



Woolworths Warnervale Town Centre

Initial Infrastructure Assessment

May 2011

Woolworths

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Issue and revision record

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Executive Summary

This infrastructure assessment has been produced to address the Director General's Requirements (DGRs) relating to the Woolworths Retail Development at Warnervale Town Centre (MP 10_0195).

A summary of the Key Assessment Requirements of the DGRs are included in Section 2. Subsequent sections of this report provide supporting information concerning infrastructure servicing requirements and issues with respect to the proposed development.

There are a number of infrastructure issues associated with the servicing of the site; these are broadly outlined below.

Sustainable Water Management

Water Quantity Management

An open detention basin is proposed on the Landcom site upstream of Sparks Road. This shall serve the contributing upstream catchment from the proposed developed public and private domain comprising part of the Woolworths, Landcom and Council owned sites. Onsite storage tanks shall be considered on some development sites if required to provide additional storage to meet Council's design criteria.

Water Quality Management

Water quality management measures shall be provided to meet Council's performance objectives. For the public domain gross pollution traps shall be located at subcatchment nodal locations and secondary treatment in the form of biosinks shall be considered within at tree wells and garden beds. Water quality measures within the private domain shall be provided within each development lots to meet the performance objectives.

Water Saving

Water saving measures shall be considered within the private domain. Bathroom taps, showers and toilets shall incorporate water saving devices and rainwater harvesting and retention for irrigation and toilet flushing shall be considered for the private domain.

Services Infrastructure

The Town Centre is currently not serviced. Preliminary discussions have been undertaken with the service providers. The site can be serviced with all services. Site developments shall be coordinated with the provision of lead in services.

Sewer

Wyong Council is currently planning the lead in gravity sewer to the south of Sparks Road. The sewer service to the southern catchment of the Woolworth's site shall be connected to this main via proposed mains through the Landcom site. Longer term development of the east side catchment of the Woolworths site depends on providing a sewer service from the west.

Water Supply

Council has confirmed that the site can be serviced from the existing mains in Sparks Road. The servicing of the Woolworth's development is dependent on the extension of these mains through the proposed landcom development to the south of the site.

Power

Ausgrid is currently planning a regional substation to the south of Sparks Road to service the proposed Town Centre. The servicing of the Woolworth's development is dependent on the provision of mains from this substation through the proposed landcom development to the south of the site.

Gas

Gas can be supplied off the mains in Sparks Road

Communications

Communications shall be provided from lines in Sparks Road.

Road Planning

Road Hierarchy

The proposed geometric road layout and typical cross sections have generally been adopted from the Warnervale Town Centre DCP. The road cross section for road W01 adjacent to the rail corridor was developed in close consultation with Railcorp and NSW Transport. The station entrance location has been coordinated and agreed in line and level with Railcorp. The bus stop and Kiss 'n' Ride locations have been agreed to by railcorp and Transport NSW. The proposed cycleway network comprises both on road and offroad sections in general accordance with the DCP with modifications as discussed with Council. Typical road cross sections for each road accompany this report.

A single lane roundabout is proposed on Road W01 (Nikko Road) to provide for bus and other vehicle turning. This shall be retained in the longer term layout.

Road Grading

The site is steep and this presents a particular planning challenge in the grading of the roads. A 'best fit' road grading has been optimised respecting the various design parameters – rail concourse level controls (the major control) , grading limits for buses/trucks, grading limits for pedestrians, topographical considerations and the objective to minimise and balance cut/fill. This latter objective was not possible due to the competing objectives and the site characteristics. Road grading has been co-ordinated with the adjacent site developers and preliminary road long sections accompany this report.

Woolworth's Development Site Grading

A preliminary cut fill diagram has been prepared. The objective was to achieve a balanced cut/fill. This outcome could not be achieved due to the need for basement excavation and the competing objectives to achieve suitable grades for the external roads in a steep environment. The earthworks quantities are subject to further optimisation during design development. Indicative cut/fill quantities have been calculated from the initial investigation. A spoil volume of approximately 102,500m³ is the approximate quantity of spoil.

Contamination

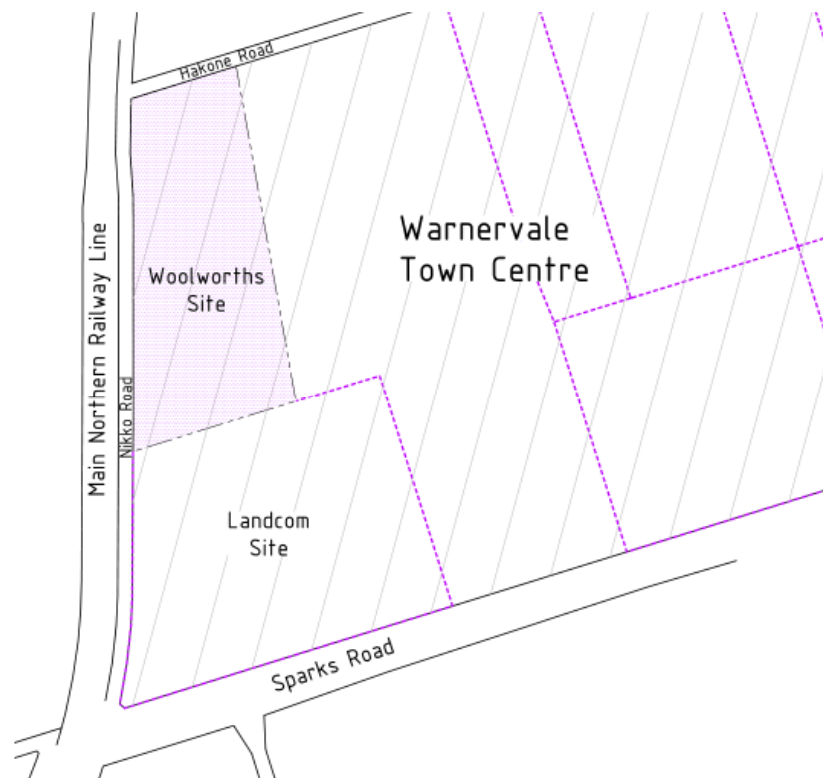
The extent of contamination to the east of the Woolworth's site presents a potential project risk and may impact on the road locations and extent of earthworks. The Woolworth's design team is working closely with Council to optimise the road locations and extent of earthworks in this zone to minimise impact.

1. Introduction

1.1 Background

Mott MacDonald Hughes Trueman (MMHT) has been commissioned by WSP-Fitzwalter acting on behalf of Woolworths Limited to assist with the infrastructure assessment for the Woolworths site as part of Warnervale Town Centre planning. The Town Centre area and Woolworth's site is indicated on Figure 1.1 below.

Figure 1.1: Site Context and Assessment Area



The Woolworth's site occupies approximately 9.04 Hectares of the Warnervale Town Centre site. The subject site is Lot 521 DP 594725.

The infrastructure masterplanning for the Woolworth's site must be considered in the context of the planning for the whole Town Centre area and this report addresses this.

1.2 Purpose of Assessment

The main aims of this Infrastructure Assessment are:

- To assess the servicing requirements for the proposed development of the Woolworth's site in the context of servicing the larger Town Centre
- To identify the broad infrastructure requirements to facilitate development of the Woolworth's site in the context of the larger Town Centre
- To consider the constraints and opportunities relevant to the site.
- To consider practical, achievable sustainable principles in the provision of infrastructure
- To address the Director General's Requirements for Project Application – MP10_0195.

1.3 Scope of Assessment

This study investigates the following:

- The infrastructure site constraints and opportunities,
- Topographical constraints – slope, drainage corridors
- Locations and indicative capacities of existing trunk infrastructure services – telecommunications, sewer, water, power, drainage, gas
- Appreciation of hydrological issues by desktop review of available information
- Identification of Stormwater Quantity Management issues - detention requirements and options for consideration – likely land-take
- Identification of likely Stormwater Quality Management obligations, land-take, etc.
- Integration issues with adjacent development, in particular Railcorp, Wyong Council and Landcom lands.

Associated with this assessment is a set of Infrastructure Masterplans prepared by Mott MacDonald Hughes Trueman that summarise the relevant infrastructure servicing issues.

The following sections of this report document the infrastructure assessment findings for Stormwater, Transport, Water, Sewer, Telecommunications, Electricity and Gas. The report considers other

potential constraints including contamination, geotechnical factors and adjacent property integration.

Figures within this report are intended to emphasise important issues within the respective report section. The masterplan drawings attached as Appendix A should be referred to for a complete picture of the relevant service/issue. Refer to Appendix A for a list of the masterplan drawings included as part of this assessment.

1.4 Drawing Base

The drawing bases used for the Infrastructure Masterplans are:

- Survey by Bannister & Hunter (26/08/2004)
- Architectural Drawings by BN Group (06/07/2010)
- Landcom design plans prepared by GHD
- Information from Service providers as discussed in Section 3.3 (Dial Before You Dig)

1.5 Regional Context

The broader Warnervale Town Centre site is generally bounded to the north by Hakone Road (alignment), to the east by Hiawatha Road, to the south by Sparks Road and to the west by the main northern railway line. The Woolworths land relevant to this investigation is situated in the north-west of the Town Centre site and is bounded by Hakone Road (alignment) to the north, the main northern railway line to the west, Lot 1 DP700096 and Lot 2 DP7738 being developed by Landcom to the south (Landcom is also developing Lot 3 DP7738 to the south-east of the site), and Lot 1 DP376264 to the east. More broadly, the site is located in the Wyong Local Government Area (LGA).

1.6 Site Areas and Current Land Zonings

The Wyong Local Environmental Plan 1991 does not apply to this site. The relevant policy pertaining to the Warnervale Town Centre is State Environmental Planning Policy (Major Development) 2005 – Schedule 3 Part 16.

The zoning for the subject site, in accordance with the above policy is B2 – Local Centre, with areas of RE1 – Public Recreation at the site's north and eastern boundaries. This is represented on Figure 1.2 below.

Figure 1.2: Current Land Zonings



Source: State Environmental Planning Policy (Major Development) 2005 (amendment No. 24)

2. Director General's Requirements - Summary

Table 2.1 presents a summary of the Key Assessment Requirements of the Director General relevant to infrastructure, water and environmental issues. The relevant section/s of this report that addresses these issues is referenced in the Table.

Table 2.1: Director General's Requirements Summary (MP10_0195)

KAR*	Description	Ref. Section	Summary
Built Form (2)	Proposed Levels and grades of the station, streets and public domain spaces	4.3	Site grading developed to integrate with adjacent lands including future railway station
Built Form (9)	Design of Infrastructure	4.2, 4.6	Concept infrastructure plans developed based on DCP road layout and cross sections (amended in consultation with Department of Planning, Wyong Council and Landcom)
Transport and Accessibility (1b)	Scope of Road Improvements	4.2.1	Consider the need for the upgrade of the regional roads and intersections to generated by the development
Transport and Accessibility (1i)	Incorporation of rail, bus and cycleway facilities in design	4.2.2	Site grading developed to incorporate proposed srail tation, bus stops and bus layovers in consultation with Dept of Planning, Transport and Railcorp
Ecologically Sustainable Design (ESD) (1)	ESD Principles in design	4.5	Water, energy and waste management principles to be incorporated in design
Drainage & SW Management (1)	On site Detention, re-use, Water Sensitive Urban Design, Integrated Water Cycle Management and drainage infrastructure	3.1.2, 4.4	Public domain water management to be addressed on a sub-catchment basis; Private domain water management to be addressed at site level
Hydrology (1)	Impacts of site hydrology	3.1, 3.4.3, 4.4	Water management principles aim to provide continuity in site hydrology and preservation of predeveloped and environmental flows.
Topography (1)	Existing and Proposed Levels / Cut & Fill	3.2.1, 4.3	Cut/fill balance not achievable due to Need to deliver project grading objectives in steep topography
Topography (2)	Disposal of spoil	4.3	Details pending geotechnical classification of spoil material; integrated design approach required for whole town centre to maximise potential for local disposal.
Utilities Infrastructure (1)	Preliminary Utility and Infrastructure Servicing Strategy	3.3, 4.6	Preliminary Servicing strategy developed. Co-ordination ongoing with authorities and adjacent landholders; coordinated /integrated approach to servicing and programming for whole town centre required.

*Key Assessment Requirement

3. Existing Site Conditions, Infrastructure & Constraints

3.1 Catchments & Hydrology

3.1.1 Regional

The site is bisected by an east-west ridge line, which provides two discrete catchments – one draining to the north and one to the south.. Both catchments are within the Tuggerah Lakes catchment and ultimately drain to Tuggerah Lake and the Pacific Ocean.

The northern catchment drains to the north-west to a tributary of Wallarah Creek, which originates at the crest approximately 300m to the west of the railway line. The tributary flows in a north-easterly direction prior to connecting to Wallarah Creek. Wallarah Creek flows to the east and connects to Budgewoi Lake, which connects to Tuggerah Lake.

The southern catchment discharges through the Landcom lands to the south and across Sparks Road via culverts (3no. 750x1800). The culvert discharge to a creekline to the south (itself originating approximately 300m to the west of the railway line). This creekline flows to the south and then westerly, crossing the railway line to the north of Watanobbi and connecting to a tributary of Wyong Creek – Porters Creek. Wyong Creek meanders easterly, connecting to Tuggerah Lake.

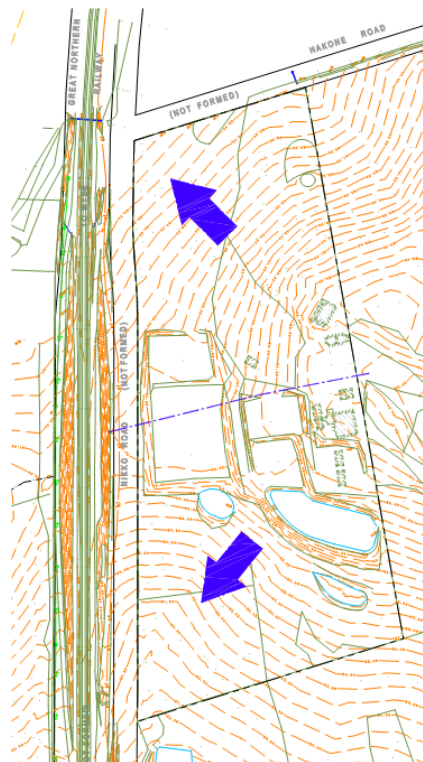
3.1.2 Internal

There are no defined creeklines within the Woolworth's site boundary and within the subcatchments containing the proposed Town Centre. A number of dams exist within the southern catchment. There is no piped stormwater system within the existing site.

Site discharge from the southern catchment sheet flows to the south west from the Woolworth's site and joins a drainage channel graded to the culvert under Spark's Road. A degraded table drain along Spark's Road collects other sheet flow runoff from the southern catchment and directs it towards the culvert along Spark's. Uncaptured flows sheet flow across Sparks Road along the the length of the boundary. The northern catchment appears to sheetflow generally towards the north-western corner of the site into a degraded open drain, with the exception of the far north-eastern corner, which appears to discharge to an existing 450mm diameter pipe crossing Hakone Road.

Refer to Figure 3.1 for details of the existing site sub-catchments related to the Woolworth's site. The attached plans include a catchment plan for the larger Town Centre.

Figure 3.1: Existing Site Sub-Catchments



3.2 Existing Site Characteristics

3.2.1 Land Use & Topography

The Woolworth's site is largely vacant and cleared of vegetation but for a number of remnant building slabs from its previous use as a wholesale nursery. Vegetation is largely confined to the western edge along the railway alignment, with only scattered vegetation elsewhere. The northern site catchment, as described above, is particularly steep with a grade of approximately 17% from the crest and decreasing to around 9% closer to the site's north-western boundary. The southern catchment grades to the south-west at approximately 10%. The existing farm dams appear to be battered at approximately 1:2.5 (V:H) to the surrounding surface.

3.2.2 Watercourses

As described above, there are no riparian or formed watercourses running through the Woolworth's site. The larger Town Square catchment includes degraded constructed open drainage channels.

3.2.3 Stormwater Quality

There do not appear to be any stormwater quality control measures within the Woolworth's site or larger Town Centre catchment area.

3.2.4 Transport Infrastructure

There are no formal roadways through the Woolworth's site. There are a number of access tracks and disused roads associated with the existing building remnants. The Nikko Road and Hakone Road corridors border the site to the west and north respectively. No constructed roads exist in these corridors.

Regionally, Sparks Roads runs east-west adjacent to the Landcom lands to the south of the site. The F3 – Sydney to Newcastle Freeway runs north-south approximately 2km to the west of the site.

The main northern railway line runs along the western site boundary – the existing Warnervale station is located approximately 1.5km to the south of the site.

3.3 Existing Utility Services

3.3.1 Water

Wyang Shire Council is the water supply authority for the region. It is noted that Gosford City and Wyong Shire Councils have agreed to the formation of the *Central Coast Water Corporation*, which will shortly be responsible for the region's water supply.

Existing water main locations have been supplied by Wyong Shire Council through the Dial Before You Dig (DBYD) service and confirmed with council officers

There is no apparent water reticulation infrastructure within the Woolworth's site. The nearest trunk service mains are in Sparks Road (250mm diameter) to the site's south and along Nikko Road (to the south of Sparks Road).

3.3.1.1 Source of Water Supply

Water is sourced regionally from the Mardi Dam located to the site's south-west. Major reservoirs exist at Tuggerah to the south and Kanwal to the east.

3.3.2 Sewerage

Wyong Shire Council is the wastewater authority for the region. Existing sewerage service locations have been supplied by Wyong Shire Council through the DBYD service and confirmed with council officers.

Regionally, there are sewage treatment works approximately 2km to the north of the site and the Wyong South Sewage Works further to the south.

There are no sewerage services within or around the site. Wyong Council is progressing a works program to service the Town Centre via a main that will run from the existing treatment plant to the south up to Spark's Road.

3.3.3 Telecommunications

Existing telecommunications services locations have been supplied by Telstra through the DBYD service.

Existing telecommunications services run along Nikko Road to the west of the site, Hakone Road to the site's north and Sparks Road to the site's south.

3.3.4 Electricity

Existing electrical service locations have been supplied by Energy Australia (Ausgrid) through the DBYD service.

Existing electrical infrastructure exists along Nikko Road along the site's western boundary. It is understood that electrical infrastructure also exists along Sparks Road.

The existing area is serviced by regional substations in Charmhaven and Wyong; however, these are understood to be reaching capacity. An existing 132kV transmission feeder (98B) links the two substations.

3.3.5 Gas

Existing gas service locations have been supplied by Jemena through the DBYD service.

A secondary gas main (150mm – 1050 kPa) runs along the western side of the railway line along the site's western boundary. A local (110mm – 210 kPa) gas service runs along Sparks Road to the east of Minnesota Road to the site's east.

3.4 Development Constraints

3.4.1 Acid Sulfate Soils

Department of Planning Acid Sulfate Soil Planning Maps do not indicate any specific encumbrances on the site resulting from the presence of acid sulphate soils. This will need to be confirmed as part of a future geotechnical investigation.

3.4.2 Flooding

The regional ARI 100 year flood level is understood to peak to the south of Sparks Road to the south of the site and therefore does not impact on the development site.

Local flooding will be addressed as part of the site grading exercise and water management strategy for the site.

3.4.3 Geotechnical Considerations

The Swansea North Entrance No. 1 mine subsidence zone affects lands within the broader Warnervale Town Centre site, however, does not appear to extend to the subject site.

There are pockets of potential contamination within the Woolworth's site, generated from the site's previous use as a wholesale nursery. Further assessment is proposed to establish the extent and nature of potential contamination across the site. A future geotechnical assessment will also address potential development impacts on the existing site geology and hydrogeology.

Reference should be made to the Stage 1 Environmental Site Assessment by Douglas Partners (March 2006) for further geotechnical considerations related to the subject site.

4. Development & Future Infrastructure Requirements

4.1 Proposed Development

4.1.1 Development Mix

The Town Centre shall provide for retail and commercial floorspace totalling approximately 43,000 sqm. Development for the stage 1 works is focused about the southern half of the site. Residential development is also proposed within the Town Centre.

4.2 Transport

4.2.1 Roads

The proposed road network within the Woolworth's site shall be part of a broader, co-ordinated road network throughout the Warnervale Town Centre. The road layout and cross sections have been generally based on the Warnervale Town Centre Development Control Plan 2008. The roads have been refined in consultation with Department of Planning, Wyong Shire Council and Landcom as development planning has progressed. The proposed arrangement of roads within the site and typical cross sections are indicated on MMHT plans 10s183C-MP03 & MP07.

4.2.1.1 Road Network and Connection to regional road network

External roads relevant to the broader site include Sparks Road, Hakone Road and Nikko Road. The main site access is proposed from an intersection off Sparks Road. Road W01 will connect to Spark's Road at this location and run through the Landcom lands to connect to the road system through the Woolworth's site to the north.

A major upgrade of Spark's Road to a lane (4) carriageway with provision for a future two (2) lanes is proposed by the RTA to service the broader area. The RTA is planning for a fully upgraded intersection at Spark's Road and Road W01 as part of the Town Centre development and has provided a preliminary layout for the upgrading of Spark's Road and for the intersection with Road W01. Limited developer funding is available for this intersection upgrade and the progression of the Town Centre depends on government funding for this vital connection. The feasibility of a sacrificial short term intersection is being examined to permit development to proceed if funding for the larger works is not forthcoming.

The Nikko Road corridor (unbuilt road) runs adjacent to the railway line and the site's western boundary and shall provide an important road

and pedestrian connection from the Landcom site joining to Road W01. Road W01 provides an important corridor for buses to link to an exchange at the proposed Warnervale Railway station. Significant consultation has been undertaken with Railcorp and Dept of Transport to optimise and agree on a layout for bus stops, bus layover, Kiss'n'Ride and taxi ranks at the rail concourse interface. MMHT plan No. Shows the agreed layout

Hakone Road runs along the northern boundary of the site. There are a number of proposed intersections to Hakone Road, the nature of which are to be developed. Current programming provides for the long term upgrading of this connection.

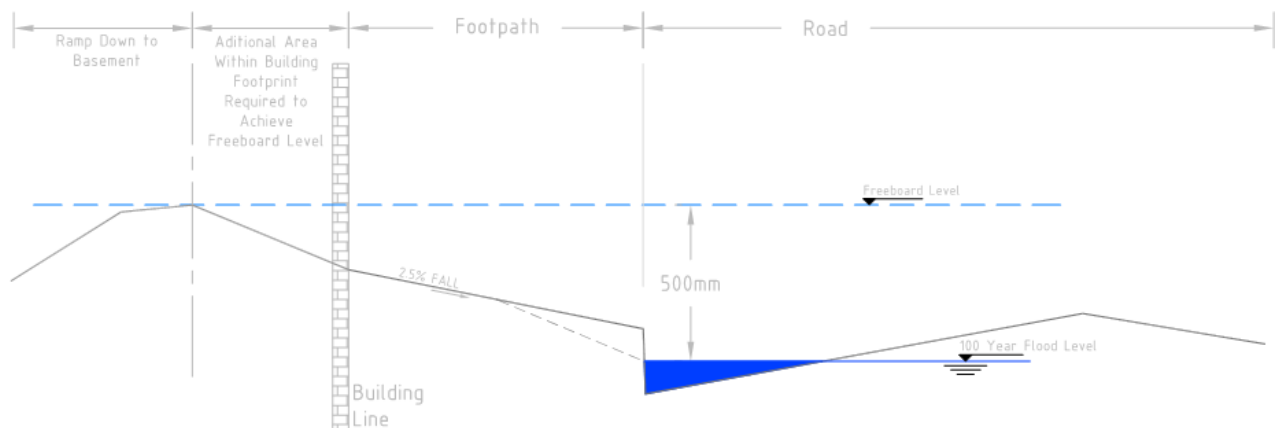
In the short term all bus connections shall be from the south and a roundabout along Road W01 shall provide for bus turnaround. In the longer term this roundabout shall provide access across the rail to the west and to the north and Hakone Road. The vel control at the roundabout to provide for a bridging of the rail corridor is critical to the design. The planning provides for the provision of a ring road around the core town centre to encourage traffic away from the main street. This ring road is proposed as part of the short term road network.

4.2.1.2 Wooworth's site accesses

Accesses to basement carparking and loading docks are proposed off the ring road system. No accesses are proposed off Main Street to minimise pedestrian conflict. This is discussed in more detail in the Traffic Report accompanying the submission.

Basement carpark entries and other site entry points to habitable areas shall be set at a level to protect against flooding. A freeboard of 300 mm above the critical flood level (usually 100 year Average Recurrence Interval (ARI)) is proposed at these access locations. Refer to Figure 4.1 below for a diagrammatic representation for a typical cross section showing this. In some cases the access crest may need to be located within the building lot as shown on the diagram.

Figure 4.1: Typical Freeboard Requirement at Basement Carpark Entry



4.2.1.3 Private Roads

Woolworth's propose to retain ownership and maintenance obligations for some of the core town centre roads. Other roads some roads within the Woolworth's site are proposed for handover to Wyong Council.

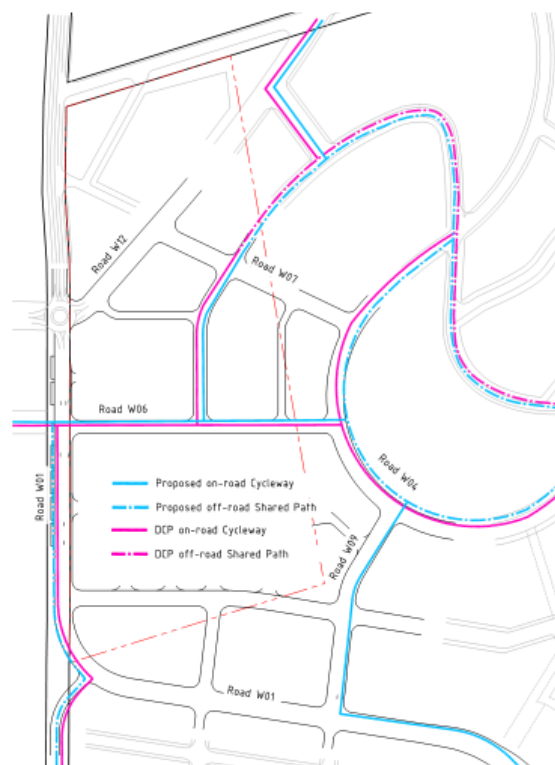
4.2.2 Other Transport Provisions

4.2.2.1 Pedestrian / Cycleway Connectivity

The project team has worked with other key stakeholder to develop a legible and integrated cycleway strategy for the Town Centre.

The DCP proposes cycleway routes (DCP – Figure 3.14), both on and off road. The proposed amended strategy generally respects the DCP proposal, however, proposes off road shared paths in lieu of on road paths in some locations, particularly along Roads W04 and W01 (Nikko Road extension). An additional on-road path is also proposed from the proposed off-road shared path running along Road W04, along Road W09 and W01 to connect to Sparks Road.

Figure 4.2: DCP & Proposed Cycle Routes



4.2.2.2 Bus Routes

The proposed bus routes have been developed in consultation with the main stakeholder groups – Railcorp, Wyong Shire Council, Transport NSW, Busways to refine the proposed bus routes through the site.

The DCP proposes a bus route (DCP – Figure 3.14) along Roads W01, W06 and W04. The alternative bus route developed by the project team, in consultation with the relevant stakeholders, is along Road W01, W12, W07, W04 and potentially looping back along Road W09. This is illustrated on Figure 4.3 below.

Bus bays are proposed along Road W01 in the vicinity of the proposed North Warnervale Railway Station in accordance with the DCP and in consultation with relevant stakeholders.

Figure 4.3: DCP & Proposed Bus Routes



4.2.2.3 North Warnervale Railway Station

A new railway station is proposed adjacent to the site, as indicated in Figure 4.3. The road and site grading have been carefully co-ordinated with Railcorp in terms of the proposed levels and location of the proposed railway station overbridge.

4.3 Site Grading

Owing to the steep topography of the site, site grading is a significant challenge. The DCP Figure 3.15 provides indicative road levels for local streets within the broader site. These levels have been used as the basis for the proposed site grading. A number of factors need to be considered in the site grading exercise. These include:

- Levels indicated in the DCP
- Maximum grades for accessibility

- Rail line control level and access from rail level (platform level and concourse level) at the proposed station – this has a major impact on the site levels.
- Suitability for bus circulation
- Integration with adjacent sites (eg. Landcom site to the south, railway station to the west, sites to the east)
- Integration with water management strategy (provision of overland flow paths)
- Suitability for lot development
- Cut/fill balance objective – limiting depth of cut

MMHT have developed a concept grading plan that respects the above factors. The proposal has been discussed and agreed with Wyong Council, Landcom, Railcorp and Dept of Planning.

Due to the steep topography of the site, significant areas and depths of cut will be necessary. A management plan will be prepared to address spoil disposal from the site. This will be largely dependent on the quality of material and with respect to potential contamination, as discussed in Section 3.4.3.

4.4 Stormwater Management

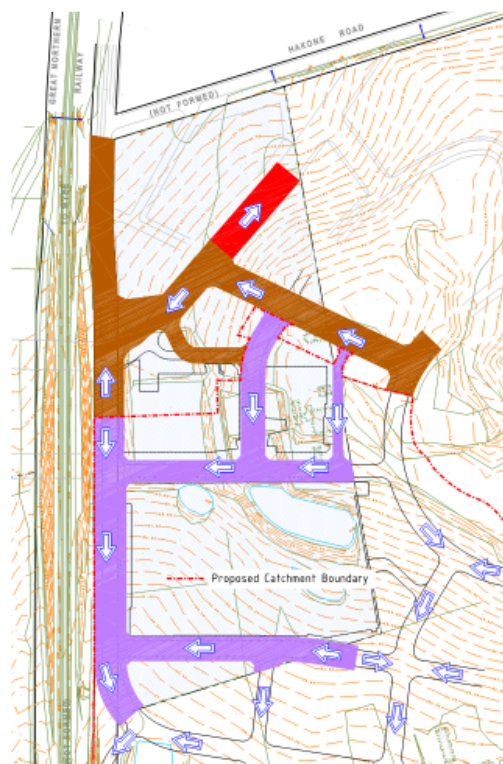
The Warnervale Town Centre Integrated Water Cycle Management Strategy (IWCM) addresses water management issues on a whole of site basis (i.e. the whole Warnervale Town Centre). The findings of this report and the DCP can be adapted for use on the subject site.

4.4.1 Water Quantity Management - Catchments and Stormwater Infrastructure

The proposed catchments for the development are dictated largely by the existing site topography and broad catchments as outlined in Figure 3.1. The proposed catchment boundaries and subsequent direction of flow along the site's roads is indicated on Figure 4.4 below. As shown, more than half of the site will drain to the south towards the Landcom site, the remainder draining north towards Hakone Road. A piped system along each road will be designed to convey the minor rainfall event, while the roads will be designed to convey the major event as overland flow. The initial development shall be in the southside catchment. A pipe system shall be designed to reticulate flows from the site through the Landcom estate to the south and then through the proposed open detention basin on the Landcom site. There is a need to integrate the design with Landcom to ensure pipes are sized through

the downstream Landcom site to accommodate the upstream developed flows. Any shortfall in the detention storage allocation for Woolworth's shall need to be accommodated in detention storage in tanks on the Woolworth's development sites. The main basin location is consistent with the location indicated on Figure 8.1 of the DCP. The stormwater management philosophy and masterplan layout are presented on MMHT Plans 10s183C – MPEA16, MPEA17 and MPEA18. The basis for the design of these facilities is the limiting of post-development site outflow to pre-development levels for all storms between the 5yr and the 100yr ARI events. It is understood that Wyong Council shall be the owner of the open detention basin.

Figure 4.4: Proposed Site Catchments



4.4.2 Water Quality Management

4.4.2.1 Public Domain

The performance criteria for subdivisions specified in the Wyong Shire Council Urban Stormwater Quality Management Plan for the Tuggerah

Lakes and Coastal Catchments (WSC-SQMP) is indicated in Table 4.1 below.

Table 4.1: Wyong Council Water Quality Performance Criteria for Subdivisions

Pollutant	Treatment Objectives
Suspended Solids	90% retention of mean the annual load
Nutrients (Nitrogen, Phosphorus)	50% reductions in the mean annual load
Litter	Retention of material > 50mm diameter for flows equivalent to 25% of the ARI 1yr flow
Coarse Sediment	Retention of particles > 125µm diameter for flows equivalent to 25% of the ARI 1yr flow
Hydrocarbons	No visible oils and greases in discharge for flows equivalent to 25% of the ARI 1yr flow

Source: Adapted from WSC-SQMP – Table 6.1.1a

The Warnervale Town Centre DCP, with reference to the IWCM, recommends the above be adopted where stormwater is discharging directly into receiving environments.

Where the stormwater discharges through management systems, such as detention basins, different objectives are recommended by the strategy. There are reduced targets for suspended solids and nutrients of 80% and 45% respectively, which generally accord with best practice. It is considered that the amended objectives are applicable to the subject site, given stormwater will generally discharge to stormwater management systems rather than directly to the receiving environment. The proposed treatment objectives are summarised below in Table 4.2. These shall be achieved by the integration of water manage facilities comprising gross pollution traps and bioretention facilities into the public domain. Bioretention facilities shall include biosinks at tree wells and garden beds built into the streetscape.

Table 4.2: Proposed Water Quality Performance Criteria

Pollutant	Treatment Objectives
Suspended Solids	80% retention of the mean annual load
Total Nitrogen	45% reduction in mean the annual load
Total Phosphorus	45% reduction in mean the annual load

4.4.2.2 Private Domain

Water management for the private domain will be managed 'at source'. The details of proposed measures will be developed as part of the building development works, however, measures such as rainwater

retention tanks and GPTs prior to discharge into the public system shall be considered where appropriate.

4.5 Sustainability

Principles of Ecologically Sustainable Development (ESD) will be used in the design. This applies primarily to the building works in complying with BASIX requirements as a minimum target. Site wide initiatives contributing to the overall ESD strategy may include:

- water management strategies, as outlined in Section 4.4,
- measures to encourage public transport use, cyclists and pedestrian amenity, as outlined in Section 4.2.2,
- water harvesting and re-use for non-potable uses

Specific measures to incorporate ESD principles in the design will be addressed during the design development phase.

4.6 Proposed Utility Services

4.6.1 Water Supply

Discussions with Wyong Shire Council engineers have confirmed that the site will be serviced from two sources. This is a common practice, which ensures the security of supply should one source be interrupted.

The proposed points of connection for the broader site will be from the existing 250mm diameter main running along Sparks Road and a proposed 375mm diameter main to run along Nikko Road to the site's west. The site will connect to water mains extended from these connection points through Landcom's site. The details of the proposed connection points are to be confirmed, however, it is anticipated that water mains will run along most roads.

Stub connections will be provided where applicable at the site boundary to provide for future connection by adjacent sites and a connection for the future rail station facilities – to be coordinated with Railcorp.

4.6.2 Sewerage

Discussions with Wyong Shire Council engineers have confirmed that the existing sewer treatment plants have the capacity to take the loads from the proposed development. Council is currently progressing the design of a sewer main from the treatment plant up to a connection

point on the northern side of Sparks Road. It is understood that delivery of this main will be completed in mid 2011.

The site sewer will reticulate within two discrete catchments, generally as indicated in Figure 4.4. The southern catchment will connect, through the Landcom lands to the south, to the sewer being installed up to Sparks Road. Given the steep topography, there may be a number of connection points to the sewers within the Landcom site, potentially along Roads W02, W10 and W08, or a combination thereof.

The northern catchment will reticulate towards Hakone Road to the north. The presence of sewer with available capacity between the site boundary and the sewage treatment plant to the north will need to be confirmed.

Sewer reticulating through the site will be designed to accommodate adjacent lands where appropriate, such as provision for connection to the proposed North Warnervale railway station to the west.

4.6.3 Gas

Gas services for the site will be designed by Jemena. Site reticulation will be within shared trenches with electricity and telecommunications services.

The existing gas services are described in Section 3.3.5. There appears to be two potential connection points for the site – connection to the secondary gas main on the western side of the railway line and extension of the gas main running along Sparks Road to the site's east. It is considered that the former would pose a number of issues with respect to the crossing of the railway line and connection to a secondary main. The latter is therefore considered the more likely/favourable option, subject to the capacity of the existing system.

Further co-ordination will be conducted with Jemena to progress the gas design, where required. The provision of the mains will need to be integrated with the Landcom site development works.

4.6.4 Electricity

The existing system is not believed to have sufficient capacity to service the proposed development. A number of options are being considered by Energy Australia (Ausgrid) to supply the site. The most likely outcome is the construction of a new 132/11kV zone substation at Warnervale, linked to the existing 98B feeder between the Wyong and

Charmhaven zone substations. It is understood that the new zone substation will be constructed in 2012/2013.

Other potential options for servicing the site include an upgrade of the Charmhaven zone substation or local generation measures. These are not considered to be long-term supply solutions in this case, however, may be appropriate short-term/interim measures for investigation.

Longer term electricity upgrades include additional 132kV feeders between Munmorah Bulk Supply Point and the Warnervale zone substation – anticipated for completion in 2016/2017.

Electricity services will reticulate along the site's roads within a shared trench with gas and telecommunications services. The design of the reticulation shall need to be integrated with the Landcom site servicing.

4.6.5 Telecommunications

It is anticipated that telecommunications services will be provided from the existing infrastructure in the adjacent roads, as indicated in Section 3.3.3 (subject to capacity limitations). Telecommunications services will reticulate within the site along shared trenches with gas and electricity services.

Provision for any National Broadband Network running along the site's roads will also need to be considered.

4.7 Staging

The timing of the proposed Woolworth's building development is dependent on the timely delivery of the lead in services and roll out of the Town Centre Roads – the public domain works.

The servicing of the site is dependent on connections through the Landcom site to the south, to connect to the mains in Sparks Road. Liaison is continuing with Landcom to ensure works are co-ordinated. Lead-in services and vehicular access through the Landcom site will need to be constructed prior to the completion of the first stage of site development. Temporary/interim measures will need to be considered where this cannot be achieved.

The road intersection upgrade at Spark's Road is critical to the delivery of the Town Centre. A sacrificial short term connection may present the best way forward if government funding is not forthcoming.

5. Infrastructure Issues Matrix

Table 5.1: Matrix of Infrastructure Issues

Item	Ref. Section	Issue	Comment	Risk/Action
1 Base Information				
1.1	1.4	Adjacent Landholder Design Information	Continue Liaison and exchange of information	Integration of designs with adjacent landholders, including Landcom is critical to the co-ordinated delivery of the site, particularly with respect to infrastructure dependencies
1.2	4.1.1	Site/Lot Boundaries	Confirm lot boundaries	Confirmation of final lot boundaries is required for finalisation of road and verge grading and services co-ordination
2 Site Constraints				
2.1	3.4.3	Geotechnical	Potential Contamination	Potential areas of contamination have been identified in the preliminary site assessment. Further investigation will need to be carried out to establish the extent of contamination and identify other geotechnical issues
2.2	4.2.2.3	Railway Integration	Level Integration	Site grading is being co-ordinated with the proposed railway station. Integration along the whole site interface will also need to be considered
2.3	4.3	Steep Topography	Depths of Cut	Significant areas and depths of cut will be required due to the steep topography. A management plan to address disposal of spoil will be required.
3 Infrastructure Requirements				
3.1a	4.2.2	Transport	Bus Routes and Cycleways	Formalisation of proposed bus and cycle routes through the site and further co-ordination with adjacent landholders and Wyong Shire Council will be required
3.1b	3.2.4 & 4.2.1	Transport	Intersections	Determination of proposed intersection treatments, including interim measures and staging to be considered
3.2	3.2.2 & Error! Reference source not found.	Water Quantity Management	Sizing & Locations	Determine proposed sizing and location of basins (southern basin by others). Consider options for private domain
3.3	3.2.3 & 4.4.2	Water Quality Management	Treatment Objectives	Confirmation of proposed treatment objectives for public and private domain uses is required
3.4	3.3.1 & 4.6.1	Water Supply	Staging & Connection	Confirm and co-ordinate connection locations to adjacent roads. Confirm status of Wyong Shire Council works
3.5	3.3.2 & 4.6.2	Sewerage	Staging & Connection	Confirm and co-ordinate connection locations to adjacent roads. Confirm status of Wyong Shire Council works
3.6	3.3.4 & 4.6.4	Electricity	Substation Location	Confirm proposed substation location and method of supply, including proposed timeframes for delivery
3.7	3.3.3 & 4.6.5	Telecomms.	Provision of Services	Consider servicing connection point and capacity limitations. Consider provision for future NBN
3.8	3.3.5 & 4.6.3	Gas	Provision of Services	Consider proposed point of connection / required mains extensions/amplifications. Liaison with Jemena required

6. References

- Department of Planning, NSW (2010), Director General's Requirements for Project Application – MP10_0195
- NSW Government (2011), Wyong Local Environmental Plan 1991 – Current version for 18 February 2011
- Department of Planning, NSW (2005), State Environmental Planning Policy (Major Development) 2005 – Schedule 3 Part 16
- Douglas Partners (2006), Draft Report on Environmental Site Assessment – Proposed Warnervale Town Centre
- Department of Planning, NSW (2008), Warnervale Town Centre Development Control Plan 2008
- Wyong Shire Council (1999), Urban Stormwater Quality Management Plan for the Tuggerah lakes and Coastal Catchments

Appendix A – Masterplan Drawings