Delfin Lend Lease

Cardno Shaping the Future

Calderwood Urban Development Project

Utility Services Study for Concept Application

Project Number: 110026-08/Report 001 Rev 1
Prepared for Delfin Lend Lease
February 2010

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Executive Summary

The Calderwood Urban Development Project (CUDP) is a master-planned community development by Delfin Lend Lease (DLL). It comprises a mix of residential, employment, retail, education, conservation and open space uses. The development proposes 4,800 dwellings and 50 hectares of retail, education, community and mixed use / employment land. The overall development will accommodate about 12,400 people by 2036.

This Utility Services Study has been prepared by Cardno to accompany a Concept Plan Application under Part 3A of the Environmental Planning & Assessment Act, 1979 (EP&A Act) and a proposal for State significant site listing under Schedule 3 of State Environmental Planning Policy Major Development 2005 (SEPP Major Development) in relation to the CUDP.

Calderwood Valley is situated on the border of the Shellharbour and Wollongong City Local Government areas and is characterised by existing properties that are used for semi-rural activities. Reticulated services are not currently provided given the low population base of the area. Water and sewer services are however provided to the neighbouring residential suburbs of Albion Park, Albion Park Rail and Yallah. Moreover, electrical and telecommunications services are provided throughout the area but these services are aging and, in the case of telecommunications, have become outdated in recent years. Telstra is currently upgrading its services to existing developments in the area.

This Utility Services Study has found that the existing water, sewer and electricity reticulated services have spare capacity to accommodate about 500 lots. This will provide an effective start to the project and bring residential lots to market.

As the development proceeds, further upgrades will be necessary to the existing services to meet the needs of the development. These have been designed as an intrinsic part of the CUDP masterplan (i.e. in a holistic manner) and will be delivered by a single developer-led solution as follows:

- *Sewer and water infrastructure will be established by a permanent connection to the proposed Marshall Mount water reservoir, for which Sydney Water already owns the site, and augmentation of the existing sewer system and modifications to the Shellharbour STP. This is consistent with Sydney Water's Growth Services Plan.*
- *Electrical reticulation will be met by construction of a new Zone Substation in the Calderwood Valley (for which a site has already been identified for transfer to Integral Energy), reticulating power throughout the site in underground cables.*
- *Telecommunication services will be provided by the placement of a Main Distribution Frame within the development site, which will distribute telecommunication services throughout the proposed development. Moreover, service providers have confirmed delivery of Fibre to the Home/Premise.*
- *Natural Gas services will be available through the local natural gas network provider.*

Delfin Lend Lease is committed to the development of alternative technologies in its communities. The issues of carbon emissions and renewable energy targets are increasingly relevant to new urban developments. DLL sees potential for both solar farms and co (or tri) generation as part of the CUDP, particularly for the town centre and employment precinct. Such opportunities will continue to be considered throughout the project.

Whilst the timing of the release of land at West Dapto and Calderwood is likely to overlap, both developments have different servicing provisions and therefore do not significantly affect each other. West Dapto is likely to be serviced with both reticulated water and sewer from the existing trunk infrastructure in the north. Similarly, a new zone substation is required in the north, probably on land central to the load in stages 1 and 2.

Calderwood on the other hand, is some 10km from the initial confirmed stages of West Dapto and will be serviced by an entirely different servicing strategy as summarised above. Calderwood can be developed independently of the WDRA and therefore will not affect the provision of infrastructure for West Dapto.

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List of Abbreviations

Acronym	Meaning
ADSL	Asymmetric Digital Subscriber Line
AHD	Australian Height Datum
BASIX	Building and Sustainability Index
BSP	Bulk Supply Point (electrical)
CUDP	Calderwood Urban Development Project
CBD	Central Business District
CDMA	Code Division Multiple Access
CMUX	Customer Access Multiplexer Unit
DIESMP	Draft Illawarra Escarpment Strategic Plan of Management
DLL	Delfin Lend Lease
EIS	Environmental Impact Statement
FPMM	Flood Plain Management Manual
GSM	Global System for Mobile Communications
GSP	Growth Services Plan
HV	High Voltage
Kbps	Kilobytes per second
kV	Kilovolt
LGA	Local Government Area
IE	Integral Energy
ISDN	Integrated Service Digital Network
Mbps	Megabytes per second
MDF	Main Distribution Frame
MDP	Metropolitan Development Programme
ML	Mega Litre
MUDP	Metropolitan Urban Development Programme
MVA	Mega Volt Amps
SCC	Shellharbour City Council
SCAD	Small Capacity Distribution System
SEE	Statement of Environmental Effects
SPS	Sewer Pumping Station
STP	Sewage Treatment Plant
SWC	Sydney Water Corporation
TS	Transmission Substation
UDP	Urban Development Programme
ZS	Zone Substation
WCC	Wollongong City Council

1 Introduction

1.1 Background

This Utility Services Study has been prepared by Cardno to accompany a Concept Plan Application under Part 3A of the *Environmental Planning & Assessment Act, 1979* (EP&A Act) and a proposal for State significant site listing under Schedule 3 of *State Environmental Planning Policy Major Development 2005* (SEPP Major Development) in relation to the Calderwood Urban Development Project.

The Calderwood Urban Development Project (CUDP) is a master-planned community development by Delfin Lend Lease (DLL).

The CUDP proposes a mix of residential, employment, retail, education, conservation and open space uses. The development proposes 4,800 dwellings and 50 hectares of retail, education, community and mixed use / employment land. The overall development will accommodate about 12,400 people and will deliver $2.9 billion in development expenditure and create 8,000 full time equivalent jobs by 2031.

The Calderwood Urban Development Project site is located within the Calderwood Valley in the Illawarra Region. It is approximately 706 hectares in area with approximately 600 hectares of land in the Shellharbour LGA and the balance located within the Wollongong LGA.

The Calderwood Valley is bounded to the north by Marshall Mount Creek (which forms the boundary between the Shellharbour and Wollongong LGAs), to the east by the Macquarie Rivulet, to the south by Johnstons Spur and to the west by the Illawarra Escarpment. Beyond Johnstons Spur to the south is the adjoining Macquarie Rivulet Valley within the suburb of North Macquarie. The Calderwood Urban Development Project land extends south from the Calderwood Valley to the Illawarra Highway. Refer to Location Plan at **Figure 1**.

The Calderwood Valley has long been recognised as a location for future urban development, firstly in the Illawarra Urban and Metropolitan Development Programmes and more recently in the Illawarra Regional Strategy (IRS).

The IRS nominates Calderwood as an alternate release area if demand for additional housing supply arises because of growth beyond projections of the Strategy, or if regional lot supply is lower than expected.

In 2008, the former Growth Centres Commission reviewed the proposed West Dapto Release Area (WDRA) draft planning documents. The GCC concluded that forecast housing land supply in the IRS cannot be delivered as expected due to implementation difficulties with the WDRA, and the significantly lower than anticipated supply of housing land to market in the Illawarra Region is now been recognised as a reality.

The GCC Review of the WDRA also recognised that there is merit in the early release of Calderwood in terms of creating a higher dwelling production rate and meeting State government policy to release as much land to the market as quickly as possible. Given the demonstrated shortfall in land supply in the Illawarra Region and the WDRA implementation difficulties highlighted in the GCC Report, the release of Calderwood for urban development now conforms to its strategic role under the IRS as a source of supply triggered by on-going delays in regional lot supply. The Calderwood Urban Development Project can deliver about 12% of the IRS' new dwelling target.

Changes in outlook arising from global, national and regional factors influencing investment and delivery certainty, housing supply and affordability and employment and economic development also add to the case for immediate commencement of the Calderwood Project.

In April 2008, the Minister for Planning issued terms of reference for the preparation of a Justification Report to address the implications of initiating the rezoning of Calderwood for urban development including associated staging, timing and infrastructure considerations.

In February 2009, the Minister for Planning considered a Preliminary Assessment Report for the Calderwood Urban Development Project that provided justification for the planning, assessment and delivery of the project to occur under Part 3A of the EP&A Act, having regard to the demonstrated contribution that the project will have to achieving State and regional planning objectives.

Subsequently, on the 16 April 2009, pursuant to Clause 6 of SEPP Major Development, the Minister for Planning formed the opinion that the Calderwood Urban Development Project constitutes a Major Project to be assessed and determined under Part 3A of the EP&A Act, and also authorised the submission of a Concept Plan for the site. In doing so, the Minister also formed the opinion that a State significant site (SSS) study be undertaken to determine whether to list the site as a State Significant site in Schedule 3 of SEPP Major Development.

The Part 3A process under the EP&A Act allows the Calderwood Urban Development Project to be planned, assessed and delivered in a holistic manner, with a uniform set of planning provisions and determination by a single consent authority. Given the scale of the proposal, the Concept Plan and SSS listing provide the opportunity to identify and resolve key issues such as land use and urban form, development staging, infrastructure delivery and environmental management in an integrated and timely manner.

This study has been prepared to fulfil the Environmental Assessment Requirements issued by the Director General for the inclusion of the Calderwood site as a State Significant Site under SEPP Major Development, and for a Concept Plan approval for the development. Specifically, this study addresses the following requirements:

- Utilities and Infrastructure
- Subdivision Works.

In accordance with the Director General's Requirements, this study has been prepared following consultation with the following agencies:

- Integral Energy
- Telstra
- Jemena
- Sydney Water Corporation
- Roads and Traffic Authority
- Department of Planning
- Shellharbour City Council.

1.2 Director General's Requirements

Director General's Requirements (DGRs) were issued by the NSW Department of Planning. DGRs that relate to Engineering Infrastructure and Utility Services are shown in **Table 1.1**.

Table 1.1 – Director General's Requirements

Director General Requirement	Section of this Report where this is addressed
2. DGRs Reference **Concept Application - Key Assessment Requirements**	
Strategic Planning • Demonstrate that the site can be serviced independently of the West Dapto release area, and therefore will not significantly impact upon the provision of infrastructure for West Dapto.	Sections 3 and 4
Utilities infrastructure • Prepare a utility and infrastructure servicing strategy detailing supply of water, sewerage, stormwater, gas, electricity and telephone services	Sections 3 and 4
• Consideration should be given to technologies which may reduce the demand or need for servicing or provide for the supply of sustainable services	Section 4
Planning Agreements and/or Developer Contributions • It should address demand, proposed services, local and regional services and cross boundary/LGA issues.	Section 4
Consultation Requirements • An appropriate level of consultation with the relevant Local or State government authorities, service providers, and other stakeholders. In particular: o Wollongong City Council o Shellharbour City Council o All relevant utility providers	**Annexure A**

1.3 Overall Approach & Study Objectives

The adjoining suburb of Albion Park is fully serviced with sewerage, potable water, telecommunications, electricity and gas. Through the DLL landholding, Calderwood has direct access to sewerage, telecommunications and gas, and is strategically located close to all other utility services.

Notwithstanding the above, existing infrastructure, services and facilities are clearly not adequate to support the development of the CUDP and a comprehensive range of infrastructure and services will be required. As a result, DLL and Cardno have undertaken thorough investigations of how the area can be serviced and together with their combined experience from other release areas have identified the required utility services. Importantly, these services have been designed as an intrinsic part of the CUDP masterplan (i.e. in a holistic manner) and will be delivered by a single developer-led solution:

DLL has established the following objectives in developing this Utility Services Strategy:

- *To demonstrate a viable implementation strategy with timely provision of facilities and services*
- *To control land required for infrastructure delivery*

- *To leverage ready access to existing infrastructure, provision of structural enhancements to the Regional infrastructure base and synergies with other Release Areas*
- *To minimise implementation risk and cost to Government*
- *To utilise DLL delivery experience and skill base to ensure innovation and flexibility in design and use of facilities and*
- *To enhance existing services and contribute to a wider regional network of community resources.*

The need for new services and infrastructure presents an opportunity:

- To provide infrastructure and high quality new facilities based on leading practice sustainability principles that are tailored to the needs of the future community;
- To deliver sustainable infrastructure solutions such as recycled water, Fibre to the Home/Premise (FttP/FttH) and sustainable funding, management and maintenance arrangements and
- To guide the provision of integrated service delivery, efficient use of resources and equitable access through shared or co-located facilities, joint use arrangements and convenient locations.

1.4 Scope of this Report

Mindful of the above objectives, this report investigates the availability of existing and proposed services for the CUDP based on:

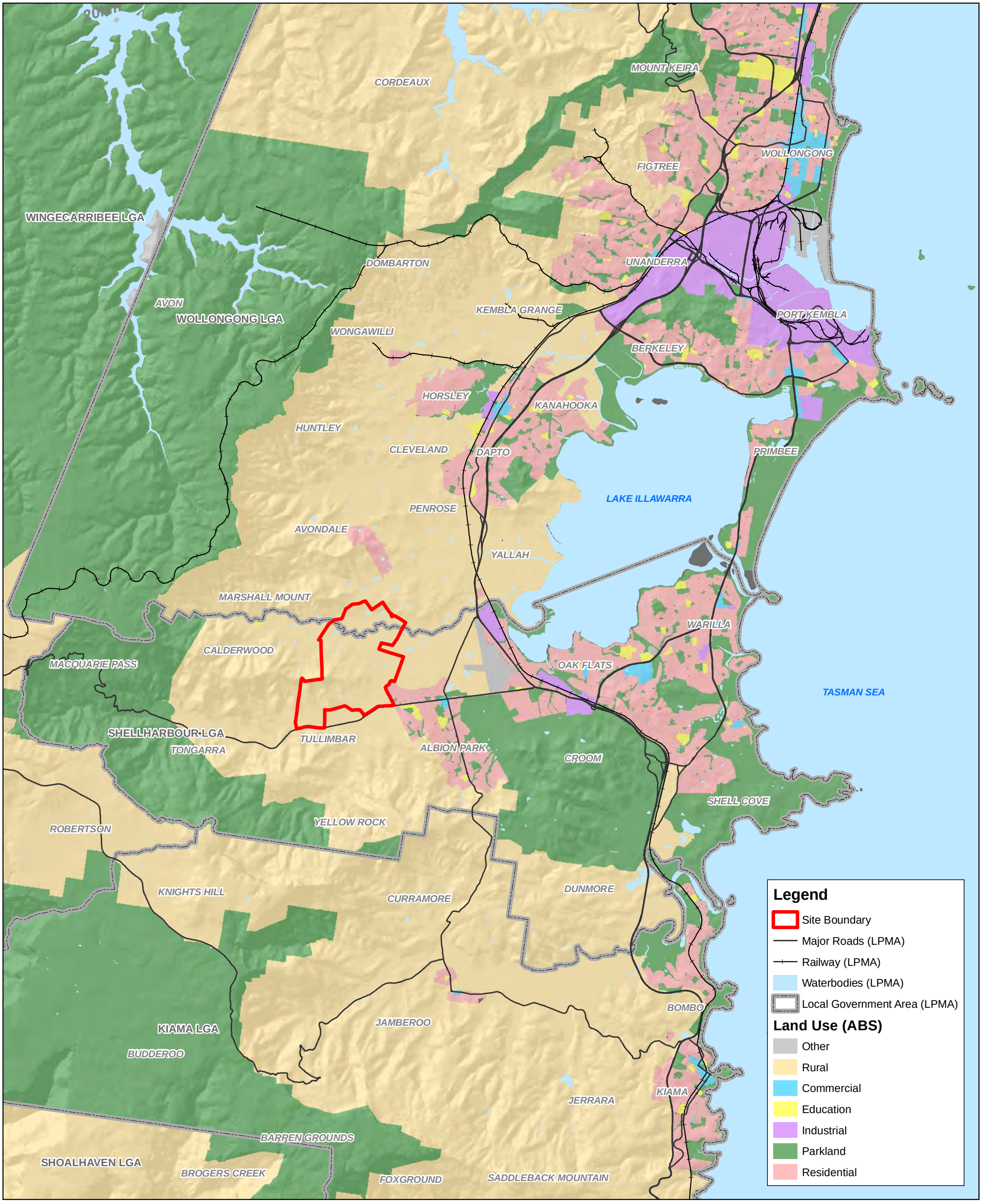
- A review of the existing services within the study area
- A review of planned upgrades of existing services of the study area through consultation with service utilities
- Discussions with service authorities and Shellharbour City Council regarding existing services and service provisioning for the CUDP.

1.5 Structure of this Report

This report is organised as follows:

- **Section 2** describes the objectives, methodology and results of the consultation programme.
- **Section 3 -** provides detail on each of the existing services within the Calderwood Valley and surrounding areas and, where relevant, describes interconnection with services beyond the Wollongong area
- **Section 4** - describes the manner in which the CUDP will be provided with utility services and major road infrastructure
- **Section 5** – demonstrates, in a strategic planning sense, how the site can be serviced and those serviced delivered independently of the WDRA, and therefore how it will not significantly impact upon the provision of infrastructure for West Dapto and
- **Section 6** provides recommendations and conclusions

A list of figures is included at the front of this report. Where necessary, additional supporting information is included as **Annexure** at the end of this report.



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N W E S

Scale 1:100,000 (at A3)

Metres

0 1000 2000 3000 4000 5000

Location Plan

FIGURE 1

CALDERWOOD URBAN DEVELOPMENT PROJECT

Cardno

Map Produced by Cardno Wollongong
Date: 15 February 2010
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 110026-01_18022_LocationPlan.mxd 06

2 Consultation

2.1 Objectives

The consultation undertaken for this project has been carried out in accordance with the following objectives. Details of the consultation are included as **Annexure A** of this report.

1. *To identify key stakeholders in relation to the CUDP project*
2. *To provide key stakeholders an understanding of the entire project and information suitable to their area of expertise or interest*
3. *To provide key stakeholders with an opportunity to provide suitable comments on the proposed CUDP at an early stage so that they can be considered in the infrastructure and servicing strategies for the concept design and development application process*

In accordance with the DGRs, the following service providers were consulted as part of this Utility Services Study.

2.2 Integral Energy

DLL has maintained a consistent and extensive dialogue with Integral Energy as part of the CUDP since the project's inception back in 2003. Most recently, the company met with Integral during September 2009 to confirm a number of arrangements before preparing the EA documentation.

The priority for Integral is to establish early supply of electricity to the site and for the longer term a location for a 132/11kV zone substation and subsequent connections. This zone substation should be located central to the load of the CUDP and an initial location off Calderwood Road was discussed. It was noted that the zone substation land would be transferred to Integral in a similar manner to DLL's St Marys project.

Integral advised that its preference would be for transmission conductors to be typically located overhead, but underground can be negotiated with developers based on funding contribution. It was also noted that telecommunications facilities might require buffer from zone substation site.

2.3 Communications (Telstra and Open Networks)

Representatives of DLL and Cardno met Telstra in early November 2009 to confirm a number of arrangements regarding telephone/communications supply to the site. Telstra confirmed that it is working on a 5-year foreword works forecast at present for standard (landline) service delivery, which will include the CUDP project. In terms of mobile coverage, early releases can be serviced but later stages will need augmentation.

Telstra will investigate pit, duct, and fibre capacity with Telstra planners and convene further meetings with DLL if necessary. Telstra advised that the National Broadband Network (NBN) will require an open access network and compulsory fibre to the premises (FTTP) from 1 July 2010. Telstra supports the open access network but is awaiting government definition (eg access to a MB rate, spare fibre capacity, spare duct capacity).

More recently, representatives of DLL and Cardno met Open Networks an "open access" wholesale telecommunications carrier who confirmed that FTTP can be made available to residents at Calderwood via Nextgen Networks or Optus Wholesale.

2.4 Jemena

Representatives of DLL and Cardno met Jemena during September 2009 to confirm a number of arrangements regarding natural gas supply to the site. Jemena advised that it is currently investigating upgrades to the system at present, which will most likely involve 'black boxes' to increase pressure in existing system rather than a off-take station at the Eastern Gas Pipeline.

Jemena advised that they would look at providing early capacity of natural gas to Stage 1 then at broader use in the CUDP and finally the balance of the release area. Jemena expects that natural gas will be available to the site once design investigations are finalised.

A number of other matters were discussed including the potential for negotiations regarding gas for cogeneration plants. This will be further explored with Jemena once the project has gained approval.

2.5 Sydney Water

DLL has also maintained a consistent and extensive dialogue with Sydney Water as part of the CUDP since the project's inception back in 2003. Most recently, the company met with SWC during October 2009 to confirm a number of arrangements before preparing this EA documentation.

In that meeting, SWC reiterated previous advice that the site could be serviced with potable water currently residing in the surplus capacity in the Sophia Street watermain in Albion Park. In the medium term, the development would be serviced with a possible extension of the Southern Towns Trunk Main, which runs along Marshall Mt Road to the proposed Mt Marshall reservoir (a site already owned by Sydney Water).

In terms of sewerage, the site would be serviced by the Albion Park Low Level Carrier Main followed by off-site upgrades to the Shellharbour System. DLL advised that, consistent with the Sydney Water Area Strategy for Illawarra release areas, recycled water was no longer proposed and in its place DLL would develop a strategy focussing on domestic rainwater tanks proposed for BASIX and local stormwater harvesting proposed for public space irrigation.

Sydney Water confirmed a range of matters at the meeting including the availability of water and sewerage infrastructure available to accommodate initial stages of Project development. SWC also confirmed the abolition of Developer Services Plan (DSP) charges with SWC now being responsible for the funding of trunk infrastructure consistent with the MDP.

In terms of the approval process, SWC advised that its approval regime would be obtained as part of the Part 3A process to provide more up front certainty regarding servicing and to allow SWC to respond faster to urban growth pressures.

SWC confirmed that Calderwood is identified on the MDP and SWC's Growth Servicing Plan (GSP). SWC has committed $5M over 5 years for approvals and $35M over 5 years for delivery of services for the Illawarra release areas consistent with the GSP's period. SWC reimbursement is linked to actual market demand/lot take up rates (commercial considerations). Typically, full reimbursement of asset costs will be provided after 30 percent of lots are developed. If Sydney Water's delivery time does not meet Developer's staging of development, the proponent can enter into a Commercial Agreement with Sydney Water to expedite infrastructure delivery and fund up front. SWC would reimburse, agreed reasonable and efficient costs of developer-funded assets, when it would have normally funded the subject assets under its GSP, depending on location and timing.

3 Existing Utility Services

This section describes the existing infrastructure and utility services within the area and their relationship with the immediate surrounds and wider region.

3.1 Sewer

Presently the existing rural development within Calderwood Valley is not connected to the Sydney Water sewerage network because of the low population base of the area and requires individual property owners to maintain septic systems to treat sewage on site.

The nearest SWC trunk service is the 600 diameter gravity feed sewer main (Albion Park low-level carrier main) constructed through the southeastern corner of the Calderwood development site (see **Figure 2**). This existing pipeline was extended from Polock Crescent to serve the Tullimbar Village development located on the southern side of Illawarra Highway and has been sized by Sydney Water (SWC) to cater for future development within the area. SWC has advised that the Calderwood development can connect into this existing main.

The 600mm sewer main feeds into a larger network of SWC sewer reticulation. The sewer drains to the Sewer Pumping Station (SPS) 505 on the corner of Tongarra Road and Stapleton Street, Albion Park (see **Figure 2**). From here, sewage is conveyed through a series of rising mains and gravity feeds to the Shellharbour Sewage Treatment Plant (STP) (Junction Road Shellharbour). This STP currently provides sewer treatment for existing Shellharbour suburbs of Albion Park, Albion Park Rail, Blackbutt, Balarang, Barrack Heights, Barrack Point, Flinders, Haywards Bay, Lake Illawarra South, Mount Warrigal, Oak Flats, Warilla and Shell Cove. Sydney Water has recently increased the capacity of the Shellharbour STP to cater for the future population growth in the area

3.2 Water

Water reticulation services are not currently provided in the Calderwood Valley area. Property owners within the immediate area rely on the collection of rainwater, drained from roof areas, into on-site rainwater tanks.

Water services within the wider area are fed from the Sydney Water catchment, west of the Illawarra escarpment. The Avon Dam (with a full operating storage of 146,700 ML) forms part of this overall water catchment network, feeding potable water from the Illawarra Escarpment to the Wollongong and Shellharbour Local Government areas (the Illawarra network). Sydney Water owns and manages water reticulation to these areas.

The Illawarra network feeds from the Avon Dam through a gravity intake shaft and water main to the Whytes Gully Water Filtration Plant (on Reddalls Road). From this point, water is either filtered or reticulated throughout the Illawarra area or forwarded to the BlueScope Steel unfiltered for use in the steel making process.

Nearby water reservoirs include:

- Mt Terry and Albion Park Heights – Servicing Albion Park to the south of Calderwood Valley
- Oak Flats – Servicing Oak Flats, Shellharbour, Blackbutt, Flinders and Shell Cove
- Mt Brown – Servicing Dapto and surrounding suburbs, to the east of the development site
- Wongawilli – Servicing the suburb of Horsley with capacity to serve future West Dapto Release stages in the north of the rezone area.

Sydney Water has previously planned upgrading of existing water storage reservoirs to accommodate population growth within Wollongong and Shellharbour. These upgrades proposed to provide two new water storage reservoirs at Bong Bong Road, Avondale (20 ML, near West Dapto) and Marshall Mount (20 ML).

A map of the existing trunk water service is included in **Figure 2**.

3.3 Natural Gas

There are currently no existing reticulated natural gas services within Calderwood Valley however there is a secondary gas main located in Calderwood Road. Neighbouring suburbs of Albion Park and Dapto do however have a natural gas service provided by Jemena (the local gas authority).

Currently natural gas is supplied to Wollongong via the South Australian gas pipeline. A gas metering station in Wilton (approximately 40km west of Wollongong) directs gas east to Unanderra where it is distributed throughout the Illawarra region. This pipeline originates from the South Australian Gas Fields (at Moomba) and is owned by the Australian Pipeline Trust. This gas supply has been reticulated to Albion Park and further reticulated to the Tullimbar development (via a 110mm PE gas main) which neighbours the Calderwood development.

The Eastern Gas Pipeline (EGP) runs through the Illawarra region from the gas fields of Bass Strait (see **Figure 2**). The natural gas is processed in Longford Victoria and transported 795 km to Sydney along the eastern coastline. This pipeline operates at a pressure of 15MPa and has a gas delivery rate of 65 Petrajoules per annum. This pipeline is owned and maintained by Jemena.

The EGP currently is not connected into the local natural gas reticulation network in the Illawarra. Jemena has advised however that there is the potential to construct an off take station tapping into the EGP and provide gas supply at a local level within the Illawarra.

3.4 Telecommunications

Cabled telephone services exist within the neighbouring suburbs of Albion Park and Dapto. The Calderwood Valley phone system relies on a combination of traditional copper cable and optic fibre services.

Recently, Telstra routed 36 fibre optic cables between the Albion Park telephone exchange and the corner of North Macquarie and Calderwood Roads where they constructed a Small Capacity Distribution System (SCAD). This SCAD acts to distribute existing phone services in the area by utilising two of the 36 available fibre optic cables. The remaining 34 cables will be available for future development. **Figure 2** illustrates the optical fibre route from Albion Park (Tripoli Way) to the corner of North Macquarie and Calderwood roads.

Telstra and Optus currently provide full GSM mobile network coverage in Calderwood Valley. Mobile network towers providing coverage to Calderwood Valley are located on the Princes Highway Albion Park Rail (opposite Creamery Road) and at the Dapto Telephone Exchange, (corner of Bong Bong Road and Marshall Street, Dapto).

Internet and data exchange services are available within the area, providing limited performance. The relatively new optical fibre network SCAD on the corner of Calderwood and North Macquarie Roads improves these services by providing Integrated Service Digital Network (ISDN) connection availability. ISDN allows Internet connection speeds of up to 128 kilobits per second (kbps) for the connected users and the limited number of existing copper cable service users.

AUSTAR currently provides satellite television services to the Calderwood Valley area. Cable television is currently not available in the area.

3.5 Electricity

Power within NSW is distributed in major high voltage (HV) powerlines between 132kV and 500kV. One controlling body, Transgrid, operates the 330kV to 550kV power distribution network, and distributes power to lower voltage network operators within NSW.

The HV overhead electrical powerlines exist within the development site and provide either reticulation to local rural properties or traverse the area as a high voltage transmission line linking power to other destinations within the NSW electricity grid. These powerlines and are operated and maintained by either Transgrid or Integral Energy.

There are four power transmission lines running near or directly through the proposed development site within easements as depicted in **Figure 2**. These are as follows:

- Line 1 – 132kV line (Integral Energy control) passing near the south - eastern part of the development site. This line is within a 45m wide easement, mounted on a single circuit wooden pole arrangement
- Line 2 - 132kV line (Integral Energy control) passing through the eastern part of the development site. This line is within a 45m wide easement, mounted on a single circuit wooden pole arrangement
- Line 3 – 330kV line (Transgrid control) from the Dapto BSP and traversing south west to Marulan. This line is within a 60m wide easement, mounted on a single circuit steel tower arrangement and passes through the northern part of the development
- Line 4 - 330kV line (Transgrid control) from the Dapto BSP and traversing south to Kangaroo Valley. This line is within a 60m wide easement, mounted on a single circuit steel tower arrangement and passes through the northern part of the development.

Power is supplied to the Illawarra district through the Transgrid Dapto Bulk Supply Point (BSP). Dapto BSP maintains three x 375MVA and one x 160MVA 330/132kV transformers. Integral Energy is supplied with 132kV power from the Dapto BSP, to the Mount Terry Transmission Substation (TS) on Terry Street approximately 4km southeast of Calderwood Valley. Mount Terry TS provides further power reticulation through to the NSW South Coast and the local district Zone Substations (ZS) as listed below:

- Albion Park
- Dapto
- Gerringong
- Jamberoo
- Kiama
- Shellharbour
- Warilla.

2 x 120 MVA 132/33kV transformers are located at the Mount Terry Substation to provide this transmission and reticulation service.

The Dapto and Albion Park Zone Substations (ZS) are within a 10 km radius of Calderwood Valley and supply power to the neighbouring suburbs. Power reticulation to the existing rural properties within Calderwood Valley is transmitted from the Albion Park ZS (on Russell Street) along 11kV overhead powerlines (generally within road reserves) to either pole or pad mounted (ground) distribution substations. The 11kV power is converted to either 415V or 240V within the local distribution substations to feed into rural properties for household/commercial use.

All power reticulation maintenance throughout the Illawarra area is controlled by Integral Energy and carried out by Integral's Spring Hill (Wollongong) maintenance department. In 2004, Integral Energy reviewed the reliability of its services across NSW (*IE Position Paper - 2004 Electricity Network Review*) and identified several areas including Wollongong as experiencing "substantially poorer average reliability" from their network. As a result, Integral Energy has implemented a capital and operating expenditure overhaul program to cope with existing and new growth demands for poorer reliability areas. This overhaul intends to deliver greater service reliability by reducing overall network outages both planned and unplanned.

Delfin Lend Lease

Existing Infrastructure

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

- Site Boundary
- Albion Park Black Box (South Australian Gas Pipeline)
- Water Tanks (LPMA)
- Sewer Pumping Station (Sydney Water)
- Mellows Road Feeder 998
- Albion Park Zone Substation (Integral)
- Mobile Phone Tower (Cardno)
- Telstra SCAD (Cardno)
- Dapto Bulk Supply Point
- Railway (LPMA)
- Major Roads (LPMA)
- Water Main (Sydney Water)
- Sewer Main (Sydney Water)
- Sewer Rising Main (Cardno)
- Eastern Gas Pipeline (Jemena)
- Existing Gas (South Australian Gas Pipeline)
- Existing Optic Fibre reticulated from Albion Park network
- 33kV Transmission Line (LPMA)
- 132kV Transmission Line (LPMA)
- 330kV Transmission Line (LPMA)
- Cadastre (LPMA)
- LGA Boundaries (LPMA)

FIGURE 2

N
W E
S

Scale 1:30,000 (at A3)

Metres
0 500 1,000 1,500 2,000

Cardno

Map Produced by Cardno Wollongong
Date: 18 January 2010
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 110026-01_88007_ExistingInfrastructure.mxd 03

4 Proposed Utility Services (Overall and Stage 1 Delivery)

This section describes how the CUDP will likely be serviced from the existing utilities, both overall and stage 1 delivery.

4.1 Background

Strategies for proposed utility service delivery (both overall and staged delivery) have been prepared and discussed with each of the servicing authorities including Sydney Water, Telstra, Integral Energy and Jemena. The strategies have been developed to ensure capacity is available to meet the future needs of the entire release area rather than the CUDP.

Staging sequences have been created to demonstrate that the area can be developed logically and economically with the full suite of services. Moreover, such services have been designed as an intrinsic part of the CUDP masterplan (i.e. in a holistic manner) and will be delivered by a single developer-led solution. These are described as follows for both the overall and stage 1 delivery.

4.2 Sewer

4.2.1 Overall Strategy

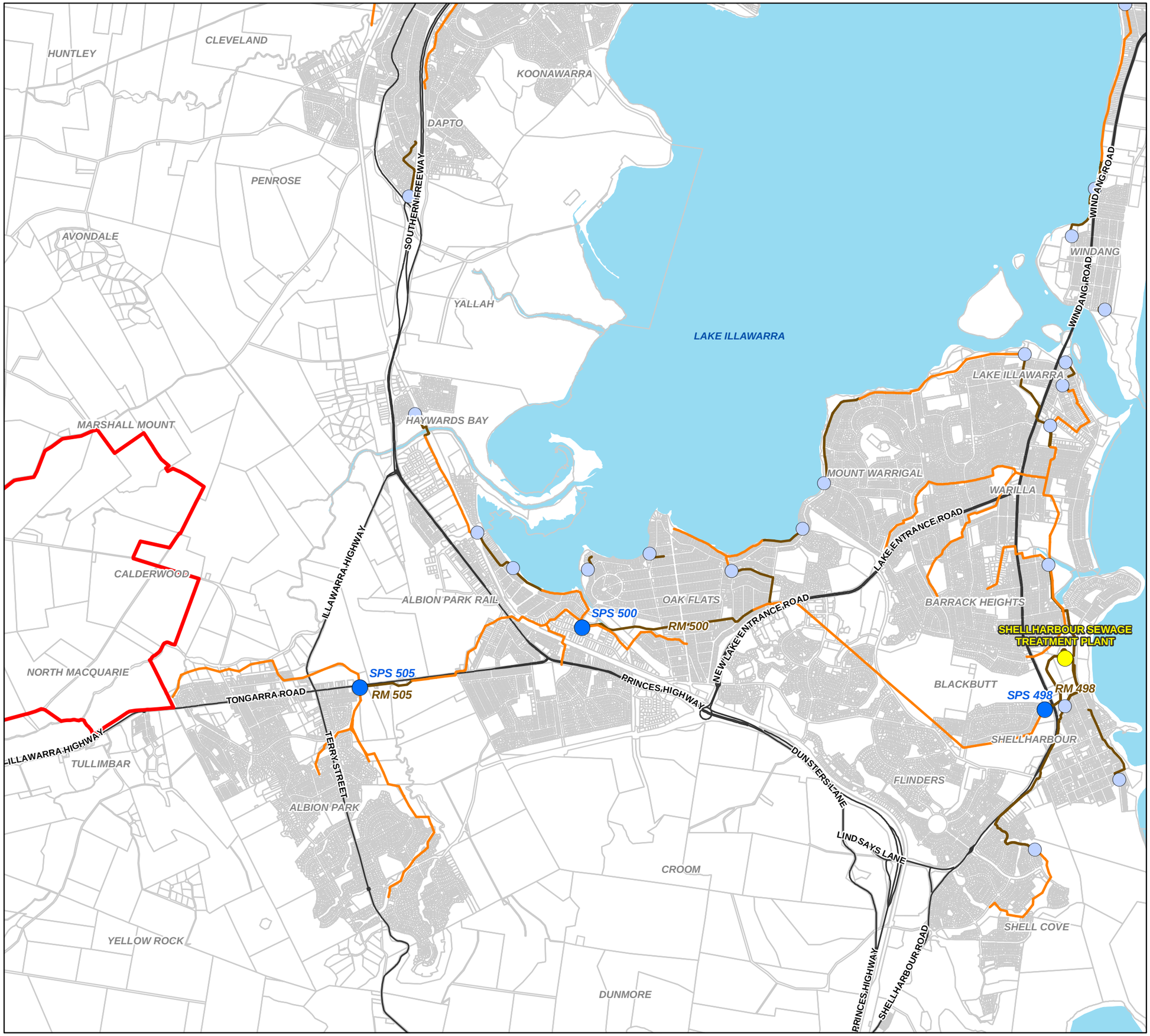
SWC's Feasibility Letter dated 16 June 2004 describes that the 600mm diameter gravity feed sewer main (Albion Park low-level carrier main) has approximately 350L/s spare design flow (DF) in addition to the future additional lots proposed for the Tullimbar Development on the opposing side of Illawarra Highway, which also feeds into the sewer main. All sewer reticulation from the Calderwood development site will be connected to this carrier main, which will convey sewage flows through to the existing Shellharbour Sewer Treatment Plant (STP).

SWC has modelled the effects of the overall CUDP on the existing SWC network and confirmed that existing system will allow 500 or so additional lots to be connected to the 600 dia. sewer main. Further system upgrades will be required to support the expected population growth which will involve upgrades to existing sewer pump stations (SPS) 505, 500 and 498 and the duplication of rising mains 505, 500 and 498 required at varying stages of development i.e. beyond Stage 1, as the existing SPS and rising mains will reach capacity (see **Figure 3**).

Sydney Water has also confirmed that upgrades of the Shellharbour STP will accommodate the proposed Calderwood Valley development. Staging of the Calderwood Development will be scheduled to ensure that, as SWC planned upgrades are undertaken, additional Calderwood areas will be released for development thus ensuring the downstream SWC sewer infrastructure can cater for the development sewage flows.

Sydney Water will fund the upgrade and duplication of the external sewer reticulation infrastructure to service the Calderwood development as the development is identified in SWCs Growth Servicing Plan (GSP) for July 2009 – June 2014 and in the Department of Planning's Metropolitan Development Plan (MDP). The plan identifies that, SWC will provide Calderwood servicing funding for lead-in trunk mains, new pumping stations and on-site and offsite sewerage reticulation upgrades.

In terms of reticulation, the overall sewer concept plan proposed for the CUDP (see **Figure 4**) details the location and sizing of proposed sewer pump stations, rising mains and gravity mains that have been used to derive the pipe sizing required for Stage 1 sewer reticulation. The servicing requirements have directly influenced the masterplan in terms of the residential and commercial layout with good connectivity and efficiency in reticulation.



Delfin Lend Lease

Lead In Sewer Infrastructure Upgrades

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

- Site Boundary
- Key Sewer Pumping Station (Sydney Water)
- Sewer Pumping Station (Sydney Water)
- Shellharbour Sewage Treatment Plant (Sydney Water)
- Sewer Carrier
- Rising Main Effluent
- Major Roads (LPMA)
- Cadastre (LPMA)

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FIGURE 3

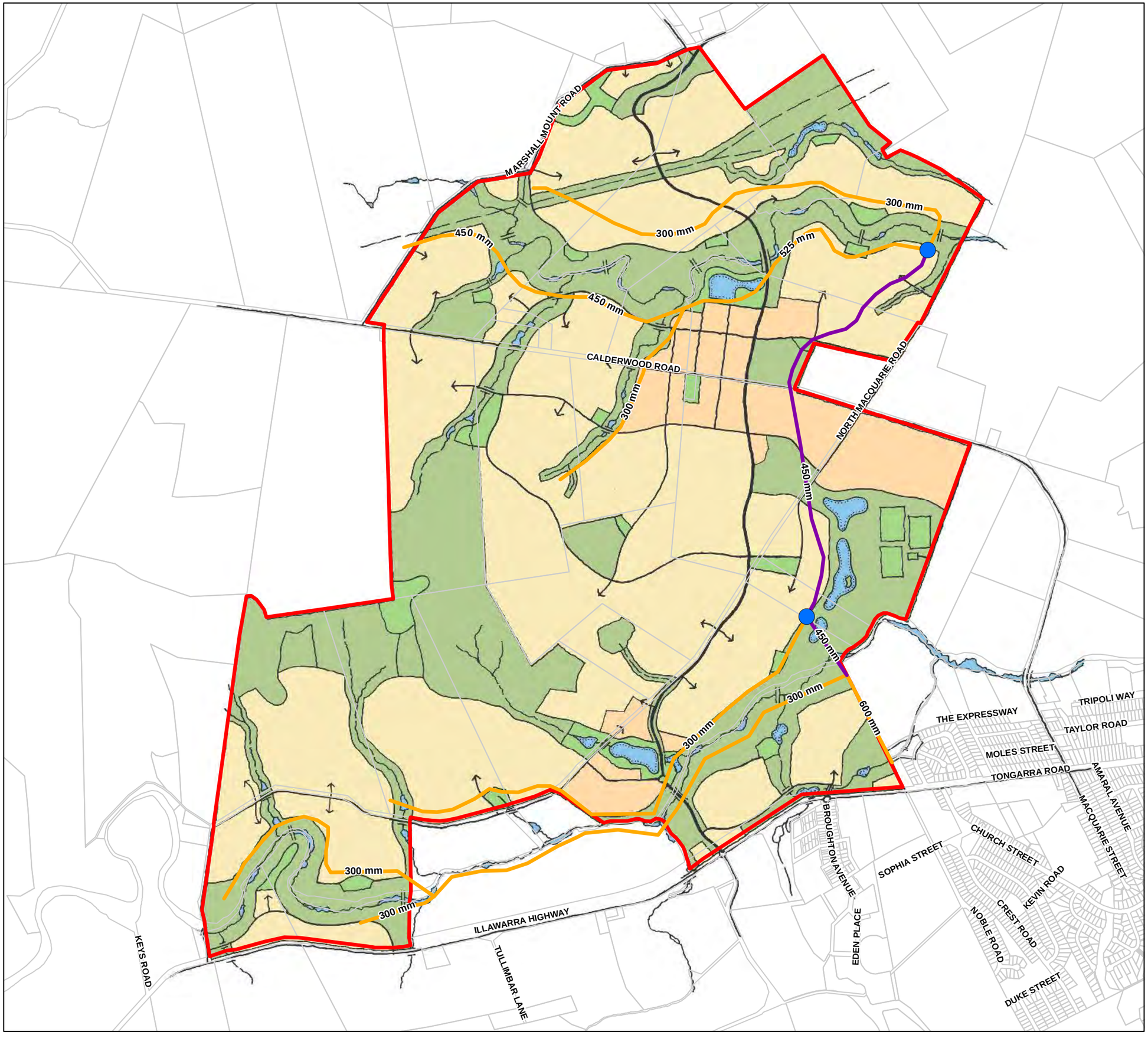
Scale 1:40,000 (at A3)

Metres

0 250 500 1,000 1,500 2,000 2,500

Cardno

Map Produced by Cardno Wollongong Pty Ltd
Date: 5 February 2010
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 110026-01_88013_LeadInSewerInfrastructureUpgrades.mxd 02



Delfin Lend Lease

Overall Sewer Concept Plan

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

- Site Boundary
- Proposed Pump Station (Cardno)
- Proposed Rising Main (Cardno)
- Proposed Trunk Sewer (Cardno)
- Cadastre (LPMA)

Concept Base Plan from Delfin Lend Lease
February 2010

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FIGURE 4

Scale 1:15,000 (at A3)

Metres
0 100 200 400 600 800 1,000

Cardno

Map Produced by Cardno Wollongong
Date: 16 February 2010
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 110026-01_88012_OverallSewerConceptPlan.mxd 04

4.2.2 Stage 1 Delivery Plan

The Stage 1 development consists of 442 equivalent residential dwellings, a Village Centre and a Sales Information Centre. This stage has been designed to be accommodated within the 500 equivalent residential lots; hence, no additional lead-in upgrade works of existing SWC sewer infrastructure needs to be undertaken for this stage of development.

The Stage 1 sewer reticulation will allow for future stages of the Calderwood Development to reticulate through stage 1 to the existing 600mm diam. SWC sewer main as noted previously. The southern catchment (i.e. land south of Johnston's Spur Ridgeline) will provide a gravity sewer main that has been sized to cater for future development to the west of stage 1 whilst the northern catchment (i.e. land north of Johnston's Spur Ridgeline) will be serviced via gravity sewer main that has been sized to cater for future development to the west. Preliminary sewer investigations indicate that an onsite sewer pump station (SPS) will be required to the north east of the northern district to pump sewage under the Macquarie Rivulet via a rising main gravity system into the existing 600mm diam. sewer main (see **Figure 5**). The proposed SPS will allow for Stage 1 reticulation initially, but will allow for upgrades/augmentation to service future stages as they come on line.

4.3 Water

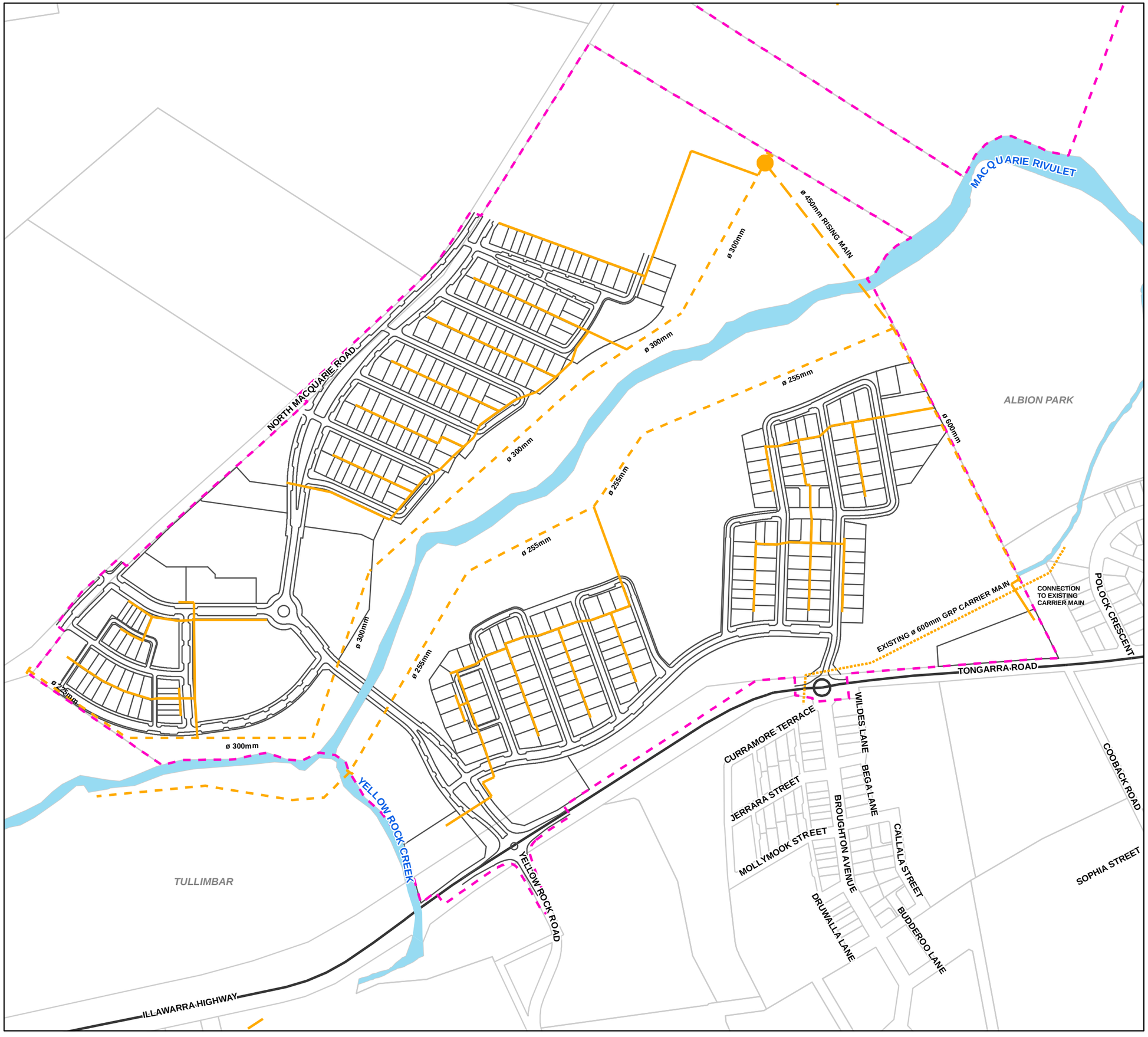
4.3.1 Overall Strategy

As noted below, the Albion Park water reservoir has capacity to service around 500 lots in the early stages of the Calderwood development, again dependent on take up of other developments in the locality. Beyond this, SWC has advised that the construction of a proposed reservoir (Volume 20ML) at Marshall Mount will be required to service the CUDP. SWC owns a site off Mountainview Terrace, which has been identified for this reservoir. To connect the existing SWC water network to this reservoir involves constructing a new 375mm diameter trunk main from the existing Southern Towns Trunk Main at Yallah, along Marshall Mount Rd to a new reservoir site. A 375mm diameter water main will then be reticulated from the Marshall Mount reservoir through a DLL partnership landowner along Marshall Mount Road to the development site. See **Figure 6** for the overall potable water strategy.

SWC will fund the construction of the lead-in watermain works and the proposed Marshall Mount reservoir as the Calderwood development is identified in SWCs GSP.

The master planned approach to the development has led to a residential and commercial layout that lends itself to an efficient internal water distribution network with good connectivity and relatively minor hydraulic losses. Water mains are to be located in the footpath verge of the road reserve at a standard distance from the property line to allow easy identification of the mains location by Sydney Water maintenance personnel and for NSW Rural Fire Service who will utilise water hydrants for potential bushfire/ firefighting purposes. The proposed subdivision water reticulation layout for Stage 1 is shown in **Annexure D**. This layout reflects the short-term 300mm diameter water main extension from Sophia Street, which extends along Illawarra Highway into the south- east corner of the site. Once onsite, the trunk main continues along the southern side of the connector road before continuing along the north/south sub-arterial road into the Village Centre and northern areas. From the trunk main, minor water mains are directed down minor roads for property connections.

Water main design and hydrant spacing will comply with the requirements for residential and commercial development as required by Sydney Water, NSW Rural Fire Service and the relevant design codes.



Delfin Lend Lease

Sewer Concept Plan Stage 1

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

- Proposed Sewer Pump Station
- Proposed Trunk Gravity Sewer
- Proposed Reticulation Gravity Sewer
- Proposed Sewer Rising Main
- Existing Carrier Main
- Stage 1 Lot Layout
- Major Roads (LPMA)
- Stage 1 Boundary
- Cadastre (LPMA)

NOTE:
PIPE SIZES & LOCATIONS ARE INDICATIVE ONLY & SUBJECT TO DETAILED DESIGN

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FIGURE 5

Scale 1:5,000 (at A3)

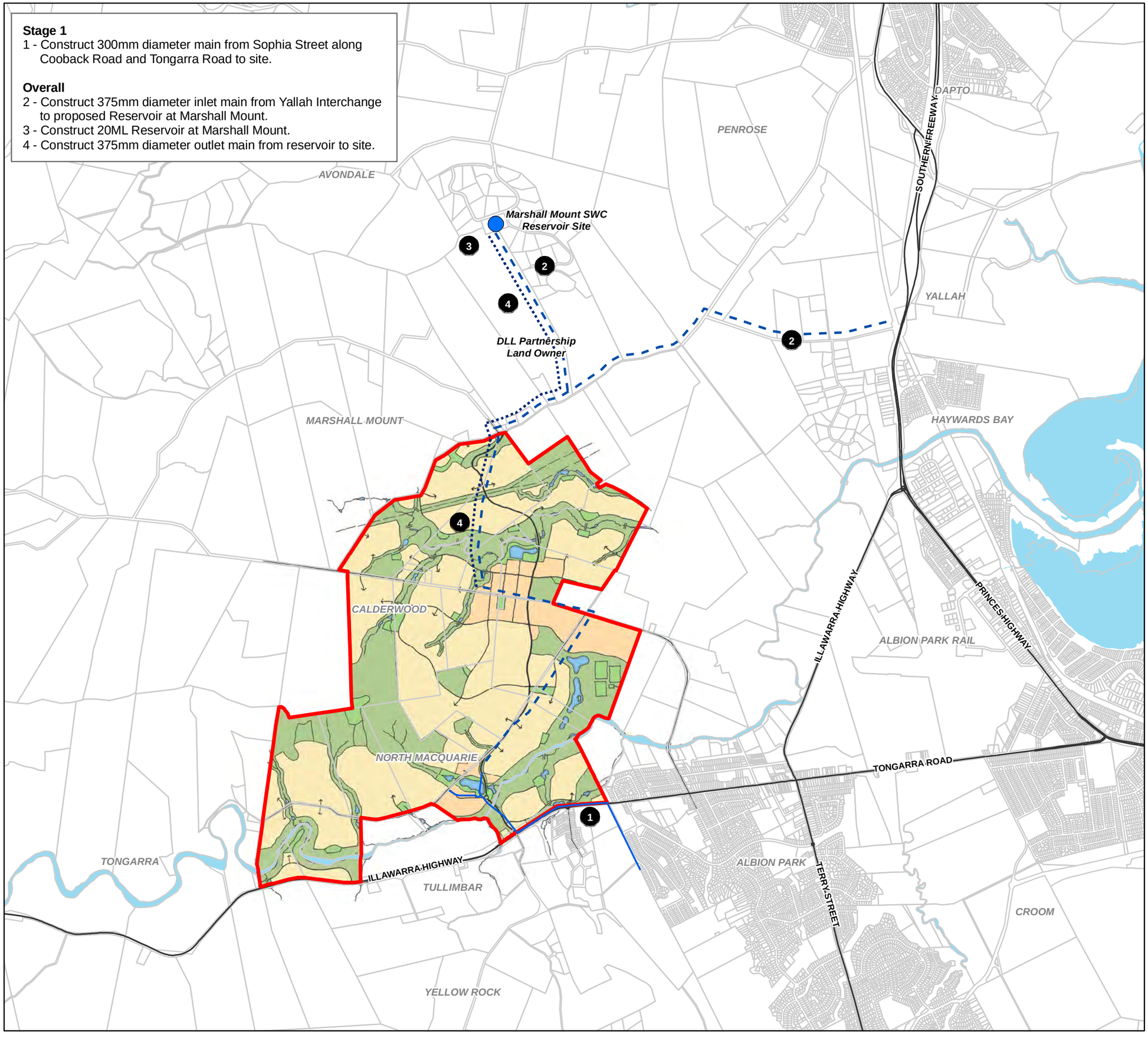
Metres
0 25 50 100 150 200 250

Cardno

Map Produced by Cardno Wollongong
Date: 1 March 2010
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 110026-01_88021_Sewer_Stage1.mxd 04

Stage 1
1 - Construct 300mm diameter main from Sophia Street along Cooback Road and Tongarra Road to site.

Overall
2 - Construct 375mm diameter inlet main from Yallah Interchange to proposed Reservoir at Marshall Mount.
3 - Construct 20ML Reservoir at Marshall Mount.
4 - Construct 375mm diameter outlet main from reservoir to site.



Delfin Lend Lease

Potable Water Strategy

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

- Site Boundary
- Marshall Mount SWC Reservoir Site
- Proposed Outlet Main
- Proposed Water
- Stage 1 Proposed Lead-In Trunk Main
- Major Roads (LPMA)
- Cadastre (LPMA)

Concept Base Plan from Delfin Lend Lease February 2010

N W E S

FIGURE 6

Scale 1:30,000 (at A3)

Metres
0 250 500 1,000 1,500 2,000

Cardno

Map Produced by Cardno Wollongong
Date: 26 February 2010
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 110026-01_88014_PotableWaterStrategy.mxd 04

4.3.2 Stage 1 Delivery

As noted above, SWC has confirmed in their Feasibility Letter that the Albion Park WS0296 water reservoir has surplus capacity to accommodate around of 500 lots in the early stages of the project. This will enable development of the 442 equivalent residential dwellings, a Village Centre and a Sales Information Centre (SIC) in stage 1. SWC have supported this approach in consultation with DLL. To establish this connection to the site, an extension from the existing DN375 uPVC water main located in Sophia Street, Albion Park will be required. The new DN300 lead-in water main extension (as shown in **Figure 4**) will connect at the intersection of Sophia St and the unformed Cooback Rd. The lead-in main will travel north in the unformed Cooback Rd, west along the Illawarra Highway to the existing Broughton Ave roundabout and then north into and through the subject site (see **Figure 7**). The Stage 1 development will be rerouted to the Marshall Mount reservoir once the proposed reservoir is constructed.

4.4 Natural Gas

4.4.1 Overall Strategy

Jemena is currently developing an upgrade strategy for the provision of natural gas to the Calderwood Urban Development Project. The upgrade strategy involves assessing the existing capacity of the existing local network, calculating the gas requirements of the proposed Calderwood development and determining upgrades required to the current infrastructure to ensure gas supply is made available. Jemena is investigating the provision of providing gas supply to the development progressively in stages, as the gas supply is required to developed areas.

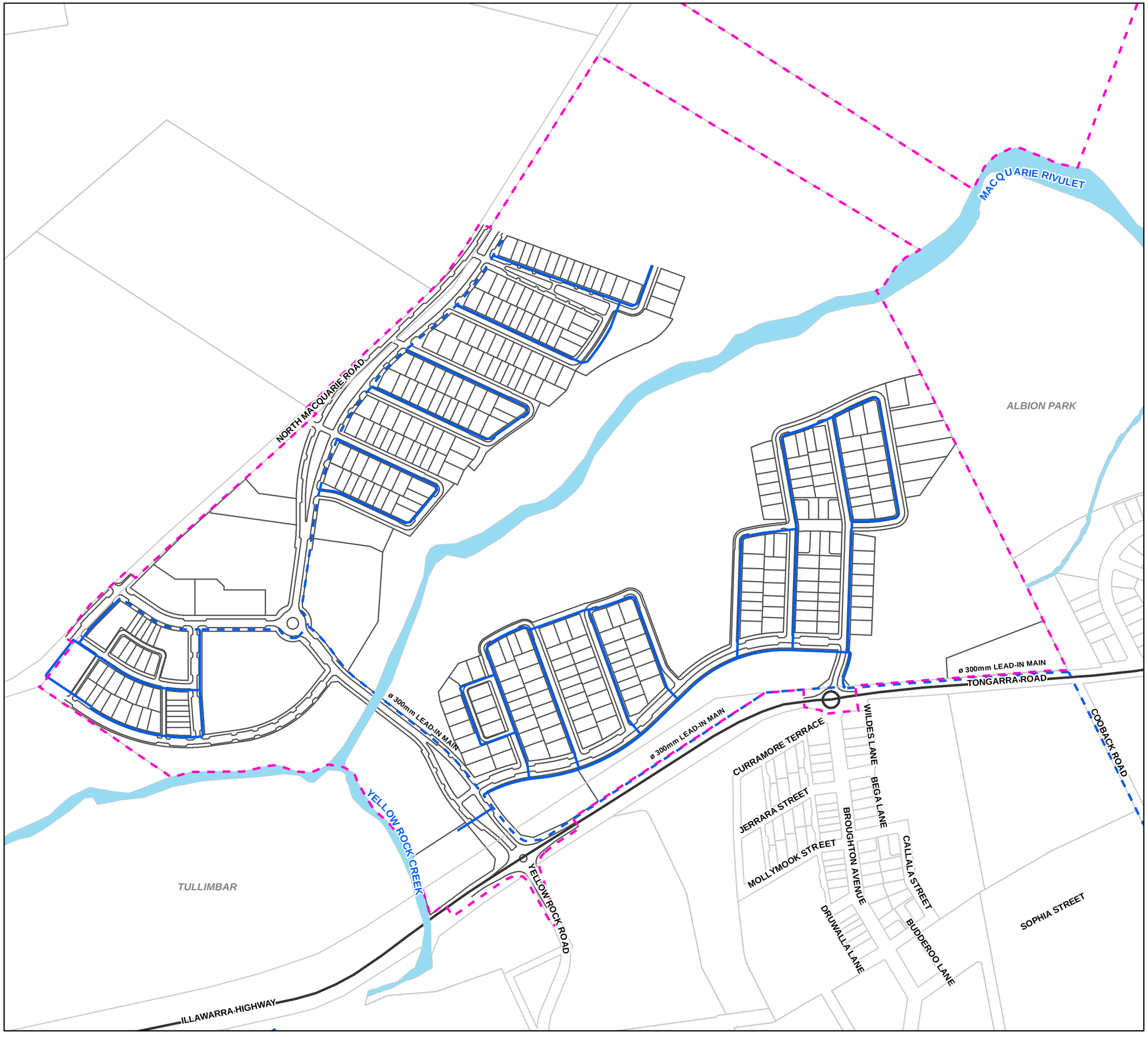
Preliminary investigations with Jemena have confirmed that will be able to provide the development with natural gas servicing. Initial gas supply provision for Stage 1 will be obtained by reticulating a gas main to the development from the Albion Park 'black box' located on the corner of Taylor Road/ Illawarra Hwy intersection (1.7km east of site at Albion Park) (see **Figure 8**).

Jemena is also investigating the possibility of tapping into the EGP with the potential construction of an offtake station located in Yallah. This gas supply would provide ample gas supply for the Calderwood site. Details of the reticulation from the EGP to the site will be reviewed once further details are received from Jemena on the location of the offtake station and pipe sizing requirements.

4.4.2 Stage 1 Delivery

In terms of Stage 1, it is envisaged that natural gas can be reticulated from the existing local gas main at Albion Park. Jemena is yet to confirm the existing capacity and infrastructure upgrades required however, initial investigations indicate that Stage 1 of the development can be catered for.

The proposed gas reticulation layout for stage 1 is shown in **Figure 8**. The gas main will be reticulated along Illawarra Highway from the existing local gas network supplied by Jemena at Albion Park. Gas reticulation has been designed within the subdivision to be undergrounded in a shared trench arrangement with electricity and communication reticulation as per the shared trench arrangement design guidelines adopted by the servicing authorities. The network will be reticulated as shown in the stage 1 layout plan to service all allotments from the footpath verge of the road reserve where possible.



Delfin Lend Lease

Water Concept Plan Stage 1

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

- Proposed Reticulation Watermain
- Proposed Leadin Trunk Main
- Stage 1 Lot Layout
- Major Roads (LPMA)
- Stage 1 Boundary
- Cadastre (LPMA)

NOTE:
PIPE SIZES & LOCATIONS ARE INDICATIVE ONLY & SUBJECT TO DETAILED DESIGN

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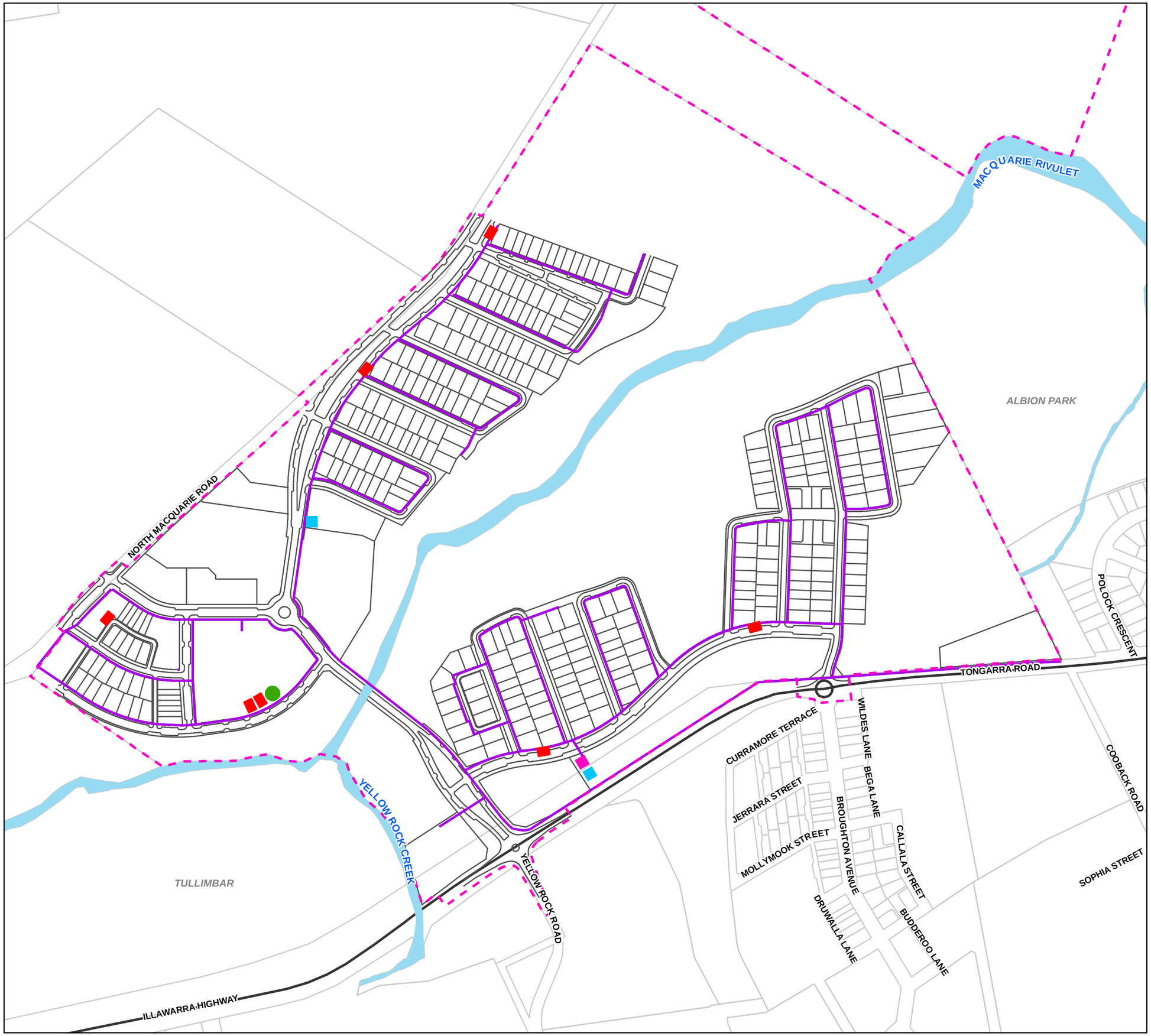
FIGURE 7

Scale 1:5,000 (at A3)

Metres
0 25 50 100 150 200 250

Cardno

Map Produced by Cardno Wollongong
Date: 1 March 2010
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 110026-01_88022_Water_Stage1.mxd 04



Delfin Lend Lease

Electrical, Gas and Telecom Concept Plan Stage 1

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

- 11kV Switching Station
- Pad Mount Substation
- Telecommunications CMUX
- Telecommunications MDF
- Shared Trench, Telstra, Electricity & Gas
- Stage 1 Lot Layout
- Major Roads (LPMA)
- Stage 1 Boundary
- Cadastre (LPMA)

NOTES:
1. PADMOUNT SUBSTATIONS, SWITCHING STATIONS & CMUX UNITS TO BE LOCATED IN PUBLIC RESERVES & ROAD RESERVES WHERE REQUIRED
2. UTILITY SERVICES SUBJECT TO DETAILED DESIGN
3. CONNECT TO LEADIN MAINS AT TONGARRA ROAD

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FIGURE 8

Scale 1:5,000 (at A3)

Metres
0 25 50 100 150 200 250

Cardno

Map Produced by Cardno Wollongong
Date: 1 March 2010
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 110026-01_88023_Utilities_Stage1.mxd 04

4.5 Telecommunications

4.5.1 Overall Strategy

Telstra has advised that telecommunication services will be made available to the site. Fibre to the premises (FTTP) can be reticulated into the development from the Small Capacity Distribution System (SCAD) located at the corner of North Macquarie and Calderwood Roads (See **Figure 2**). Further discussions between DLL, Telstra and Open Networks are being undertaken to determine the level of communication services to be reticulated through the development and contractual service agreements involved.

Telstra has advised that National Band Network (NBN) will mandate fibre to the premises from 1 July 2010. NBN will require an open access network. Telstra supports the open access network but presently is awaiting government definition (eg access to a MB rate, spare fibre capacity, spare duct capacity).

As discussed in the existing services section, Telstra and Optus provide full GSM mobile network coverage in the Calderwood Valley area.

Telstra will supply the cabling, associated service infrastructure and provide connections into existing reticulation. The developer will be responsible to undertake the trenching and laying conduits from the connection point to the development site.

The proposed telecommunications reticulation layout for stage 1 is shown in **Figure 8**. Telecommunications will be reticulated in a shared trench arrangement as noted in section 4.4.1 with gas and electricity services to service the development.

Indicative CMUX locations have been detailed on the plan. Final locations of Telstra infrastructure requirements will be determined by Telstra Designers at detailed design stage.

Overall communications reticulation to the development is still being revised by Telstra. Negotiations are still in place determining what services are to be provided and agreements undertaken between the developer DLL and the service providers (Telstra, Open Networks). Overall coverage will be able to be established; it is the detail on service provision, developer/ service provider agreements and future subdivision layouts that need to be determined for further investigations to be undertaken.

4.5.2 Stage 1 Delivery

For the Village Centre (see **Figure 8**), a Telstra Mains Distribution Frame (MDF) will need to be established which will require a room within the Village Centre Development to be utilised as a hub for all lines infiltrating into the centre to distribute back through the MDF out to the external Telstra system. DLL will ensure this room is made available for Telstra services. It is envisaged Telstra will fund the communications infrastructure.

4.6 Electricity

4.6.1 Overall Strategy

Integral Energy has confirmed the requirements for a suitable location of the new 132/ 11kV zone substation which will be required to provide electricity supply to the CUDP. The existing power distribution station (DS) at Albion Park (Russell Street) does not have the capacity to support the overall development. Integral has advised that a suitable location for the zone substation site would be on Calderwood Road in an area approx 1km east of Marshall Mount Road as this is approx the electrical load centre of the Calderwood Urban Development Area. The precise location of the zone substation has not been finalised, though the parcel of land required by Integral Energy for the substation would be approximately 100m x 100m (i.e. 1 Hectare) as shown in **Figure 9**.

The zone substation will be supplied from three 132kV feeders:

- Feeder 1: Established between the zone substation and Transgrid's Dapto Bulk Supply Point located in Yallah Road, Yallah (within a 25m 132kV easement or public road reserve)
- Feeder 2 & 3: Established between the zone substation and connect into the existing 132kV feeder 988 (Dapto BSP to Fairfax Lane TS) located adjacent to Mellows Road off Calderwood Road (also within a 25m 132kV easement or public road reserve).

IE will fund the zone substation and three incoming 132kV feeders whereas DLL will provide the zone substation parcel of land through an agreement with IE.

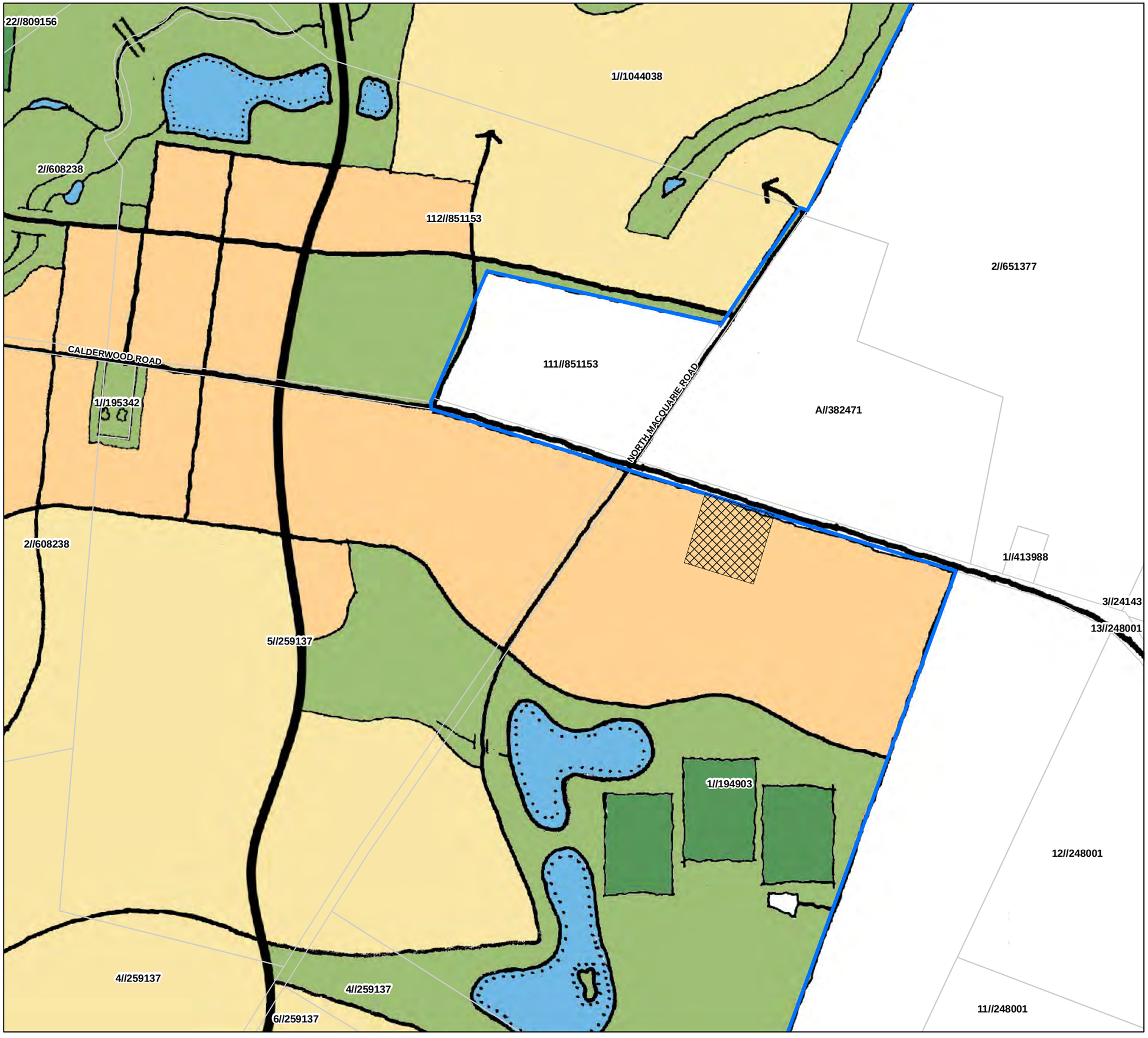
From the zone substation, the 11kV distribution network will be established to service the Calderwood Urban Development Area. This network will include padmount substations strategically positioned throughout the network to reduce the electricity load down to residential & commercial usage. Level 3 accredited service providers will be engaged to perform the electrical reticulation design and level 1 service providers to construct the services onsite.

4.6.2 Stage 1 Delivery

For Stage 1 (i.e. 442 equivalent residential dwellings, a Village Centre and a Sales Information Centre (SIC)), Integral Energy has advised this can be supplied from the existing DS at Albion Park provided a few conditions are undertaken. All future electrical reticulation however must be reticulated from the new zone substation required as detailed above.

To supply the development site an 11kV underground feeder will be established to the site from the existing DS at Albion Park (located on Russell Street approx 100m from Terry Street).

The proposed electricity reticulation layout for stage 1 is shown in **Figure 8**. Telecommunications will be reticulated in a shared trench arrangement with gas and telecommunication services to service the development.



Delfin Lend Lease

Zone Substation Site Plan

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

- Site Boundary
- ProposedSubstation
- Cadastre (LPMA)

Concept Base Plan from Delfin Lend Lease (10/01/2010)

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FIGURE 9

Scale 1:5 000 (at A3)

Metres
0 50 100 150 200 250

Cardno

Map Produced by Cardno Wollongong
Date: 12 February 2010
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 110026-01_88008_ZoneSubstationSitePlan.mxd 04

4.7 Stage 1 Delivery (Summary)

Overall staging sequences have been developed to demonstrate that the area can be developed logically and economically with the full suite of utility services. DLL works or funding delivers lead infrastructure for the initial stages of development of approximately 500 lots comprising which will enable development of the 442 equivalent residential dwellings, a Village Centre and a Sales Information Centre in stage 1.

This strategy achieves efficient use of spare capacity in the following services:

- The Albion Park Low Level Sewer Carrier Main located on the southern portion of the DLL landholding
- The Albion Park WS0296 water reservoir at Mount Terry and
- The existing Distribution Substation at Albion Park.

This is shown diagrammatically in **Figure 10**.

4.8 Co-Generation

Electricity cogeneration (the efficient and simultaneous conversion of energy from gas to electricity and heat) and trigeneration (the simultaneous conversion electricity, heat and cooling) has been used in residential communities in New South Wales including the Glenfield Vision estate in south-western Sydney.

The potential for cogeneration in the Calderwood Urban Development Project exists in the town centre and employment precinct. Cardno held initial discussions with cogeneration power generators as part of the utilities investigations for the site. Cogeneration is a potential alternative to traditional electricity generation and opportunities will be continue to be considered throughout the project.

The current proposal for energy sustainability is to focus on demand initiatives. These include reducing the demand for energy through the efficient design of the urban form to capitalize on the natural features of the site. Demand will also be mitigated through consumer demand initiatives including BASIX requirements for dwelling design. The potential for generation initiatives such as cogeneration (and solar generation as discussed below) will be monitored throughout the project as generation technology improves and the energy market framework evolves.

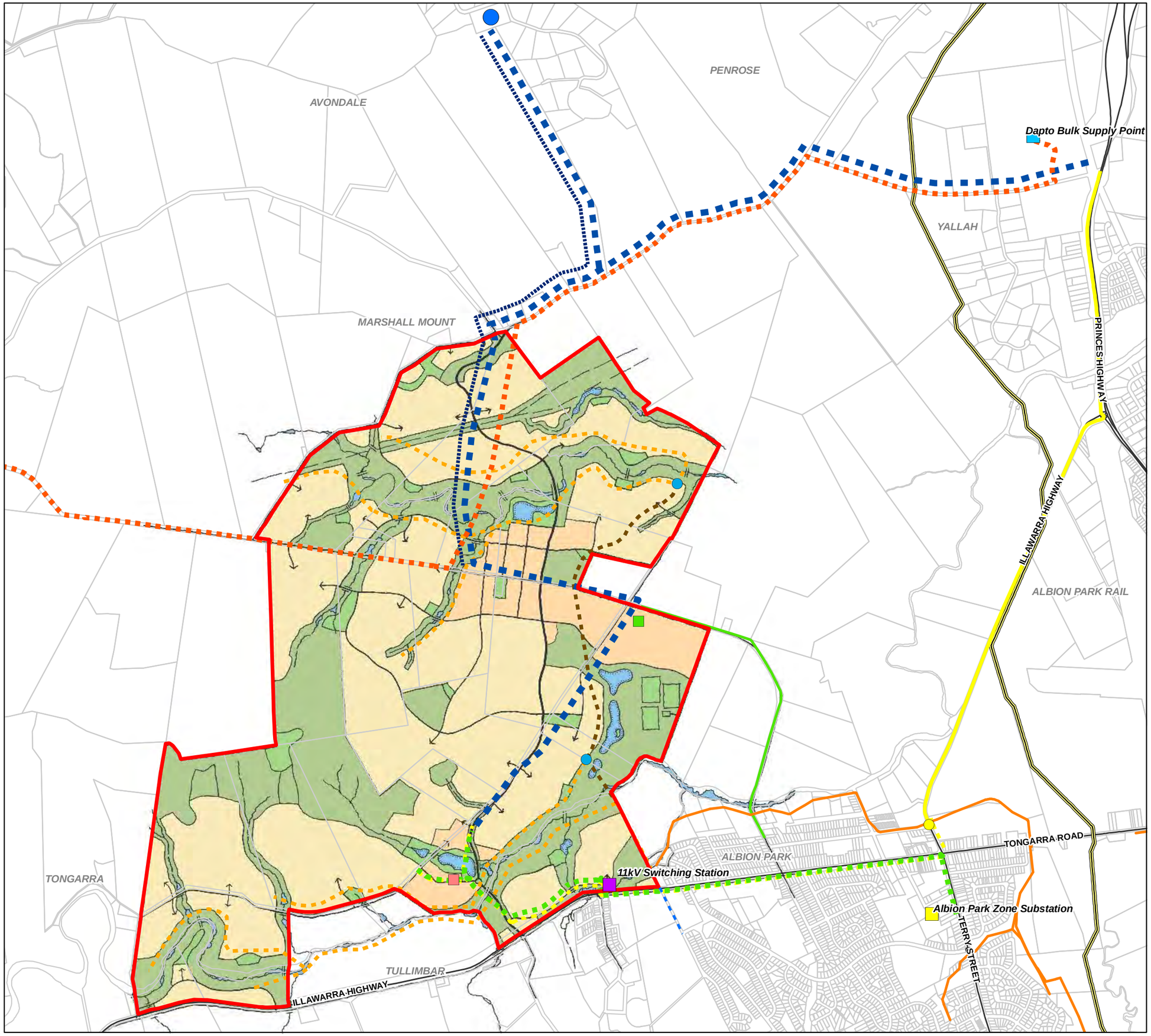
4.9 Solar Farm

Technological developments in photovoltaic cells have progressed to a point where solar power can be a commercially viable supplement to traditional energy generation. Factors such as environmental conditions, land availability, renewable energy policy of the government and power distributor and concentrated demand hubs will impact on the feasibility of solar farms. Lend Lease has invested in the research and development of solar technology and has proposed solar power generation to the recently awarded Barangaroo project to be developed in Sydney with the Barangaroo Delivery Authority.

Solar power at Calderwood could potentially be introduced to supplement electricity supply to the town centre. A solar farm would be located within the development site proximate to the town centre and outside the development footprint. Open space and floodplain may be appropriate sites for solar power generation. A three-megawatt solar farm would currently require approximately eight hectares of land comprising 60cm x 120cm solar modules stacked in series vertically on poles typically 2.1 metres high. The underground conductors would carry direct current to inverters to convert the electricity to alternating current acceptable to the electricity network.

1.4MWp at Sinzheim, one of Germany's largest solar power plants

Delfin Lend Lease is committed to the development in solar technology in communities. The issues of carbon emissions, renewable energy targets and long term land tenure will become increasingly relevant to new urban developments. While solar power is not currently a part of the CUDP, DLL will continue to monitor the potential for solar farms as the technology for solar energy improves over the life of the project.



Delfin Lend Lease

Infrastructure Servicing Strategy

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

- Site Boundary

Proposed Infrastructure

- Telstra MDF
- 11kV Switching Station
- Indicative Location of Zone Substation
- Pump Station
- Marshall Mount SWC Reservoir Site
- Water Outlet Main
- Water Trunk Water Main
- Stage 1 Lead-In Trunk Main
- Stage 1 Lead-In Gas Main
- Sewer Rising Main
- Trunk Sewer
- Stage 1 Lead-In 11kV Underground Feeder
- 132kV OH Feeders to New Substation

Existing Infrastructure

- Telstra SCAD - Small Capacity Distribution System
- Albion Park Zone Substation
- Dapto Bulk Supply Point
- Albion Park Black Box (South Australian Gas Pipeline)
- Sewer Carrier
- Existing Gas (South Australian Gas Pipeline)
- Eastern Gas Pipeline (Jemena)
- Existing Optic Fibre reticulated from Albion Park network
- Major Roads (LPMA)
- Cadastre (LPMA)

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FIGURE 10

Scale 1:20,000 (at A3)

Metres

0 125 250 500 750 1,000

Concept Base Plan from Delfin Lend Lease February 2010

Cardno

Map Produced by Cardno Wollongong
Date: 18 February 2010
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 110026-01_88020_InfrastructureLeadIn_Stage1.mxd 05

5 Utilities Infrastructure Independence

Calderwood along with West Dapto represent the last remaining greenfields urban release areas in the Illawarra. Whilst the projects will be virtually contiguous when fully developed, their respective early stage releases (i.e. initial development fronts) are more than 10km apart and will be supported by an entirely different services delivery and implementation mechanism. This is shown conceptually in **Figure 11**.

From an infrastructure perspective, West Dapto will be a government-led release area with multiple developers (including Wollongong City Council) acting on multiple fronts under a traditional Authority and Council delivery system. Calderwood will be a developer led master planned project under control of a single developer (DLL).

In terms of servicing the WDRA, the Growth Centres Commission (2009) has published a review of the capability and capacity of services. GCC has indicated that West Dapto is able to be serviced with water and sewer utilising existing infrastructure subject to augmentation to increase capacity over the life of the Release Area's development. Following on from that review, Council has now resolved to release only Stages 1 and 2 and indefinitely defer the balance (see **Figure 11**). At this stage, only Stages 1 and 2 will be zoned for urban purpose.

Sydney Water's GSP has confirmed that potable water will be delivered to the WDRA from the north from the Wongawilli Reservoir. The capacity of the existing water infrastructure head works is adequate for servicing the Release and its adjacent development areas. The Wongawilli reservoir can service the early stages of development. There would be a requirement for construction of a new reservoir to service the latter stages of development and/or development areas in the southern end.

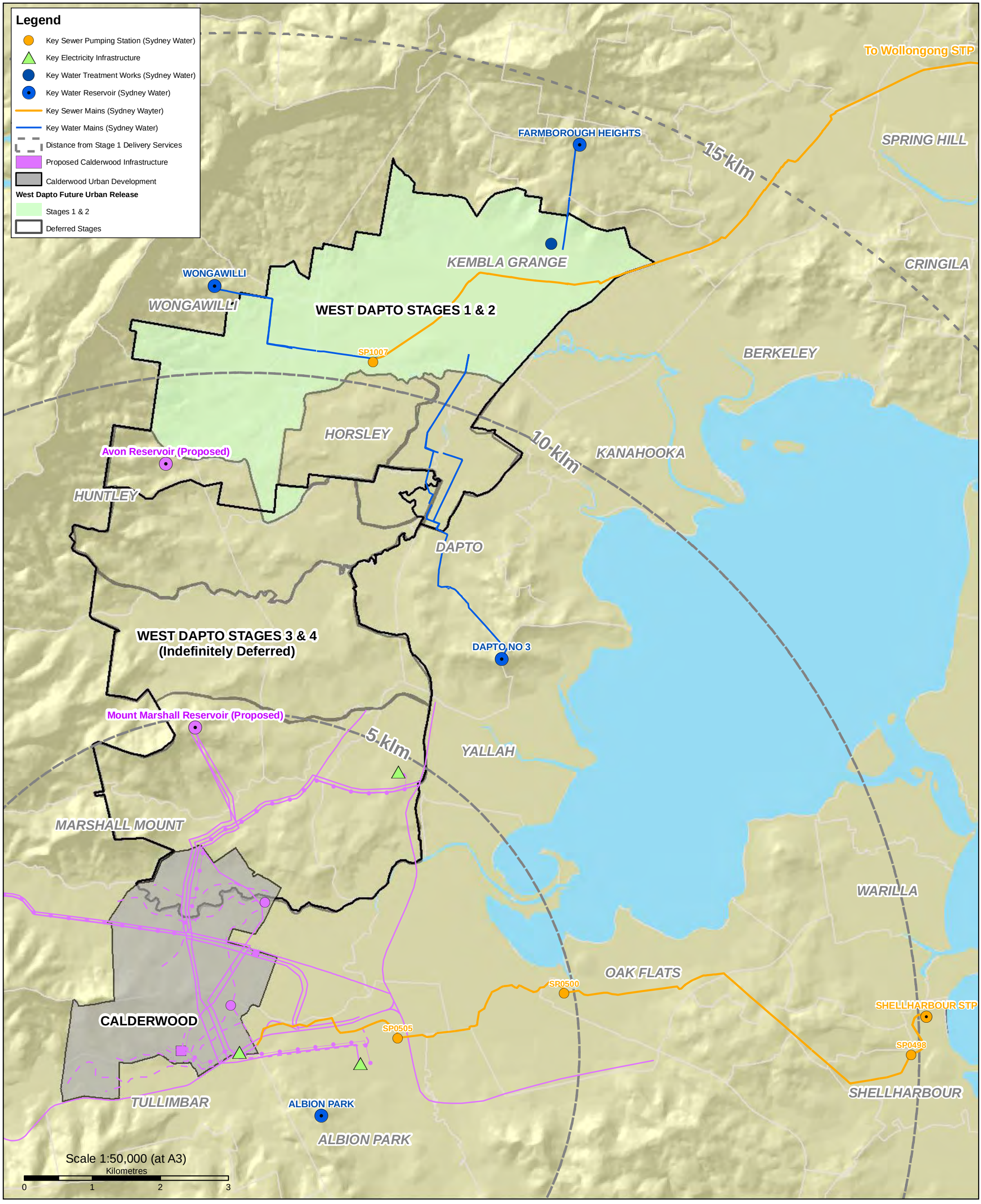
Calderwood will be serviced initially from the existing Albion Park Reservoir in the south and in the longer term from a future reservoir at Mount Marshall (also in the south). The service areas for the Wongawilli and Mount Marshall Reservoirs are quite separate and have been purposely sited by SWC so as not to overlap supply areas and hence lead to inefficiencies.

In terms of sewer, both Wollongong and Shellharbour STPs have available treatment capacity for early development (first 5 years) though both will need to be amplified in order to accommodate the future growth of both Calderwood and West Dapto. Both these are separate augmentations and independent of each other. They have physically separate reticulation areas, which generally align to the respective local government area boundaries. Both systems are managed and planned as separate entities under SWC's GSP.

Integral Energy's strategy for servicing the WDRA is independent of their plans for Calderwood and involves the establishment of three 132/11kV zone substations. The approximate locations of these substations have been determined based on the assumed centre of load as well as proximity to existing 132kV transmission lines and in consultation with Council. Integral will require the installation of the zone substation to service any major development in West Dapto and will need to make suitable arrangements with developers that enable the establishment of zone substations. Some limited capacity is available to service a relatively small yield in the early stages.

Capacity is available to service around 500 lots in Calderwood but then a new zone substation will need to be established. Integral has identified that, based on the expected centre of load, a location on Calderwood Road within the Calderwood site; approximately 1km east of Marshall Mount Rd would be suitable. DLL has identified a suitable location for establishment of this substation would require transmission works, including a new 132kV line to the Trans Grid Dapto bulk supply point adjacent to the railway line on Yallah Road.

It is clear from the overview above that Calderwood can be serviced independently of the WDRA, and therefore will not significantly affect the provision of infrastructure for West Dapto.



Existing and Proposed Utility Services for Calderwood and West Dapto

CALDERWOOD URBAN DEVELOPMENT PROJECT

FIGURE 11

Delfin Lend Lease

Cardno

Map Produced by Cardno Wollongong
Date: 18 February 2010
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF: 10026-01
88024_Infrastructure_CUDP_WDRA.mxd 02

6 Conclusion

This section draws conclusions from the preceding text and in particular summarises the main findings against the project brief.

6.1 Conclusion

This Utility Services Study has been prepared by Cardno to accompany a Concept and Project Plan Application under Part 3A of the Environmental Planning & Assessment Act, 1979 (EP&A Act) and a proposal for State significant site listing under Schedule 3 of State Environmental Planning Policy Major Development 2005 (SEPP Major Development) in relation to the CUDP.

Existing reticulated services of water, sewer and electricity have spare capacity to accommodate about 500 lots. This will provide an effective start to the project and bring residential lots to market.

As the development proceeds, further upgrades will be necessary to the existing services to meet the needs of the development. These have been designed as an intrinsic part of the CUDP masterplan (i.e. in an holistic manner) and will be delivered by a single developer-led solution as follows:

- Sewer infrastructure will be established by augmentation of the existing sewer system and modifications to the Shellharbour STP. This is consistent with Sydney Water's Growth Services Plan.
- Water infrastructure will be established by a permanent connection to the proposed Marshall Mount water reservoir, for which Sydney Water already owns the site. This is also consistent with Sydney Water's Growth Services Plan
- Electrical reticulation will be met by construction of a new Zone Substation in the Calderwood Valley (for which a site has already been identified), reticulating power throughout the site in underground cables.
- Telecommunication services will be provided by the placement of a Main Distribution Frame within the development site, which will distribute telecommunication services throughout the proposed development. Moreover, servicing providers have confirmed delivery of Fibre to the Home/Premise.
- Natural Gas services will be available through the local natural gas network provider.

DLL is committed to the development of alternative technologies in its communities. The issues of carbon emissions and renewable energy targets will become increasingly relevant to new urban developments. DLL sees potential for both solar farms and co (or tri) generation as part of the CUDP, particularly for the town centre and employment precinct. Such opportunities will continue to be considered throughout the project.

Calderwood along with West Dapto represent the last remaining greenfields urban release areas in the Illawarra. Whilst the projects will be virtually contiguous when fully developed, their respective early stage releases are more than 10km apart and will be supported by an entirely different services delivery and implementation mechanism. From an infrastructure perspective West Dapto will be a government-led release area with multiple developers acting on multiple fronts under a traditional approval system whereas Calderwood will be single developer led and managed.

Calderwood can be developed independently of the WDRA and therefore will not affect the provision of infrastructure for West Dapto.

7 References

This section cites references used in this report.

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Annex A

A. Correspondence with Service Authorities

Calderwood Urban Development Project
Summary Record of Agency Consultations

Date	**Wednesday 30 September 2009 – 11:30am** **at Integral Energy 51 Huntingwood Drive Huntingwood**		
Project team member / firm	**Bill Mitchell – Calderwood Project Director – Delfin Lend Lease** **Martin Wells – Infrastructure Engineer – Cardno**		
Organisation	**Integral Energy**		
Name of contact	1. **Matt Webb** 2. **Charles Howatt**		
Position in organisation	1. **Manager Strategic Asset Management** 2. **Distribution Network Planning Manager**		
Contact details	**51 Huntingwood Drive Huntingwood** **Telephone 131 081**		
Form of Consultation	**Face to face**	Phone call	Email
Issues discussed / outcomes	1. **Bill Mitchell – Discussed scope, scale and status of Calderwood project (refer Attachment A – Project Overview and Status Summary)** 2. **Martin Wells** a. **Discussed previous dialogue and correspondence:** i. **Correspondence 27 February 2006 from Craig Willebrand (Integral Energy) (refer Attachment B)** ii. **Meeting 7 May 2008 with Peter Freckelton & Garry Gibson (Integral Energy)** iii. **Correspondence from Peter Freckelton 19 June 2008 (Refer attachment B)** iv. **Telecons Martin Wells & Ty Christopher + Rick Wallace 3 March 2009** b. **Calderwood has an integrated infrastructure solution that can be incrementally delivered.** c. **DLL controls key infrastructure lands including zone substation site.** 3. **Charles Howat & Matt Webb** a. **Andrew Simms at Coniston is the Integral planner, but dialogue and correspondence for Calderwood should be directed through Charles.** b. **Integral will need to check currency of previous information.** c. **First steps will be to:** i. **Establish location for zone substation and**		

	connections. Note that zone substation land transfer will be similar process to DLL's project at St Marys ii. Confirm method of early supply. d. Integral preference for transmission conductors is typically overhead, but underground can be negotiated with developers based on funding contribution. e. Note that telecommunications facilities may require buffer from zone substation site. 4. Bill Mitchell a. Timeframe for Concept and Project Application is: i. Pre-lodgement meeting with DoP December 2009 ii. Lodge applications with DoP end February 2010 or early March 2010 b. Bill Mitchell will be the DLL contact for negotiations to transfer the zone substation site.
Actions arising	1. Cardno to provide package of information to Integral including: a. Project Overview (Attachment A) b. Previous correspondence (Attachment B) c. Plan of Infrastructure Strategy dated 4 May 2009 (Attachment C) d. Letter from Dept Planning to DLL dated 22 April 2009 regarding Major Project status (Attachment D) e. Dept Planning Director General Requirements dated 10 June 2009 (Attachment E) 2. Cardno to provide proposed staging and timing for residential lots (refer schedule below). a. 2011 75 lots b. 2012 125 lots c. 2013 210 lots d. 2014 225 lots e. 2015 - 2020 1,125 lots (225 lots per annum) f. 2020 - 2025 1,125 lots (225 lots per annum) g. 2025 - 2030 1,125 lots (225 lots per annum) h. 2030 – 2035 1,125 lots (225 lots per annum) i. > 2035 Balance of other lands (approx 3,000 lots) 3. Cardno to provide to Integral during course of assessment a structure plan with town centre, employment etc landuses plus the potential zone substation site. 4. Integral to continue to investigate and confirm method and timing of supply and advise DLL through Martin Wells. 5. Cardno to arrange follow up meeting with Integral when / as required.

Attachment B.

Martin Wells (Sydney)

From: Peter Freckelton [Peter.Freckelton@integral.com.au]
Sent: Thursday, 19 June 2008 6:19 PM
To: martin.wells@cardno.com.au
Cc: Garry Gibson; bill.mitchell@lendlease.com.au
Subject: ENL0319 - Calderwood Valley Development Area
Attachments: Email dated 19-6-2008.zip

Martin Wells
Cardno
Phone: (02) 9496 7700
Fax: (02) 9499 3902
Email: martin.wells@cardno.com.au
Web:http://www.cardno.com.au

Martin

Further to the meeting 7/5/2008 at Integral Energy's Coniston office attended by Martin Wells (Cardno), Bill Mitchell (Delfin Lend Lease), Peter Freckelton (Integral Energy) and Garry Gibson (Integral Energy), information provided by Cardno and Delfin Lend Lease at the meeting (refer attached maps and briefing note presented at the meeting) and previous correspondence from Integral Energy (refer attached letter dated 27/2/2006), the strategy for the provision of electrical supply to the Calderwood Valley Development Area is based on the establishment of a 132/11kV zone substation to service the Calderwood Valley Development Area.

The zone substation site identified in Figure 9 (refer attached) adjacent 132kV feeder 988 is not an acceptable zone substation site to supply the Calderwood Valley Development Area as it is not located centrally to the electrical load of the Calderwood Valley Development Area.

Integral Energy has identified that a suitable zone substation site would be in Calderwood Road in an area approximately 1km east of Marshall Mount Road. This area is located approximately in the electrical load centre of the Calderwood Valley Development Area. This facilitates the most economical use of network assets for the customer/developer and Integral Energy when 11kV distribution feeders are developed from the zone substation. In addition, the area meets the National Electricity Rules least cost solution requirements.

The proposed zone substation site would require a parcel of land measuring 100m x 100m. Subject to adjacent land uses, site constraints and a more detailed investigation, there may be opportunities to reduce or alter these dimensions to suit specific site constraints. The site:

- Needs to be essentially level, above the 1:100 flood level and not be adjacent to any major existing telecommunications underground pits or be affected by other utility easements or plant.
- Should not be near community facilities such as schools and child care centres.
- Should be adjacent existing roads providing access to the site during construction and must have a dedicated all weather road to the sites upon commissioning of the zone substations.

The 132kV supply to the zone substation would be from three 132kV feeders, they being:

- One 132kV feeder would be established between the zone substation and Transgrid's Dapto Bulk Supply Point located in Yallah Road, Yallah. It is proposed that this 132kV feeder would be established within a 25m wide 132kV easement with the majority of the route adjacent to the existing Transgrid 330kV tower line easement (for the Transgrid 330kV feeder between Dapto Bulk Supply Point to Kangaroo Valley TS, circuit number 18) between Transgrid's Dapto Bulk Supply Point and the zone substation. The feeder would be subject to landowner agreement, easement acquisition, design and environmental assessment.
- Two 132kV feeders would would be established between the zone substation and connect into existing 132kV feeder 988 (Dapto BSP to Fairfax Lane TS) located adjacent Mellows Road off Calderwood Road. It is proposed that one of these 132kV feeders would be established in Calderwood Road and the other by a route yet to be determined. Both feeder routes would require the 132kV feeders to be within a 25m wide easement. The feeders would be subject to landowner agreement, easement acquisition, design and environmental assessment.

Integral Energy where practical adopts a "prudent avoidance" policy in relation to transmission lines and sensitive receptors such as schools. Integral Energy would be responsible for the Environmental Impact Assessment for the zone substation and the 132kV feeders. Integral Energy policy requires that the 132kV feeders must be of overhead construction. Provision must be made in the development for the 132kV feeders.

The establishment of the zone substation and the 132kV feeders connected to the zone substation to supply the Calderwood Valley Development Area would be funded by Integral Energy.

At present there is no capacity in Integral Energy's existing 11kV distribution network to supply any development within the Calderwood Valley Development Area prior to the establishment of a zone substation. However, 500 lots could be supplied within the Calderwood Valley Development Area prior to the zone substation being established provided:

- A parcel of land is dedicated to Integral Energy for the zone substation by the customer/developer who's development in the Calderwood Valley Development Area will be the significant beneficiary of the establishment and capacity of the zone substation. This would secure Integral Energy tenure for the establishment of the zone substation.
- Integral Energy has received a masterplan for the Calderwood Valley Development Area.
- Integral Energy has received a firm commitment from a customer/developer that the Calderwood Valley Development Area will proceed.
- Integral Energy has received a lot release program for the Calderwood Valley Development Area showing the lot lease program within the context of the total lot release program for the Illawarra area.
- The Calderwood Valley Development Area development commences in the south east area bounded North Macquarie Road, Calderwood Road, Macquarie Rivulet and Integral Energy's 132kV feeders 98W & 98F. This area is adjacent Integral Energy's existing 11kV distribution network.
- An 11kV underground feeder is established from Albion Park Zone Substation (located in Russell Street, Albion Park - approx 100m from Terry Street) to supply the 500 lots.

The establishment of the zone substation would take between 3 to 5 years subject to the above.

The customer/developer will be responsible for the installation and funding of the "Connection Assets" in accordance with the IPART determination for capital contributions. The "Connection Assets" would include the 11kV underground feeder from Albion Park Zone Substation to supply 500 lots. Refer to Integral Energy's Network Connections General Terms and Conditions.

A Level 3 Accredited Service Provider (refer Department of Fair Trading at www.fairtrading.nsw.gov.au) will need to be engaged by the developer to carry out the electrical network design. A Level 1 Accredited Service Provider (refer Department of Fair Trading at www.fairtrading.nsw.gov.au) will need to be engaged by the developer to carry out the electrical network construction of the connection assets.

Please submit an Application for Connection of Load at to Integral Energy prior to making any financial commitments or undertaking any works on site.

The advice provided above is in response to an enquiry only and does not constitute a formal method of supply but an indication of the works required to make the connection.

Please quote reference number ENL0319 for all future correspondence.

Regards

Peter Freckelton
Contestable Projects Manager Central & Southern Region
Network Connections
Ph - 0403 343 228
Ph - (02) 4252 2970
Ph - 8 2970
Fax - (02) 4252 2892
Email - peter.freckelton@integral.com.au

****

INTEGRAL energy

Martin Wells
Forbes Rigby Pty Ltd
278 Kiera Street
Wollongong NSW 2500

27 February 2006

Dear Martin,

Calderwood Valley Release Area

Thank you for your enquiry regarding the your proposal for energy supply to the Calderwood Release Area. This enquiry has been registered under Customer Application Number (CAP) ENL0319. The relevant Integral Energy staff have reviewed your enquiry and would like to offer the following advice:

1. The load assessed by Integral Energy is in the vicinity of 40 MVA. A load of this magnitude will require a zone substation to service the land release area. This zone substation would be a 132kV/11kV.

2. The planning department have performed a preliminary analysis of the connection arrangements for the new zone substation and they are detailed below.

    - One connection by a new feeder from the Transgrid Dapto Bulk Supply Point. Subject to confirmation, it is envisaged that this feeder would follow the same easement (for the majority of it's length) as the two 330 kV feeders from Dapto to the Transgrid substations at Kangaroo Valley and Marulan.

    - The second connection required is from feeder 988 (between Dapto BSP and Fairfax Lane TS). This connection would require the sectionalisation of feeder 988, and the construction of a new feeder from each section feeder 988 to the new ZS (ie two feeders to feeder 988).

3. The construction of these 132 kV feeders would normally be overhead and comply with the relevant Integral Energy standards.

Contact name Craig Willebrand Direct phone 9853 5189 Fax 9853 6036
51 Huntingwood Drive Huntingwood NSW 2148. PO Box 6366 Blacktown NSW 2148. DX 8148 Blacktown
Integral Energy Australia ABN 59 253 130 878 Telephone 02 9853 6666 Facsimile 02 9853 6000 www.integral.com.au

4. It is considered that the supply to this new Zone Substation at 33 kV is not feasible because of:

    - The magnitude of the proposed load.
    - The remote location of the development, and the distance from Mt Terry and Springhill transmission substations.
    - The effect of this load on the capacity of Mt Terry TS.

5. If you have any further enquiries please do not hesitate to contact me on the numbers provided.

Yours faithfully

Craig Willebrand
Engineering Officer
Engineering Performance
In reply please quote file no.: ENL0319

Calderwood Urban Development Project
Summary Record of Agency Consultations

Date	**Thursday 5 November 2009 – 12:00pm** **at The Bond No. 30 Hickson Road Sydney**		
Project team member / firm	**Bill Mitchell – Calderwood Project Director – Delfin Lend Lease** **Martin Wells – Infrastructure Engineer – Cardno**		
Organisation	**Telstra**		
Name of contact	**Jeoffrey Keogh**		
Position in organisation	**Urban Development Manager**		
Contact details	**Ph 02 4251 0664** **Mb 0419 236 124** **Fax 02 4225 1138**		
Form of Consultation	**Face to face**	Phone call	Email
Issues discussed / outcomes	1. **Bill Mitchell** a. **Discussed background, context and status of Calderwood project (refer Briefing Note tabled at meeting)** b. **Noted that the community information session was being advertised in local papers today.** 2. **Martin Wells** a. **Discussed previous dialogue and correspondence (refer Briefing Note tabled at meeting)** b. **Discussed previous investigations of telecommunications and surplus capacity in optical fibre at Calderwood Road and Illawarra Highway for incremental development.** 3. **Bill Mitchell** a. **The Calderwood development will include fibre to the premises (FTTP).** b. **DLL will consider the benefits of FTTP as a mode shift from private vehicle trips. JK noted research into this topic.** c. **Discussed scheduled release rate of residential lots:** i. **2011 75 lots** ii. **2012 125 lots** iii. **2013 210 lots** iv. **2014 thereafter average of 225 lots per annum** v. **Balance of other lands (assumed at approx 3,000 lots as per MDP)**		

	4. **Jeoff Keogh** a. **Telstra is working on a 5 year works forecast at present. JK will feed the information of this meeting into the forecast.** b. **Noted that existing mobile phone infrastructure will need to be augmented for ultimate development. Early development will be okay.** c. **Pit and pipe infrastructure available to the Tullimbar development.** d. **Telstra provides infrastructure based on a 10 year development build program.** e. **The National Broadband Network (NBN) will require an open access network.** f. **NBN will mandate fibre to the premises from 1 July 2010.** g. **Telstra supports the open access network but is awaiting government definition (eg access to a MB rate, spare fibre capacity, spare duct capacity)** h. **Telstra is still contracting for the provision of Telstra Velocity (= FTTP).**
Actions arising	1. **Jeoff Keogh to provide information on mode shift from vehicle trips to telecommunication.** 2. **Jeoff Keogh to investigate pit, duct, fibre capacity with Telstra planners and convene a second meeting with DLL if necessary.**

5 January 2009

Mr Bill Mitchell
Project Director Calderwood
Email bill.mitchell@lendlease.com.au
Email tracey.davidson@lendlease.com.au

Dear Bill

Fibre to the Premises (FTTP) Telecommunications for Calderwood Urban Development Project

I refer to the above project and your briefing note dated October 2009. OPENetworks is an "open access", wholesale only, telecommunications carrier operating community Fibre to the Premises (FTTP) networks. Open access principles means that OPENetworks does not deliver retail services to end user residents or compete for the provision of retail services with retail carriers and other service providers seeking access to those residents. OPENetworks has contracted with retail carriers and service providers to deliver their retail telecommunications services (including voice, data, internet, Free to air TV and Pay TV) to residents and the community via our networks which are connected to major data centres where the major wholesale fibre optic network carriers and service providers can interconnect.

OPENetworks can confirm that FTTP telecommunication services (including voice, data, internet, Free to air TV and Pay TV) can be made available to residents at Calderwood (the site being generally described on the map) via back haul links from either Nextgen Networks (shown as the blue line on the map) or Optus Wholesale (which is about 1.5 to 2 km radial distance from Calderwood site.

Yours faithfully

Michael Sparksman
Authorised Officer

www.openetworks.com.au

OPENetworks Pty Ltd
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Calderwood Urban Development Project
Summary Record of Agency Consultations

Date	**Monday 28 September 2009 – 4:00pm at Cardno Gordon**		
Project team member / firm	**Bill Mitchell – Calderwood Project Director – Delfin Lend Lease** **Martin Wells – Infrastructure Engineer – Cardno**		
Organisation	**Jemena Gas Networks**		
Name of contact	**Elle Peters**		
Position in organisation	**Network Development Manager**		
Contact details	**P.O Box 287 Unanderra NSW 2526** **Mobile: 0402 060 559**		
Form of Consultation	**Face to face**	Phone call	Email
Issues discussed / outcomes	**Martin Wells:** **1. Re-capped outcomes of previous meeting 7 May 2008** **a. Secondary main in Calderwood Road** **b. Upgrades required for ultimate development** **c. Potential offtake station at Eastern Gas Pipeline.** **2. Outlined planning status of Calderwood Urban Development Project (identified as Major Project now subject to Concept and Project Application).** **3. Timing for Concept and Project Application is lodgement in February 2010.** **4. DLL is seeking natural gas reticulation within development starting at Stage 1.** **5. Proposed residential lot staging for DLL project is:** **a. 2011 75 lots** **b. 2012 125 lots** **c. 2013 210 lots** **d. 2014 225 lots** **e. 2015 - 2020 1,125 lots (225 lots per annum)** **f. 2020 - 2025 1,125 lots (225 lots per annum)** **g. 2025 - 2030 1,125 lots (225 lots per annum)** **h. 2030 – 2035 1,125 lots (225 lots per annum)** **i. > 2035 Balance of other lands (approx 3,000 lots)** **Elle Peters:** **1. Jemena is working out upgrades to the system at present.** **2. Upgrade solution is unlikely to be off-take station at EGP.**		

	3. **Rather the upgrades will be reinforcement to existing system (black boxes to increase pressure in existing system)** 4. **EP to consider provision of natural gas for Stage 1, then broader use in DLL project (approx 5,000 lots) and then whole release area (approx 8,000 lots).** 5. **Jemena will run corporate model on commercial viability of gas reticulation with emphasis on providing early capacity for Stage 1.** 6. **Existing capacity exists at the Tullimbar development.** 7. **EP expects that natural gas will be available to the site once design investigations have been done. Timing will need to be considered.** 8. **Common trenching of gas mains will help commercial viability of gas reticulation.** 9. **Jemena will need from DLL when available:** a. **Projected number and timing of lot release** b. **Landuse and staging for non-residential land (schools, employment land, retail etc)** c. **Lot layout, particularly for Stage 1.** 10. **Jemena does provide gas for cogeneration plants, but this is negotiated with Jemena's contract division rather than EP.**
Actions arising	1. **DLL to provide to Jemena:** a. **Staging for residential lots (done in notes above)** b. **Landuse and staging for non-residential land (when available)** c. **Lot layout for Stage 1 (when available)** 2. **Jemena to continue investigation for providing natural gas to Calderwood Urban Development Project with early emphasis on Stage 1.**

Calderwood Urban Development Project
Summary Record of Agency Consultations

Date	**Wednesday 28 October 2009 – 10:00am** **at Sydney Water No. 1 Smith Street Parramatta**		
Project team member / firm	**Bill Mitchell – Calderwood Project Director – Delfin Lend Lease** **Martin Wells – Infrastructure Engineer – Cardno**		
Organisation	**Sydney Water**		
Name of contact	1. **Sharon Davies** 2. **Helal Morshedi** 3. **Mark Obuchowski** 4. **Alicia Nucifora**		
Position in organisation	1. **Manager Urban Growth and Asset Management** 2. **Coordinator Strategic Projects** 3. **Team Leader Southern Area** 4. **Project Manager**		
Contact details	**1 Smith Street Parramatta NSW 2150** **PO Box 399 Parramatta NSW 2124**		
Form of Consultation	**Face to face**	Phone call	Email
Issues discussed / outcomes	1. **Bill Mitchell** a. **Discussed scope, scale and status of Calderwood project (refer Briefing Note tabled at meeting)** b. **Noted previous updates provided at SWC / DLL Relationship Meetings with Paul Saxby, Gordon Cameron, Pamela Derijk.** c. **Advised of DLL successful HAF applications and housing affordability imperatives leading to current Project status** d. **Advised of DoP assessing officers Michael File, Simon Bennett and Michelle Cramsey.** 2. **Martin Wells** a. **Discussed previous dialogue and correspondence (refer Briefing Note tabled at meeting)** b. **Discussed evolution of water & sewerage infrastructure solution:** i. **Short term potable water from Sophia St Albion Park** ii. **Medium term potable water extension from Southern Towns Trunk Main along Marshall Mt Rd to proposed Mt Marshall reservoir (site owned by**		

Sydney Water)

iii. Sewage to Albion Park Low Level Carrier Main

iv. Offsite sewerage upgrades identified in liaison with Sydney Water Illawarra Region (refer Feasibility Letter in Briefing Note).

v. Recycled water proposal abandoned in accordance with Sydney Water Area Strategy for Illawarra release areas.

vi. Domestic rainwater tanks proposed for BASIX and local stormwater harvesting proposed for public space irrigation.

3. Bill Mitchell – Discussed scheduled release rate of residential lots:
   a. 2011 75 lots
   b. 2012 125 lots
   c. 2013 210 lots
   d. 2014 average of 225 lots per annum thereafter
   e. Balance of other lands (assumed at approx 3,000 lots as per MDP)
4. Sharon Davies
   a. Noted abolition of DSP's. Sydney Water to fund trunk infrastructure. Program to coincide with MDP.
   b. SW Planning approvals will be obtained early to allow rapid Sydney Water response to urban growth.
   c. SW approvals to be obtained through Part 3A EP&A Act.
   d. Developer to fund out-of-sequence works. Sydney Water will reimburse costs at:
      i. 33% completion if project is on the MDP
      ii. 66% completion if project is off the MDP
   e. The definition of the "project" would be negotiated with the proponent.
   f. Calderwood is identified in the draft Growth Servicing Plan (GSP) for planning and environmental studies.
   g. Industry briefing on GSP scheduled for 25 November 2009 – BM & MW to attend.
   h. Utlimate decision to approve is made by the Minister for Planning. Infrastructure provided by Sydney Water as required.
   i. Need to ensure recognition of Project Part 3A approvals in any SW Part 3A approvals processes.
   j. Confirmed that, subject to Project approval, Calderwood servicing funding options as:
      i. Via GSP, or
      ii. Via process outlined at Item 4 (d) above.

	5. **Mark Obuchowski:** a. **SKM completed the Illawarra Water & Sewer Area Plan for Sydney Water** b. **Parsons Brinckerhoff has been engaged to further the studies for the Illawarra (West Dapto, Calderwood and other Release Areas).** c. **Environmental approvals expected by the end of 2010.** d. **Sydney Water has committed funds to approvals ($5M over 5 years) and delivery ($35M over 5 years) for Illawarra release areas.** e. **Funds could be shifted to various infrastructure items depending on project takeup rates.** f. **Noted water & sewerage infrastructure available to accommodate initial stages of Project development.** 6. **General discussion:** a. **Dated status of MDP (Illawarra at 2007 base date).** b. **Status of Regional Strategy housing targets.** c. **Basis for changed Calderwood status.**
Actions arising	1. **Sydney Water to provide generic shell of Sydney Water Commercial Agreement to Cardno for information.** 2. **Cardno to provide draft copy of servicing strategy to Sydney Water when available.**

agency $33,913

Sydney WATER

Case Number: 54097

Delfin Lend Lease
C/- Forbes Rigby Pty Ltd

Dear Applicant

FEASIBILITY LETTER

Developer: **Delfin Lend Lease**
Development: **4500 Lot Subdivision – Marshall Mount Road & Calderwood Road, Calderwood**

Your attention is drawn to the requirements in this letter that may apply should you proceed to obtain development consent and then are required to apply to Sydney Water for a Section 73 Subdivider/ Developer Compliance Certificate (the Certificate) for your proposed development.

Because of the tentative nature of this application, after you receive that consent, you will need to make **a fresh application to Sydney Water for that Certificate by engaging your current or another authorised Water Servicing Coordinator (the Coordinator).**

The advice provided in this letter is valid for a year from 16th June 2004 except that there may be two variations during this period in respect of the Developer Charges identified below. These are:

(a) CPI adjustments of charges within that period that might apply; and
(b) Adjustment of charges that may be scheduled for review using methodology established by IPART. After review, Sydney Water is required to apply new registered prices.

Since you have not yet obtained a consent, this letter contains Sydney Water's anticipated requirements. It is not an approval to execute any work.

For a list of authorised Coordinators, see www.sydneywater.com.au and refer to *e-Developer* under *Your Business*, or call **13 20 92**. Coordinators may provide you with **a quote or advice regarding costs for their and other supplier's services/ works as well as** other Sydney Water costs.

The Coordinator will generally be the single point of contact between you and Sydney Water **and can answer any questions in the first instance you may have on Sydney Water's developer process and developer charges.**

SUMMARY OF REQUIREMENTS:

This following investigation has been carried out on the basis of present day conventional sewerage and water services and should in no way be taken as the servicing methodology that would be required should rezoning be successful.

WATER

Presently there is no reticulated water supply to the Calderwood area. Previous planning identified a requirement for the construction of a trunkmain from Wongawilli Reservoir to new reservoirs at Avondale and Marshall Mount. The latter reservoir proposed to service the Calderwood area,

although the resultant service zone will not supply that portion of the applicant's land immediately south of Mount Marshall.

The adjacent Albion Park water system is a site specific design and has been sized to service only the urban zoned land in Albion Park and as such any service provided to Calderwood can only be a short term solution.

Consequently as a temporary measure 500 lots at Calderwood could be serviced from the Albion Park system by one of the following options. Crucial to this approach is that the Marshall Mount Reservoir system must be constructed and these 500 lots transferred to this system prior to exhaustion of the existing Albion Park system capacity thus enabling the development of the remaining 500 lots in Albion Park.

- **Option 1:** - Lay 5,300m of 250mm main from corner Princes Highway/Mount Brown Rd via Huntley Rd and then Marshall Mount Rd to the site, (Limit of Supply 70m AHD);
- **Option 2:** - Lay 2,000m of 250mm off the proposed 375mm outlet main to service Tullimbah Village from corner Sophia/Church Sts via Illawarra Highway and Calderwood Rd to site, (Limit of Supply 55m AHD) ;
- **Option 3:** - Lay 920m of proposed 450mm outlet main from Mount Terry Reservoir (if not already laid by Tullimbah Village developers), then lay 3,000m of 250mm lead-in to site via Illawarra Highway and Calderwood Rd, (Limit of Supply 120m AHD), and
- **Option 4:** - Lay 2,000m of 250mm main from corner of Illawarra Highway and Taylor Road to the site via Taylor Road and Calderwood Road, (Limit of Supply 75m AHD).

Options 2 & 3 above would be constructed in conjunction with the Tullimbah development, which is in the planning stages, with the first lots expected to be released in early 2005.
Options 1 & 4 are independent of other proposed developments.

SEWER
Sydney Water in 2002 completed modelling of the Shellharbour Sewer System based on the projected development of existing urban-zoned land to 2021. The model identified various system amplifications required to cater for the ongoing development. These future works have been programmed for construction by Sydney Water to enable optimal operation of the system.

Rezoning of Calderwood for urban use was not considered in the model however if this were to occur then the resultant additional flows would accelerate the identified amplifications to the existing Shellharbour Sewerage system. It is envisaged that these amplifications will form part of Sydney Water's capital works programme and these works will be included in future IPART approved Development Servicing Plans.

Following is the sewerage infrastructure adjacent to the site and progressively downstream to termination at the Shellharbour Sewage Treatment Plant.

Modelling to 2021 for the sewerage system included a total allowance for 2,135 additional lots from Albion Park, including 1,535 lots from Tullimbah.

- **Albion Park Low Level Carrier Sections 3 & 4**
  The closest major sewer with capacity to service the proposed site is Section 4 of the Albion Park Low Level Carrier, which drains via Section 3 to SPS 505. The carrier downstream of Calderwood Road has approximately 350 L/s spare design flow (DF) capacity in addition to the design flows to be generated by the 2,135 lots.

- **SPS 505**
  SPS 505 will be amplified in 2005 to cater for the ongoing growth in Albion Park particularly Area 10B (Stockyard Creek, Rosetta Hills Estate and Harris land) off Terry Street and new growth in Area 9 (Tullimbah Village). This amplification (installation of a 3rd pump to give a total output

of 390 L/s) will cater for 2,135 lots. The station would require further progressive amplification (larger pumps, storage and electricals) to cater for the development at Calderwood.

- **Rising Main from SPS 505**
  The existing RM is a 500mm DICL and will require duplication if SPS 505 is amplified to cater for proposed development at Calderwood.

- **Albion Park Low Level Carrier Sections 1 & 2**
  Receives pumping from SPS 505 together with gravity flows from Albion Park Rail and Oak Flats. There is sufficient capacity in these sections to cater for the projected urban development and the proposed development at Calderwood. This sewer flows to SPS 500 at Oak Flats.

- **SPS 500**
  Has only sufficient capacity to cater for the 2,135 lots identified from Albion Park together with ongoing development such as Haywards Bay, any additional lots such as Calderwood will necessitate further amplification to the station.

- **Rising Main from SPS 500**
  Will require amplification to cater for the increase in flows from the surrounding gravity catchment, pumping from Haywards Bay and the 2005 amplification to SPS 505.

- **Oak Flats Submain**
  Has sufficient capacity to cater for the Calderwood lots.

- **SPS 498**
  Has sufficient capacity to cater for the ongoing identified urban development, any additional lots such as Calderwood will necessitate further amplification to the station.

- **Rising Mains from SPS 498**
  Have sufficient capacity to cater for the 2,135 lots identified from Albion Park; any additional lots will necessitate further amplification.

- **Shellharbour Sewage Treatment Plant**
  Programmed amplification in 2006 to cater for identified development to 2021.

Greenfield Growth Servicing Strategy

Further to the objectives previously outlined the following servicing alternatives will be considered by Sydney Water in the development of a Greenfield Growth Servicing Strategy for the Illawarra.

The major premise of sustainable development is that water, what ever its nature, is a valuable resource and its use must be optimised. Based on the CSIRO's paper "Innovative Urban Water Solutions" (June 2002) and Sydney Water's Greenfield Manual there are five broad alternatives for providing future water services. They are:

- Conventional centralised system, based on one water supply and effluent discharged to waters.
- Conventional centralised system with extensive water demand management.
- Integrated water services approach linked with Integrated Effluent Management at a regional scale. (Water efficient model)
- Integrated water services approach at local level (Socially acceptable model)
- Household / estate self sufficiency (Pro environment model)

Conventional Centralised

This alternative would result in Illawarra expanding with a service delivery strategy for water and wastewater planned and operated as independent systems. New growth areas would be serviced with the traditional approaches and be connected to the existing centralised water supply and sewerage treatment systems. This alternative would be relatively easy to implement, as no change from the traditional methodology is required. However, when viewed from the perspective of the water cycle this approach is not sustainable due to high potable water usage and continued treat and discharge of most sewage effluent. It will lead to an increase in the demand for water supplies that will ultimately lead to water shortages. It is not unexpected with this strategy that water transfers or other expensive sources of water may be developed.

Conventional Centralised with Demand Management

This alternative approach is based on the previous but also involves active leak reduction, continued development and implementation of the demand management program including the installation of AAA rated water fittings and the installation of rainwater tanks. This will reduce the water consumption of both existing and new development areas. However, the reduction in water consumption from the Demand Management Program alone may not be sufficient to bring consumption within the dam safe yield or counteract the reduction in the safe yield through the introduction of an environmental flow regime. However just reducing the demand for potable water will not make full use of all available water resources, nor result in required improvements to waterways health.

Integrated Water Services Approach, Linked with Regional Effluent Management

This alternative endeavours to provide an integrated water cycle management approach to the provision of water services. It seeks to provide long term sustainable services whilst maintaining use of existing potable supply for high grade purposes and recycling effluent as part of a regionally based Integrated Effluent Management Strategy.

Features of the integrated water service approach would include:

- Active implementation of the Demand Management Program.
- Progressive use of alternate water supplies for lower grade purposes such as use of household rainwater tanks.
- Recycled effluent to replace industrial water supply, water use in agriculture, or potable water uses eg horticulture.
- Enable a sustainable environmental flow regime to improve river health.
- Asset Planning
  - Leak tight sewers for all new networks.
  - Recycled water storage and reticulation.
  - Stormwater managed as a source of water.
  - Integration of water services and structure planning.

This alternative is well suited for application utilising the existing infrastructure arrangement and the expected area growth profile. It is the model that will probably be the most acceptable in the medium term (20 years). It also has the least implications for the sewage system as the total waste stream will be collected and treated at the development site. The sewage flow will be reduced with the use of highly water efficient appliances and rainwater tanks even with no "on lot" use of grey water.

Integrated Water Services Approach at Estate & Household Level

This alternative provides an integrated water cycle management approach similar to the previous but applied at the local level (estate or household level). The existing potable supply is used for high-grade

purposes, effluent is treated and recycled locally for non potable uses in conjunction with household rainwater tanks. The concepts of cascading water use in the household and or estate are introduced.

This alternative is well suited for estates and households remote from existing sewerage systems. It is also applicable for conversion of existing households to a more sustainable water usage level.

Houschold / Estate Self Sufficiency

This alternative provides for self-sufficient water cycle management for new housing developments at the estate or household level. No external potable water or sewerage/recycled water services are provided to the self-sufficient estate. Potable water is provided through treatment of rainwater tank supplies, and cascading water use and recycled effluent and stormwater provide lower grade water requirements. The aim is to provide various water products that are fit for purpose. Implicit in this approach is focus on the services provided by water products, such as cleaning clothes and watering the garden. These activities are analysed to determine the best way of providing that service and tailoring different water products to achieve the desired services.

This alternative is a possible future solution to be implemented for individual new development areas however it cannot easily be applied to the existing customers. It is a development of the systems used in Australia prior to the 20th century, except in the few large cities that had basic reticulated systems. New technology makes this model more feasible however it is also more dependent on attitudinal changes by consumers, legislators and regulators

Discussion

Sydney Water's current service provision strategy utilises a combination of these alternate approaches and efforts have begun to develop an integrated water services or efficiency model approach. Although many of the current service programmes and targets are moving towards sustainable solutions, to continue as is or the do no more option will not be enough and changes or additions to the service delivery strategy are required.

The solution to these issues is dependent on State and regional planning initiatives and the timing of private sector investments. It will be progressed in the Illawarra by a structure planning process that includes servicing for industrial growth with the residential needs and a life cycle analysis of options process that best meets sustainability criteria at least cost.

DEVELOPER CHARGES

Developer charges for this development would be applied at the Shellharbour Sewer and Avon Water Development Servicing Plan Rates.

END OF NOTICE