water Act 1994.

Electricity

Electricity will be provided to the site by Endeavour Energy (EE). Early discussions have commenced with EE and early applications for relocation of high voltage (HV) assets have been made. Further detailed applications will be made upon finalisation of DA plans for the site.

Telecommunications

Provision for telecommunications will be made through the National Broadband Company (NBN).

Gas

Gas services will be provided by Jemena through its normal processes for urban development projects.

Servicing and waste

Relevant legislation, policies, guidelines and references applicable to servicing and waste are listed below:

- Waste Avoidance and Resources Recovery Act 2001 (WARR Act);
- Protection of the Environment Operations Act, 1997;
- Protection of the Environment Operations (Waste) Regulations, 2008;

- Protection of the Environment Operations (General) Regulations, 2009;
- Waste Avoidance and Resource Recovery Act, 2001;
- NSW Government Department of Environment and Conservation Assessment,
- Classification and Management of Liquid and Non-liquid Wastes, 2004;
- NSW Sustainability Policy 2008 – specifically WRAPP requirements;
- Austroads Environmental Strategy, AP-S27 2002;
- Austroads Guide to Road Design Part 7 2008 – Geotechnical Investigation and Design;
- North Penrith Stage 1 Project Application Preliminary Construction Environmental Management Plan, Worley Parsons, October 2010.

4. Methods and results

At a glance

The design of the surface of Stage 2B-3B was undertaken using the computer software "12D Model". This software provides a means to create 3D surfaces from existing survey data and to document the designs of roads and drainage systems. The software also performs calculations of volumes between created and existing surfaces.

The surfaces that result from 12D for this project are documented in the drawings prepared by J Wyndham Prince under separate cover to this report.

Civil design

Civil designs for this project are contained under separate cover and are summarised in the table below.

Site staging	J Wyndham Prince plan set
Stages 2B & 2C	9470/DA00 to 9470/DA23
Stage 2D	9470/DA100 to 9470/DA108
Stage 3B	9470/DA200 to 9470/DA205

In preparing the drawings the following steps summarise the design method:

- Receive digital survey and existing surface as a digital terrain model
- Receive boundaries in digital form from project surveyor
- Incorporate survey information into a complete 3D digital model
- Create a design surface using road grading to suit the requirements of Penrith City Council
- Review grading to ensure objectives of client are satisfied
- Amend grading where required to minimise export of material off site
- Finalise grading
- Carry out preliminary drainage design to convey stormwater flows to the water feature via Gross Pollutant Traps (GPTs)
- Determine traffic control features if required
- Determine cycle/pedestrian facilities
- Coordinate with landscape architect to ensure landscape concepts are enabled

Utilities

Preliminary investigation of utility servicing and discussions with service authorities has commenced. Design and applications for the various utility services will be prepared following development approval, in accordance with typical servicing processes.

The general servicing environment for the site is well known and there are no barriers that would prevent the necessary services being provided to the development in due courses.

Servicing and waste

Initially, waste will be classified and separated on site for recycling and re-use. Material will be further segregated once it has arrived at a recycling facility. Landcom aims to achieve 95% recovery (reuse and recycle) of total construction and demolition waste materials generated from the sum of civil works completed in that year.

Waste will be managed in accordance with the NSW Government's Waste Reduction and Purchasing Policy (WRAPP) and the regulatory policies, guidelines, and references mentioned within this report.

The demolished materials will that have been assessed to be fit for re-use will be loaded and stockpiled accordingly using an assumed 35T excavator with heavy rigid truck tippers. The Main Works Contractor (MWC) will need to confirm the availability of plant and machinery at the time of construction.

Any demolished materials considered unfit for re-use/recycling requiring disposal shall be loaded wholly within the site using an assumed 35t excavator and carted to an approved waste handling facility that receives that type of waste.

Chemicals fuels and any lubricant containers encountered or generated as part of construction works as well as solid and liquid waste will be disposed of in accordance with the OEH guidelines.

It is the responsibility of the civil contractor to ensure that the waste identification, classification and handling is dealt with in accordance with the associated legislation, policies and guidelines referenced in this report, as well as the Construction Environmental Management Plan.

5. Assessment

At a glance

The designs prepared for this development application satisfy the objectives set out above. The export off site of excess material is limited, given the competing interests, and roads and drainage designs satisfy the requirements of Penrith City Council.

Consultation with Penrith Council

During the design development of this application, consultation with the officers of Penrith City Council was conducted on the design of the wetland and water feature and on the road and drainage designs. The design philosophy was discussed and generally agreed but was subject to the provision of "DA standard" design drawings.

Wetland and water feature

Details of this element of the proposed development are contained in the J Wyndham Prince report, "*North Penrith Stages 2B-3B Water Cycle Management Strategy Report incorporating Water Sensitive Urban Design Techniques*", October 2012.

Bulk earthworks

In completing the bulk earthworks design for the DA the table below reports the outcomes.

Description	Volume (m^3)	Export/Import	Comment
Total cut from works	39,580	Export	(Row A)
Topsoil shortfall	4,227	Import[A]	(Row B)
Total export	35,353		Row A - Row B
Site allowance	**35,000**	**Export**	

[A] No import - just use available material

The following assumptions/issues have been adopted in calculation of the above site allowance:

- A bulking factor of 90% has been allowed for fill
- Allowances for stormwater, service trenching are estimates only at this stage as the detailed design of these aspects of the project have not yet been undertaken
- Excess from Stage 1 as stated by Landcom
- Pavement thickness allowed is 0.5m from design finished surface to boxing surface

- Final site allowance will vary from that stated in the table above based on final detailed design

Excess material will be validated and then transported off-site in covered trucks to either, a licenced waste facility, or to a fill site that has development approval to receive the excess material generated.

Tree removal

As part of the earthworks it will be necessary to remove existing trees as shown on drawing 9470/DA05. Approximately 131 trees will be removed that have been individually identified from the survey. This is consistent with the approved Concept Plan that detailed the removal of all trees from this area of the site. Extensive planting of new trees (eg. street trees, park landscaping) is proposed as part of the landscaping and this will compensate for the loss of existing trees.

Road grading

As previously stated, the site is basically level with very little fall. It is for this reason that the central water feature will be created. The water feature allows the site to drain to it without the requirement to import soil to regrade the site to achieve normal design falls.

The minimum road grade of 0.5% has been adopted. This is the grade stated at section 2.2.14 in the Penrith City Council "*Guidelines for Engineering Works for Subdivisions and Developments, Part 1 - Design*", May 1997.

Traffic management

Median are proposed at the intersection of Combewood Avenue and Thornton Drive,. This intersection will be controlled by a Give Way, which is consistent with the approved Concept Plana and traffic assessment prepared by Parsons Brinkerhoff in support of these applications. The priority at this intersection is given to the through traffic on Combewood Drive accessing the commuter carpark from Coreen Avenue.

Other traffic management is controlled by signage and line marking, which will be fully detailed in Construction Certificate.

Castlereagh Road Intersection

The intersection of Castlereagh Road and Thornton Drive is being upgraded to create a four-way intersection with full movement with traffic control signals. The concept has been developed in consultation with the Roads and Maritime Services (RMS).

This intersection upgrade forms part of the Stage 2B & 2C works, which is in accordance with Landcom's obligations under the Concept Plan. Subject to approval of the development application, Landcom will develop the detailed design for these intersection works for final approval by the RMS.

Cycles and pedestrians

A pedestrian refuge is to be incorporated into the Give Way medians proposed within Thornton Drive. Another pedestrian refuge is also proposed in Lord Sheffield Circuit near Klenig Place in Stage 2B.

All streets will be provided with footpaths for pedestrians within the street verge. There are no footpaths proposed in lanes.

Cyclists will be provided the following facilities:

- On-road marked lanes from Castlereagh Road to Combewood Avenue linking the existing regional cycleway in Castlereagh Road with the site
- On-road marked lanes from Thornton Drive, south to the commuter carpark
- Off-road shared path from Combewood Avenue to Woodman Street on the park side linking through the park to the proposed bridge across the water feature at Woodrow Way
- Off-road shared path through the park on the north side of the water feature linking opposite Woodrow Way through to Stage 1, Lord Sheffield Circuit

Road drainage

A preliminary drainage network is shown in the drawings that accompany this application. Generally, the piped system for minor flows will be designed to contain the 5 year ARI event which is stated in section 3.3.1 of Council's design guide. Major system flows will manage the 100 year ARI event containing these flows within the road carriageways.

Of particular interest is the management of the 100yr ARI flow in Walshaw Street. The 100yr ARI event arrow in drawing 9470/DA04 indicates that water flows north. This flow will be accommodated in an overland flow relief easement in the lot on the north side of Cleveland Lane fronting Walshaw Street. Note that the drainage pipes will be designed to contain this 100yr ARI flow event and convey it back to the water feature so that the relief path is only to be utilised if the system totally blocks. This is shown on drawing 9470/DA103.

Soil & water

Soil and water will be managed using the concepts contained in the Soil & Water Management drawings. These proposed measures are consistent with the concepts contained in the Landcom publication, *Managing Urban Stormwater : Soils and Construction – Volume 1, 4th Edition.*

In addition to the drawings, the construction contractor will also establish variations to meet on-site conditions and work sequencing. Possible methods to reduce the potential for impact on air quality in the way of odour, dust, windblown soil and exhaust emissions arising from construction activities include but are not limited to:

- Works in accordance with Soil & Water Management details prepared by J Wyndham Prince

- Install temporary hard surfaces on roadways in areas where vehicle movements are frequent i.e. adjacent to temporary site access points
- Establishment of exclusion zones for construction plant to minimise the footprint of works
- Material transported on or off site to be covered while in transit
- Plant and equipment to be regularly serviced to ensure they are in working order to minimise exhaust emissions
- Promote ground cover on stockpiles if required
- Remove from site any organic waste that has the potential to emit an odour
- Undertake dust suppression by water carts using non-potable water, (if and/or when it can be reasonably sourced at the site) by routinely dampening down surfaces
- Cease works that have the potential to disturb un-stabilised ground in high wind events and/or implement additional dust suppression mechanisms as required
- Monitor and assess air quality, when required, in accordance with regulatory guidelines and standard industry practices. Any assessment or monitoring of air quality should be undertaken by a suitably qualified professional

6. References

- Penrith City Council “Guidelines for Engineering Works for Subdivisions and Developments, Part 1 - Design”, May 1997
- Landcom, “Managing Urban Stormwater : Soils and Construction – Volume 1”, 4th Edition
- Worley Parsons, “North Penrith Regional Flooding Assessment’, October 2010
- Worley Parsons, “North Penrith Drainage Stormwater & Groundwater Report”, October 2010
- Worley Parsons, “North Penrith Utilities Services Report”, October 2010
- Worley Parsons, “North Penrith Defence Land Concept Plan Application Drawings”, October 2010;
- Worley Parsons, “North Penrith Defence Land Stage 1 Project Application Drawings”, October 2010
- Geotechnique, “Geotechnical & Groundwater North Penrith Assessment Report”, October 2010
- The Institution of Engineers Australia, “Australian Rainfall and Runoff Volume One & Two”, 2001