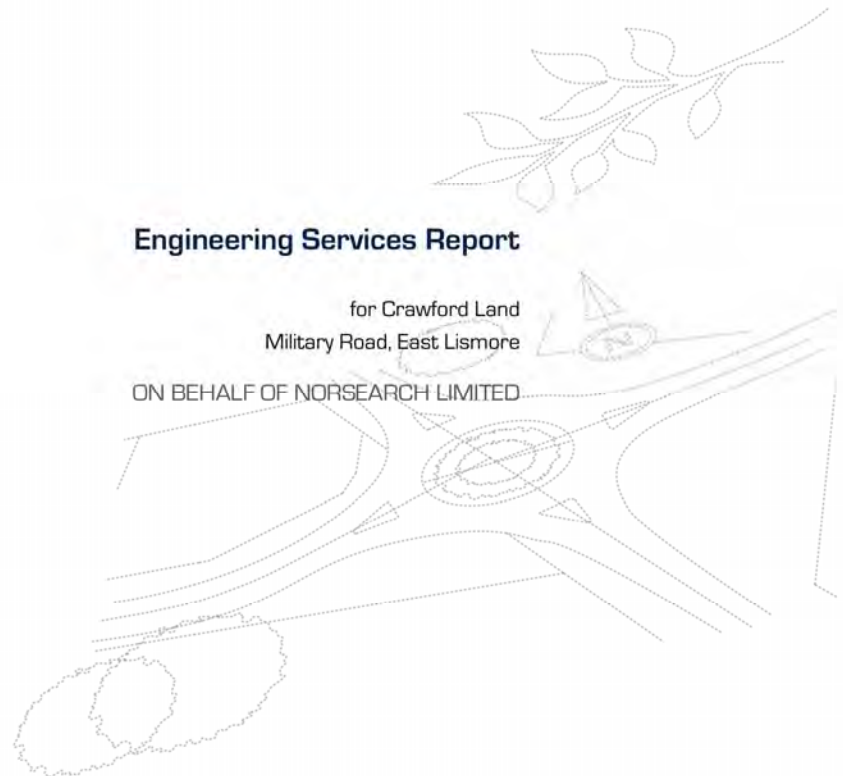


**ATTACHMENT 1**

**Engineering Services Discussion Paper  
Newton Denny Chapelle**

• JOHN NEWTON B. Surv; M.I.S. Aust. • TONY DENNY B. Surv; [Hons]; M.I.S. Aust. • DAMIAN CHAPELLE BTP. CPP.



### Engineering Services Report

for Crawford Land  
Military Road, East Lismore

ON BEHALF OF NORSEARCH LIMITED

Our Ref: 08/609

Date: August 2011



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## Crawford Land

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# Engineering Services Report Discussion Paper

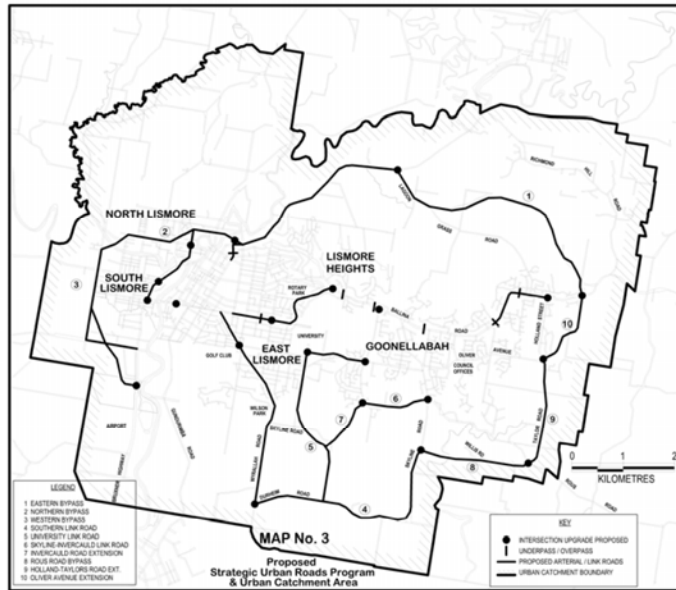
*This reports identifies the broader engineering design considerations for the urban development of the subject land for the purposes of residential housing and other similar urban mixed uses to accompany a Planning Proposal for the development lands.*

### **Introduction**

The development site is of nominal 74ha and is located adjoining existing urban infrastructure services of roads, sewer, water, electricity, and telecommunications to which extension of such services would be sought. Drainage paths are evident through the site but at present do not discharge to a designated stormwater management system, but rather meander to downstream drainage corridors via non defined flow paths. These flow paths cross the existing Military Road road reserve and cause nuisance inundation problems in the Wade Park locality, hence opportunities exist to improve this drainage situation. The development site is prone to flooding impacts from larger regional floods up to the Q100<sub>r</sub> ARI which are backwater impacts up to RL11.2m AHD. This effects the lower western portions of the site being nominally 19% (approx. 14ha) of the site area being flood liable lands.

### **Access and Transport Networks**

The development site is identified as having frontage to a strategic transport connection between the University and Skyline Road (refer to Map 3 - Link Number 5). This access serves as a feeder connection into the urban area of East Lismore and the traffic numbers modelled as using this link road connection via Skyline/Durheim Rd are a modest 1,348vpd. This traffic volume is consistent with local collector road volumes (ie less than 3,000vpd). The development layout would make provision for this north south connection by having the subdivision configuration incorporating a western permitter road that not only services the subdivision access to the local street network but provides this strategic connection sought by Council.



Extract – Lismore Contribution Plans 2004 - Transport

TTM Group has completed a transport generation assessment for the proposed development of the Crawford Land. The report covers traffic generated only by the residential use of the development and complete details are contained within the planning proposal attachments.

Based on the development model for the site, TTM has identified peak hour generated trips from the development will equate to 336 trips (am) and 395 trips (pm). Traffic generation based upon following table – allowed for 60% normal home lots and 40% duplex lots. The commercial precinct has some 2,000m<sup>2</sup> GFA with a further 40 shop top units.

Table C4 – Traffic Generation

Land Use	Peak Hour Trip Generation Rate	Unit	Internal Trips Reduction	Peak Hour Generated Trips	Authority
Single Family Homes (Detached Homes)	AM: 0.75 PM: 1.01 Trips Per Dwelling	132 Dwellings	0%	AM: 99.0 Trips PM: 133.3 Trips	ITE (2008)
Apartments (Duplexes)	AM: 0.51 PM: 0.62 Trips Per Unit	176 Units	0%	AM: 89.8 Trips PM: 109.1 Trips	ITE (2008)
Apartments (Shop Top Housing)	AM: 0.51 PM: 0.62 Trips Per Unit	40 Units	0%	AM: 20.4 Trips PM: 24.8 Trips	ITE (2008)
Dwelling Houses (Display Village)	AM: 0.75 PM: 1.01 Trips Per Dwelling	4 Dwellings	0%	AM: 3.0 Trips PM: 4.04 Trips	ITE (2008)
Mixed-Use Neighbourhood Commercial	2.5 Trips per 100 m <sup>2</sup> GFA	2000 m <sup>2</sup> GFA	50%	25 Trips	Assumed (based on ITE (2008) and RTA (2002) rates)
Soccer Complex (APSI)	20.67 Trips per Field	6 Fields 3 Half Fields 1 Futsal Court	50%	98.2 Trips	ITE (2008)
<b>Total Trips</b>				<b>AM: 336 Trips PM: 395 Trips</b>	

Potential impacts from the development have been assessed for each intersection using computer package *SIDRA Intersection 5.0*. The 3 intersections analysed for this report are:

- Military Road/Dalley Street
- Invercauld Road/Cynthia Wilson Drive
- Dalley Street/Wyrallah Road

Traffic splits assign approximately 33% [ie 74 trips] of morning outbound traffic heading east out to Invercauld/Ballina Road intersection. This is in the Year 2025 assuming the subdivision is fully developed.



Extract of Trip Assignments - *Transport Generation Assessment May 2011*

Based on the assessment by TTM, traffic generated by the residential portion of the development has a minor impact on the Invercauld Road/Cynthia Wilson Drive and Military Road/Dalley Street intersections, but the performance on these intersections remains acceptable. TTM has advised the practical absorption capacity of right turn movement, calculated from Austroads' formula, is vastly greater than the expected right turn movements. No ameliorative works would be required of these two intersections within the 10 year design horizon.

The Dalley Street right turn movement on the existing Wyrallah Road/Dalley Street intersection has its capacity exceeded by 2015, regardless of the site being developed. Council has existing plans for the intersection to be upgraded to a roundabout. The proposed roundabout upgrade has sufficient capacity to service the traffic generated by the development site during the 10 year design horizon, and hence no further ameliorative works would be required.

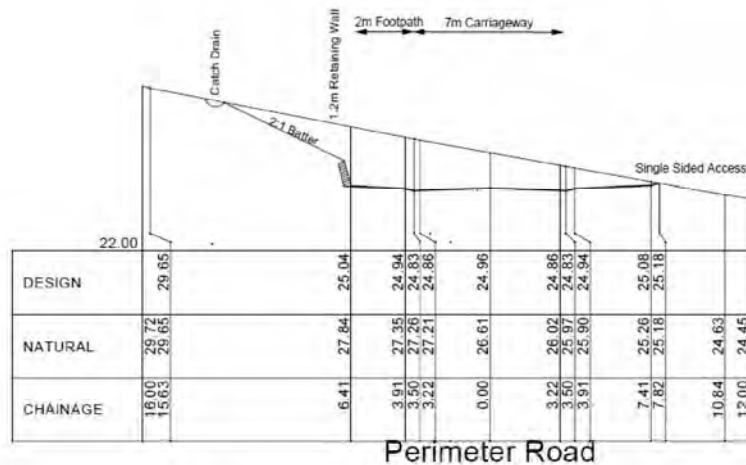
TTM report raises that the cost of the roundabout upgrade should be entirely borne by the Council due to the existing issue of capacity in the intersection. This is further confirmed by these intersection

works being listed within Lismore City Council's schedule of road works to which S94 contribution monies are being collected. The timing of the upgrade is currently uncertain, but it is likely that the upgrades will be performed well before any development on the site opens as ancillary works have already commenced in this location.

**Internal Development Road Configuration**

The anticipate road configuration will maximise the use of interconnection between access streets to improve general movement corridors and traffic flow within the development site residential precincts. This will result in the minimal use of culdesac's within the estate.

A key component in considering the development footprint of the land parcel is the hilly topography along the eastern portion of the site. To define the extent to which the land form permits an appropriate level of access, preliminary road design alignments and site survey levels have been undertaken. This early design work has relied upon compliance with the Northern Rivers Local Government Design Manual standards such that road longitudinal gradients of 1 in 6 and residential driveway access gradients of 1 in 4 are achievable. This design investigation was based upon there being limited residential or driveway access opportunities to the residual vegetated land along the ridgeline on the eastern boundary. To achieve these outcomes, retaining walls on the boundary of the perimeter road will be necessary in the steeper portions of the site, thereby providing a good driveway access standard to lots within the residential precinct footprint of the development. Refer to *Sketch A - Cross Section For Access on Eastern Perimeter* of the site that depicts the design solution for access concerns in the steeper locations upon the land.



*Sketch A - Access on Eastern Perimeter (Road N)*

The internal road hierarchy would readily be able to comply with the requirements of the Northern Rivers Local Government Design and



Development Manuals with a mix of access streets (nominal 100vpd capacity), local streets (nominal 2,000vpd capacity) and with a collector road forming a strategic link from Skyline Road to Dalley Street as per Council's road network planning requirements. Details of the road hierarchy configuration that could service the site is shown on the following Road Hierarchy Plan.

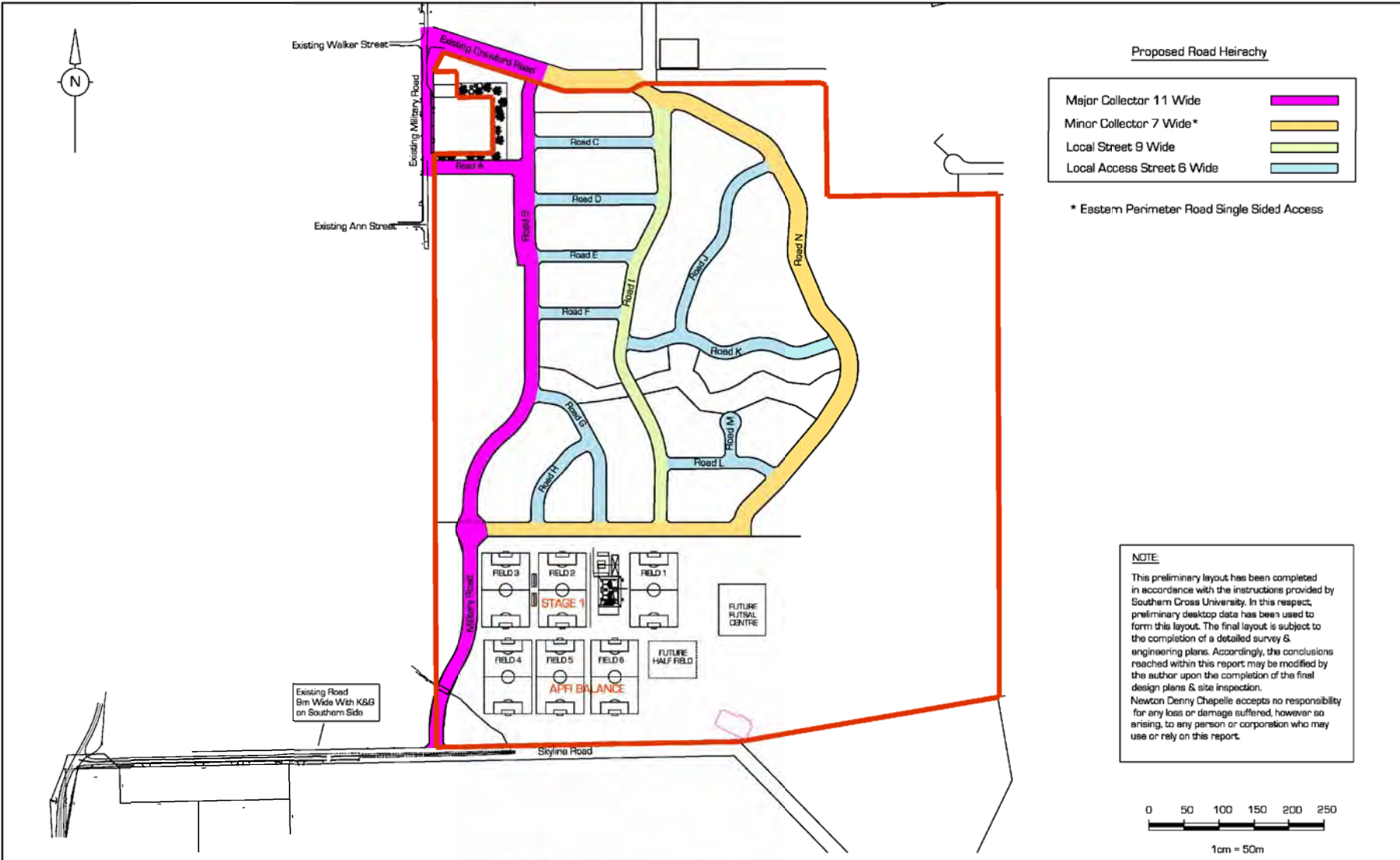
#### **Stormwater Quality and Quantity**

The land parcels for the site total some 74ha to which provision is able to be made for incorporation of stormwater controls in the following manner:

- (a) Dwellings and mixed use developments to incorporate water reuse (rainwater tanks) where possible to reduce quantity of runoff.
- (b) Provision of swales along the western collector road (that will run in a north to south direction) to which opportunity for over 500 linear metres (0.5ha) is available.
- (c) Stabilisation of the steeper major gully flow paths that run east to west that will lessen impacts of urbanisation from the existing external upstream residential areas. Some 550 linear metres (0.55ha) of stabilisation/rehabilitation would be anticipated.
- (d) Sufficient space exists for a 1.2ha stormwater treatment area (at the south end of the lands) to enhance the removal of pollutants from the proposed urban stormwater runoff generated by the development site prior to discharge to Monaltrie Creek drainage channel.
- (e) It is noted that open space/vegetation areas of the development which do not contribute pollutant loads represent approximately 32% of site.

The Healthy Waterways publication "*Water Sensitive Urban Design - Technical Design Guidelines for South East Queensland 2006*" provides guidance as to the amount of area required to achieve an effective stormwater treatment outcome, nominates [refer *Figure 5.5 Bio-retention Basins*] between 3% to 4% of the urban catchment area is required as a treatment area. With the 68% (say 70%) of the site to be developed, the nominal treatment areas needing to be available amount to  $70\% \times 74\text{ha} \times 4\% = 2.1\text{ha}$ . Concept layout plans have an allowance for 2.25ha for specific treatment uses. Refer to details as shown on the following Stormwater Servicing Plan.

It has been raised during public meetings that the stormwater flows currently discharging from the site in a westerly direction, make their way across and down Military Road that then impacts upon the lower lands at Wade Park. Opportunities exist within the development of the Crawford lands to formalise the drainage flow paths for those catchment areas that currently discharge to Military Road to be diverted in a more southerly direction so as to improve local inundation issues at Wade Park. This re-direction is able to be jointly served by the use of open swales as proposed adjacent to the western collector road that performs the link between Skyline Road with Dalley Street.

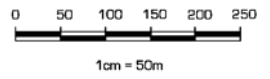


**Proposed Road Hierarchy**

- Major Collector 11 Wide
- Minor Collector 7 Wide\*
- Local Street 9 Wide
- Local Access Street 6 Wide

\* Eastern Perimeter Road Single Sided Access

**NOTE:**  
 This preliminary layout has been completed in accordance with the instructions provided by Southern Cross University. In this respect, preliminary desktop data has been used to form this layout. The final layout is subject to the completion of a detailed survey & engineering plans. Accordingly, the conclusions reached within this report may be modified by the author upon the completion of the final design plans & site inspection. Newton Denny Chapelle accepts no responsibility for any loss or damage suffered, however so arising, to any person or corporation who may use or rely on this report.



<b>Client :</b> SOUTHERN CROSS UNIVERSITY
<b>Location :</b> CRAWFORD ROAD EAST LISMORE

Amendments :	
Date	Changes

**NDC**  
**Newton Denny Chapelle**  
 Surveyors Planners Engineers

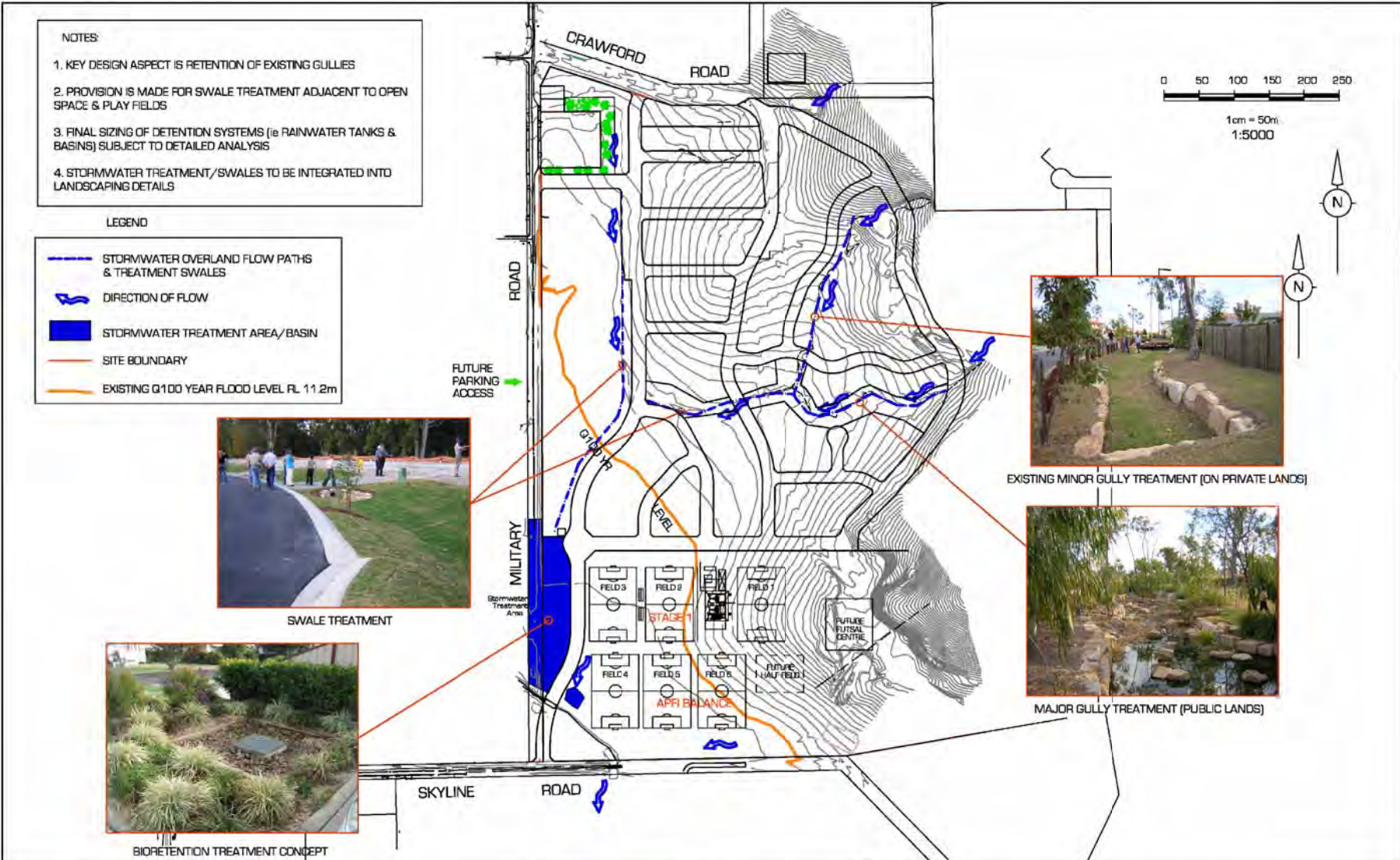
Email: [office@newtondennychapelle.com.au](mailto:office@newtondennychapelle.com.au)  
 Lismore Casino  
 31 Carrington St, Lismore 2480 100 Barker St, Casino 2470  
 T: 9822 1011 F: 9822 4088 T & F: 6562 5000

**ROAD HIERARCHY PLAN**

Drawn: BRP

Date: 03.08.11      Scale 1:5000 @ A3      Ref No. 08/609





Client : SOUTHERN CROSS UNIVERSITY	Amendments :		 <b>Newton Denny Chapelle</b> Surveyors Planners Engineers Email: office@newtandennychapelle.com.au Lismore Casino 31 Carrington St, Lismore 2480 100 Barber St, Casino P470 T: 9822 1011 F: 9822 4088 T & F: 6562 5000	<b>STORMWATER SERVICING PLAN</b> Drawn: BRP
	Date	Changes		
Location :	E			
MILITARY ROAD	C			
EAST LISMORE	D			
	E			
	F			

### Flooding

The 'Crawford' lands are identified as 'flood liable' and as per the '*Lismore Flood Plain Management Advice to Council*' prepared by the Public Works Department (PWD) of NSW, March 1983.

Council prepared the '*Lismore Floodplain Management Plan (Oct. 2002)*'. The *Lismore Floodplain Management Plan* (LFMP) was prepared using modelling by Patterson Britton & Partners in 2001 to define floodways and areas of differing flood hazard. From this flood modelling it is determined that a nominal flood level of RL11.2m AHD is applicable to the land, subject to more specific detailed assessment. Newton Denny Chapelle area calculation of the site likely to be affected upon the site was that 14ha is flood liable land.

Further detailed modelling assessment was undertaken in April 2011 by Worley Parsons whom undertook a regional flood impact review for both the 10yr and 100yr ARI. The findings from this assessment were that as the site is affected by flooding in a backwater manner, the main impact upon flood levels would be resulting loss in storage by filling of flood prone lands. This lead to the conclusion that subsequent filling of the site would result in less than a 0.1% impact upon flood storage and as such a negligible impact on the regional flood levels, both in the vicinity of the site and throughout the floodplain would occur.

Details of the Worley Parsons *Crawford Site Flood Impact Assessment (April 2011)* is contained within the Planning Proposal attachments.

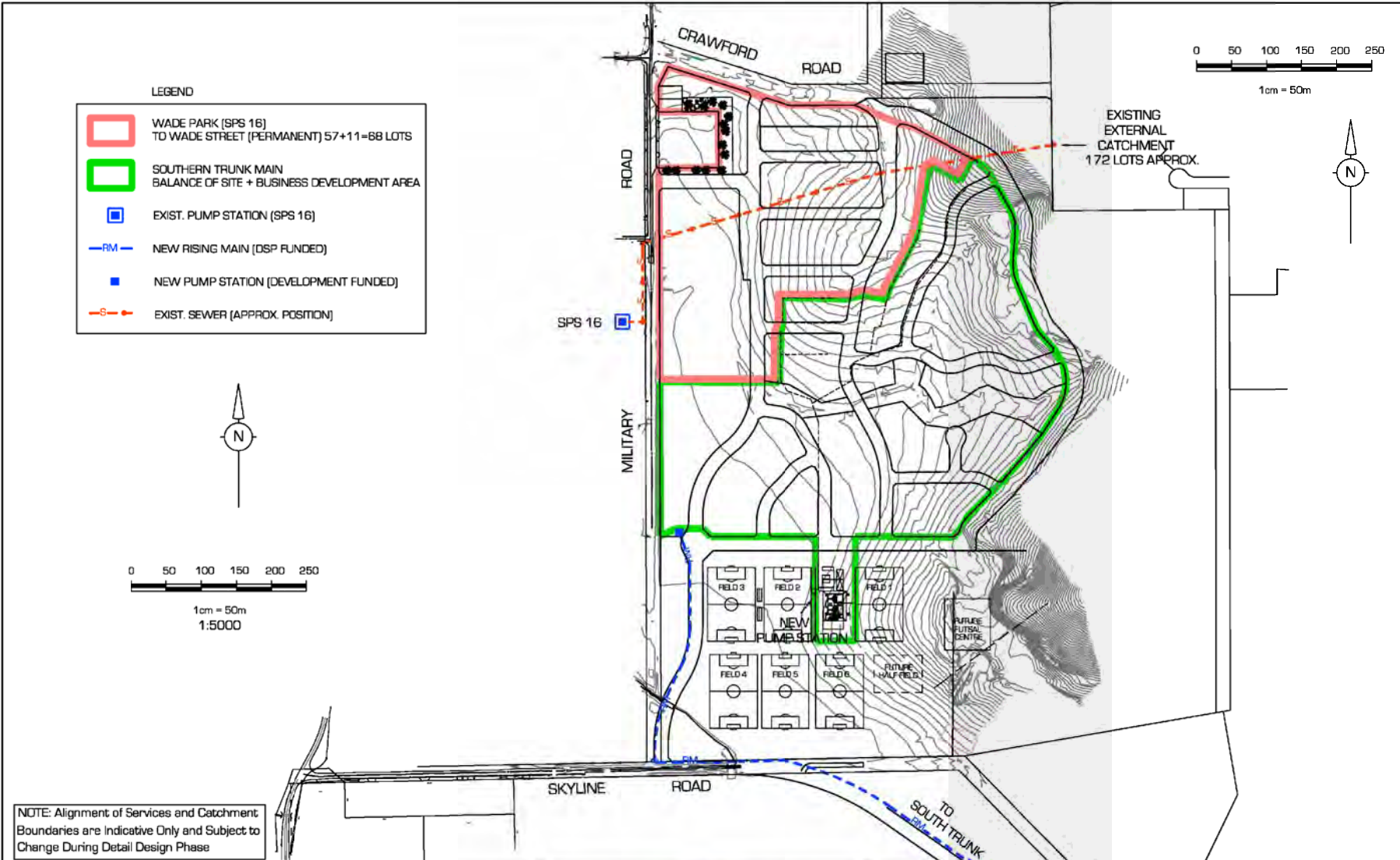
### Sewage Services

The proposed Crawford Land subdivision and development on the eastern side of Military Road is located in close proximity to Council's existing Sewage Pump Station No. 16 (SPS 16) which is on the western side of Military Road at Wade Park. A small part of the proposed development, located on the north-western portion of the site, is able to connect to this pump station by a gravity sewer connection. This portion of the site is anticipated to create a demand for 68 lots. Given the availability of sewer at the northern portion of the site, stage release of residential lands would be anticipated to be in a north to south manner subject to further detailed design investigations.

The majority of the site will drain to the south and will be served by a new pump station to be constructed to serve this development (Crawford pump station). The new Crawford pump station will be located near the southern boundary of the development. Refer to details as shown on the following Sewer Servicing Strategy plan.

Given the close proximity of the development to the existing SPS 16, the normal preferred option would be for the new Crawford pump station to pump to SPS 16. Furthermore, following construction of the Southern Trunk Main (STM) and the diversion of load from the





**Client :** SOUTHERN CROSS UNIVERSITY

**Location :**  
MILITARY ROAD  
EAST LISMORE

**Amendments :**

Date	Changes
B	
C	
D	
E	
F	

**NCS**  
**Newton Denny Chapelle**  
Surveyors Planners Engineers

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**SEWER SERVICING PLAN**

Drawn: BRP

Date: 03.08.11 Scale: 1:5000 @ A3 Ref No. 08/609

existing Goonellabah sewerage system to the STM, SPS 16 will have reserve capacity to cater for this additional load.

However, in order to meet longer term strategic objectives, it is necessary to require that the Crawford pump station pump to a connection point with the STM. This decision forms part of Council's overall strategy for the servicing of new urban land releases in the vicinity of Goonellabah, whereby the reserve capacity in the Northern Trunk Main and SPS 16 created by diversion of load to the STM is to be held in reserve to allow servicing of future urban releases located to the north of Goonellabah (ie. Trinity, Pineapple Road and Lagoons Grass urban release areas).

Given that the Crawford pump station only serves land within the subject development site, the developer would normally be responsible for the full cost of constructing this pump station and the associated rising main.

However, given the circumstances of this case, Council is requiring that the Crawford pump station connect with the STM rather than the nearer SPS 16. This leads to a significant increase in the cost of providing this infrastructure and this cost is being incurred in order to facilitate other future development to the north. Consequently, it can be construed that construction of the Crawford pump station and rising main does benefit other development. Therefore, some sharing of the costs of this pump station and rising main is warranted.

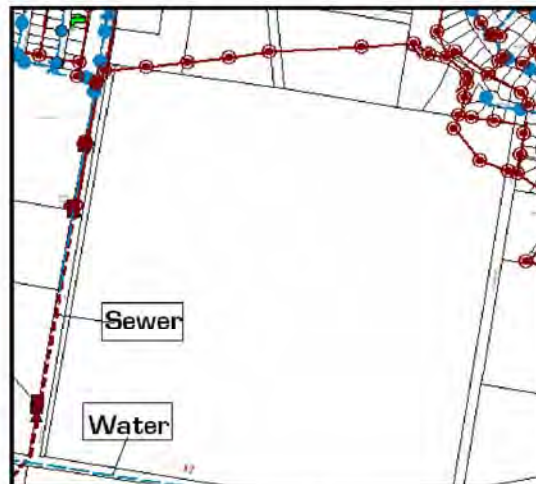
Cost sharing could be achieved through a variety of means. However, following negotiations, Norsearch Ltd has committed to funding the construction of the Crawford pump station, subject to Council committing to the construction of the associated rising main. Council has resolved to construct the Crawford rising main with construction not be required until 2013/14 or later. This agreement will need to be formalised through a Planning Agreement advertised concurrently with any future Development Application.

#### **Water Services**

The proposed development is able to be connected to existing potable reticulation that exists within Military Road subject to augmentation works to the water network to increase flow rate/pressure. Details of the surrounding network is shown in Sketch B - GIS Water and Sewer Mapping. Preliminary investigation by Lismore City Council technical officers have advised that future modelling of the water main network will be required during the detailed design phase of the project to identify the most cost effective way of augmenting the existing water network and the timing of when these works would need to be undertaken.

The scope of these augmentation works raised by Lismore City Council were associated with installation of an additional water main connection in the vicinity of Cynthia Wilson Drive. This connection would be a cross connection to an alternative pressure main feed (ie alternative reservoir supply) that could provide improved flows.

Depending upon the modelling outcomes, installation of pressure reducing valves and their location are also likely to be required.



**Sketch B: GIS Water & Sewer Mapping**  
(Source [www.lismore.nsw.gov.au](http://www.lismore.nsw.gov.au) 17 March 2009)

#### **Pedestrian and Public Transport**

The proposed development is able to incorporate a high degree of pedestrian accessibility via the use of pathway and shared cycleways within the estate. Details of likely services able to be provided are shown on the following Pathway and Public Transport Network plan.

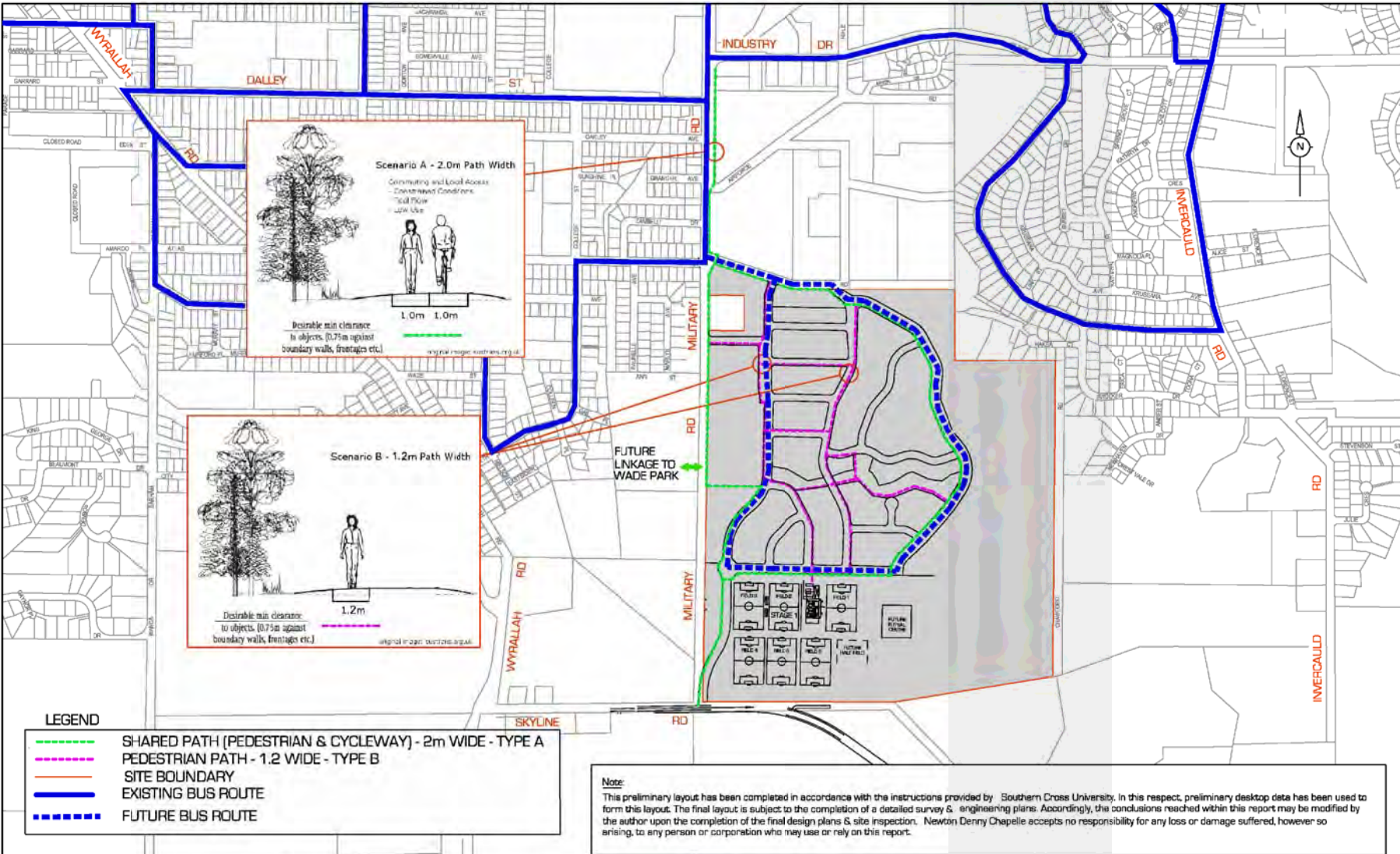
Upwards of 11 existing bus services are available along Dalley Street and Military Road via Route 681 and 682 by Northern Rivers Buslines. These services could readily be extended to within the Crawford lands given the road configuration advocated (ie limited use of culdesac's) for the proposal, which enables a bus circuit or loop to be incorporated within the road network.

With Wade Park and Thistles Soccer Club adjacent to the development site, which are likely to have attraction to residents of the development, consideration of pedestrian linkage to these facilities has been had and pathways were subsequently shown in this vicinity.


#### **Bulk Earthworks**

The proposed development is seeking to have a range of allotment sizes whereby the smaller lots (ie 400m<sup>2</sup>) would be best served by having access to flat lands. As the site has a range of topography slopes, the larger lots are proposed on the more steeper lands (up to 15%) and the smaller lots on the relatively flatter lands on the north-western portion of the site. These smaller lots will be created by having their earthworks building platforms created in conjunction with the site civil works for roads/drainage. These earthworks





Client : SOUTHERN CROSS UNIVERSITY	Amendments :	
Location :	Date	Changes
MILITARY ROAD	E	
EAST LISMORE	C	
	D	
	E	
	F	

  
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**PATHWAY & PUBLIC TRANSPORT NETWORK**  
 Date: 03.08.11  
 Ref No. 08/609  
 Drawn: BRP

platforms would need to be integrated with the provision (or consideration) of vehicular access, site runoff management and relative surface level interactions to both side and rear neighbouring lands. Subject to detailed design, it is anticipated that to achieve the optimal design solution, use of retain walls to nominal 1.2m heights would be expected resulting in a change in the landform of the site in these precincts.

Other areas where significant earthworks would occur would be in the lower portions of the site associated with filling for flood control compliance. Fill depths would nominally range from 0.5m to 2.5m. The perimeter road (Road N) along the eastern edge of the residential areas would require the use of retaining walls to minimise length of cut batters, particularly on the eastern batter which intersects with the existing ridgeline. Preliminary design investigations anticipate cut depths of 4m to 5m would be necessary to enable perimeter road compliance with longitudinal design gradients specified within the Northern Rivers Local Government Design and Development Manual. Our review of Lismore City Council mapping documents identify portions of the site as being hilly but not affected by significant geotechnical constraints, however a detailed assessment of slope stability would be undertaken during the development phase once design matters are further refined and the extent of works are known with greater certainty.

#### Summary

The proposed development is able to be satisfactorily serviced by engineering infrastructure such that:

- (a) Residential lands are able to be created above the Q100yr ARI flood level of RL11.2m without unduly impacting upon others,
- (b) Sewer and water servicing can be provided in a logical and conventional manner,
- (c) Stormwater management for the development can be controlled and treated in a manner as to improve local drainage amenity concerns,
- (d) Traffic impacts are able to be effectively managed and the broader strategic network considerations of Lismore City Council can be incorporated within the proposal,