

Appendix G

Infrastructure Report

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12 January 2009

Dear Graham

South Dural Servicing Infrastructure Memo Report

1.0 Background Information

South Dural development area is located south of Round Corner/Dural and is bounded by Old Northern Road to the west, Hastings Road to the south and New Line Road to the east. The area is currently zoned as Rural BA (Small Landholdings – Agricultural Landscapes), Environmental Protection B (River Catchment) and Special Uses A (Community Purposes). The area comprises approximately 240 hectares.

As part of this servicing review Maunsell AECOM consulted with Sydney Water, Alinta, AGL, Telstra, Integral Energy and Energy Australia. A Dial Before You Dig search was also undertaken.

The results of this review are detailed in this report

1.1 Concept Master Plan

The Preliminary dated 14 July 2008 details the following potential land uses and dwellings. Maunsell AECOM has used this plan to estimate the equivalent population and demands for servicing.

Table 1 Estimated Dwellings and Equivalent Population (EP)

Land Use	Number of Dwellings/ Area	Estimated Equivalent Population (EP)
Large Lots (1,000 – 2,500m ²)	100	350
Conventional Lots (600 - 800m ²)	800	2800
Cottage Lots (400- 599m ²)	240	840
Integrated Housing (250m ² site area / dwelling)	1800	6300
Local Centre	1000m ²	16
Parkland		
Total		10306

Based on 3.5 EP = 1 Equivalent Tenement (ET), the equivalent number of dwellings is estimated to be approximately 2900.

2.0 Potable Water Supply

2.1 Existing Potable Water Infrastructure

The South Dural development area is within the Dural Water Supply System. The Dural Water Supply System currently supplies approximately 16600ha including the areas of West Pennant Hills, Castle Hill and Cherrybrook. This supply system is fed from the Prospect North and East Ryde Delivery Systems. Water is pumped via Water Pumping Station WP129 from the 1200mm diameter Prospect to Thornleigh main into the three Dural South Reservoirs (R112, R158 and R288) located at the north east corner of the development area. The reservoirs also provide a water supply via Dural South Pumping Station WP14 to Dural Elevated Reservoir R39 in Galston Road, Dural that serves the large rural areas north of Round Corner as well as the villages of Round Corner, Galston and Glenorie. The Full Service Level of the existing Dural Surface Reservoir and the Elevated Reservoir is 224m AHD and 247m AHD respectively.

2.2 BASIX

BASIX (the Building Sustainability Index) requires that all new residential dwellings incorporate features to reduce potable water consumption by up to 40% (compared to the metropolitan average). Whilst this applies to single residential and multi unit dwellings there are as yet no requirements for commercial and industrial developments.

The Government announced as part of the 2006 Metropolitan Water Plan that *“it is committed to providing recycled water via dual reticulation to all new homes to be built in new suburbs in Sydney’s North West and South West growth centres over the next 25 years.”* However, it is understood that this mandate does not apply to existing MDP lands that are outside of the Growth Centres. This means that whilst the BASIX requirement must be met, the provision of a dual reticulation system may not be mandatory for South Dural.

The BASIX requirements can be achieved by the incorporation of a combination of rainwater tanks, stormwater harvesting and dual reticulated recycled water schemes.

There are currently no recycled water mains servicing the immediate adjacent developments in the surrounding area. The following demand calculations consider two servicing options where the alternative source of water could either be rainwater tanks or by dual reticulated recycled water system.

2.3 Potable and Recycled Water Demands

The potable and recycled water demand estimates are initial calculations based on the proposed future land use which will yield approximately 2900 equivalent residential lots over say 160 net ha.

Table 2 Potable Water Demand Rates with Rainwater Tanks

Item	Design Criteria [kL/net ha/day]		Estimated Demand
			MLD
Residential	Average Day Demand	18	2.9
	Max Day Demand	41	6.6
	Max Hr Demand	90	14.4

Table 3 Potable Water and Recycled Water Demands with a Dual Reticulation System.¹

Item	Design Criteria (kL/dwelling/day) ¹		Estimated Demand MLD
Drinking Water Residential	Average Day Demand	0.28	0.8
	Max Day Demand	1.0	2.9
	Max Hr Demand	3.4	9.9
Recycled Water Residential	Average Day Demand	0.48	1.4
	Max Day Demand	1.5	4.4
	Max Hr Demand	6.9	20.0

1. Based on the Sydney Water Design Criteria for Dual Reticulation Systems (2007) used for initial option studies in the South West Growth centre.
2. Assumes recycled water used for gardens, toilet flushing and washing machines.

2.4 Capacity of Existing Potable System

Sydney Water has advised that the existing potable water infrastructure in the area is insufficient to supply the development area. Sydney Water has indicated that the construction of an additional 4ML Elevated Reservoir located at the existing elevated reservoir site at Dural on Galston Road would be required for the development area to be serviced. The existing water pumping stations at Pennant Hills (WP129) and South Dural (WP014) will also require upgrading. New inlet /outlet mains to the new reservoir and amplifications to existing watermains in Galston Road and Old Northern Road are required.

Maunsell AECOM has reviewed Sydney Water's proposed initial servicing strategy and the basis of its sizing and estimated cost of proposed works. They are considered reasonable at this stage. It should be noted however, that these costs are indicative order of cost estimates and more detailed modelling will be required to further refine the options and costing.

2.5 Potable Water System without Dual Reticulation.

Sydney Water has provided indicative infrastructure upgrades and corresponding costs which are detailed in Table 4 below.

Table 4 Potable Water Upgrade Costs

System Component	Description of Works	Preliminary Cost Estimate (\$Million)
Pennant Hills WP129	Upsize 4 pumps	1.00
Dural South WP014	Upsize 4 pumps	0.95
Dural Elevated Reservoir	Construction of new 4ML Elevated Reservoir	5.60
Trunkmains	From Dural South Reservoir to development area 3km of 375mm pipe.	4.40
Galston Road main amplification	610m (amplify from 375mm to 500mm)	1.30
Inlet/Outlet mains to Dural Elevated	200m of 600mm pipe.	0.50
Old Northern Road DSP main	655m of 300mm pipe.	0.75
Total		14.50
Cost per lot		\$5,000

- Notes
1. Cost data provided by Sydney Water.
 2. Does not include reticulation cost to be borne by the developer.

2.6 Existing Dual Reticulation Infrastructure

There is currently no Recycled Water infrastructure in the South Dural area or any surrounding areas.

2.7 Dual Reticulation System Servicing Options

The ability to proceed with this option is predicated on the ability to receive recycled water from a nearby sewage treatment plant (STP). This requires the development of a recycled water scheme based around an existing STP. The two nearest STP's to the development area are at Castle Hill which is approximately 6km away and at West Hornsby which is approximately 13km away. Land availability at West Hornsby STP is limited, however it is believed that there is sufficient land for recycled water facilities. This will be subject to further onsite survey and investigations.

Sydney Water also advised that it hasn't looked at sourcing recycled water from Castle Hill STP at this stage but it is an option that should be considered if the development is approved. Sydney Water further advised that the current inflow into Castle Hill STP is about 6.5MLD. Therefore if Castle Hill STP was considered as an option for recycled water there would be sufficient product.

Dual reticulation scheme costs below are based on recycled water sourced from West Hornsby STP. They do not include STP upgrades or treatment costs. There may be up to \$7 million in savings on the estimated costs detailed below if the option of providing recycled water from Castle Hill STP is found to be viable in the future. This is because the length of the rising main from Castle Hill STP is approximately 7 km shorter

2.8 Cost of Dual Reticulation system

Table 5 Recycled Water Costs

System Component	Description of Works	Preliminary Cost Estimate (\$Million)
Rising Main	From West Hornsby STP to Elevated Reservoir site (15.3km of 250mm pipe)	14.70
West Hornsby STP RWPS	100kW Recycled Water Pumping Station	1.80
Elevated Reservoir	Construction of new 3 ML Reservoir	5.00
Eastern Outlet Main	1km of 375mm pipe	1.46
Western Outlet Main	1.8km of 375mm pipe	2.63
Internal Ring Road	3.8km of 300mm pipe	4.30
Internal Ring Road	2.2km of 200mm pipe	1.80
Total		31.69
Cost per lot		\$11,000

- Notes
1. Cost data provided by Sydney Water.
 2. Does not include reticulation cost to be borne by the developer.

2.9 Conclusions & Recommendations

Based on advice from Sydney Water, there is insufficient capacity in the existing water supply system to service the proposed development. Sydney Water has indicated that there is a viable option to bring potable water into the site. This involves the construction of a new 4ML elevated reservoir on the existing elevated reservoir site at Dural on Galston Road, construction of inlet/outlet mains and the amplification of water pumping stations at Pennant Hills and Dural South. The developer will also be required to lay approximately 3km of trunk main from the new reservoir to the development site and amplify existing watermains in Galston Road and Old Northern Road.

The provision of recycled water for a dual reticulation option from West Hornsby STP may be cost prohibitive. If this is the case an alternative source of water will need to be provided using rainwater tanks. Further analysis of the viability of this option will need to be undertaken in the detailed planning phase.

3.0 Wastewater Servicing

3.1 Existing Wastewater Infrastructure

The development area is located at the boundary between the West Hornsby and Castle Hill Sewerage Systems. The area naturally gravitates towards the West Hornsby Sewerage System. The surrounding areas, which include parts of Castle Hill and Dural, drain via the 450mm Georges Creek Carrier to SPS641. SPS641 pumps to the Elouera Carrier and flows are then transferred via gravity to the Thornleigh Submain and to SPS541. SPS541 pumps directly to the inlet works of West Hornsby Sewerage Treatment Plant (STP).

West Hornsby STP has a total plant capacity of 13.9ML/day with an approved operational capacity of 12.6ML/day. The STP is currently running at a capacity of 11.5ML/day. Sydney Water has no planned capital works for West Hornsby STP.

3.2 Wastewater System Demands

Table 6 Wastewater Flow Calculations

Land Use	EP	ADWF (L/sec)	PDWF (L/sec)	DWWF (L/sec)
2900 ET @ 3.5 EP per ET	10,150	21	49	120

These previous table of values was calculated using the Association of Australia (WSAA) – Sewerage Code of Australia

3.3 Capacity of Existing Works

Sydney Water has advised that West Hornsby STP has sufficient capacity to service the proposed 2500 ET development at South Dural.

Sydney Water further advises that preliminary hydraulic wastewater modelling that was undertaken indicated that the existing carrier main discharging to SPS641 has sufficient capacity to service the proposed development. This modelling was based on the existing pumping station and rising main capacity, therefore the existing pump station and rising main has sufficient capacity to service the development site.

3.4 Wastewater System Servicing Options

As previously stated the existing Georges Creek Carrier draining to SPS641 and the SPS and rising main have spare capacity to serve the development. The end of the carrier is located just south of the intersection of Hastings Road and New Line Road and finishes just within the development site. An extension of the carrier main will most likely be required to service the northern parts of the site.

At this stage the future wastewater system sizing and indicative costs have not been considered.

3.5 Conclusions and Recommendations

Based on advice from Sydney Water the existing wastewater collection system, transfer system and the West Hornsby STP appear to have spare capacity to serve the proposed development. Further hydraulic modelling will need to be undertaken in the detailed planning phase of this project to determine the sizing and staging of infrastructure required and the impact on the adjacent sewerage systems.

4.0 Power Servicing

Power servicing options have not changed greatly since the GHD Report of March 2007.

4.1 Existing Infrastructure

The development area is located on the boundary between Integral Energy and Energy Australia. Integral Energy's area is west of New Line Road, and Energy Australia is to the east of New Line Road. Integral Energy has several Zone Substations (ZS) serving the surrounding area including Kenthurst ZS, Kellyville ZS and Castle Hill ZS. See Attachment D.

4.2 Capacity of Existing Infrastructure

Integral Energy has indicated that their current network is at capacity and power to the area is likely to be delivered by Energy Australia. However, it is believed that Energy Australia's network is also close to capacity.

4.3 Servicing Options

Estimated electrical demand based on 2900 lots is approximately 12.5MVA. Possible servicing options are by Integral Energy via the new substation at Glenhaven 1.5km away or by Energy Australia via proposed substation at Galston approximately 5km away. New underground feeder mains from either of these substations would need funded by the developer.

5.0 Telecommunications

Telephones are considered an essential service and are supported under the Universal Services Obligation (USO), set out under the Federal Telecommunications (Consumer Protection and Services Standards) Act 1999, to provide to all people in Australia, reasonable access, on an equitable basis, to standard telephone services and payphones.

The universal service regime also includes the digital data service obligation, which is the obligation to ensure that either general digital data services or special digital data services are reasonably accessible to all people in Australia on an equitable basis. The general digital data service is a carriage service that provides a basic rate ISDN (Integrated Services Digital Network) capable of transmission speeds up to 64kbps. Both voice telephony and data are provided using copper cable.

Telstra is the primary universal service provider which means it has the obligation to provide these services including the installation of conduits and cables (not including trenching) for future telephone connections. It is cost effective for the developer if the laying of cabling can be coordinated with the power and gas installation so that the services share a common trench. The separation of the services within the trench would be in accordance with Australian Standard AS/ACIF S009:2006.

At the other end of the spectrum a fibre optic network is also available to the developer. This alternative provides faster data transmission speeds, free-to-air digital TV and has the capacity to handle multiple telephone lines. However, this option will incur additional costs to the developer and an assessment of value added versus capital outlay needs to be performed.

5.1 Existing Telecommunications Infrastructure

Currently there is limited telecommunications infrastructure within the South Dural development area. The current infrastructure has only sufficient capacity to service the existing area and it will require augmentation to service further development. There is extensive telecommunication infrastructure in the surrounding area. The development site shares two Exchange Service Areas (ESA's). The satellite image below provided by Telstra indicates the ESA boundary across the site.



Figure 1 – Red line indicating ESA boundary

The area north of the red line is part of the Dural ESA and the area south of the red line is part of the Castle Hill ESA. The location of the exchange for the Dural ESA is 969 Old Northern Road Dural while the location of the exchange for the Castle Hill ESA is 4 Castle Street Castle Hill.

5.2 Mobile Networks

The network company is responsible for any development of infrastructure required to accommodate the additional loading to the area. At this stage, according to Telstra's website and personal correspondence there is a large portion of the site where 3G network coverage is available while some areas are only able to receive GSM network access (**Figure 2**). The establishment of new mobile repeater towers will follow the standard development procedures and the network providers themselves fully fund all infrastructure.

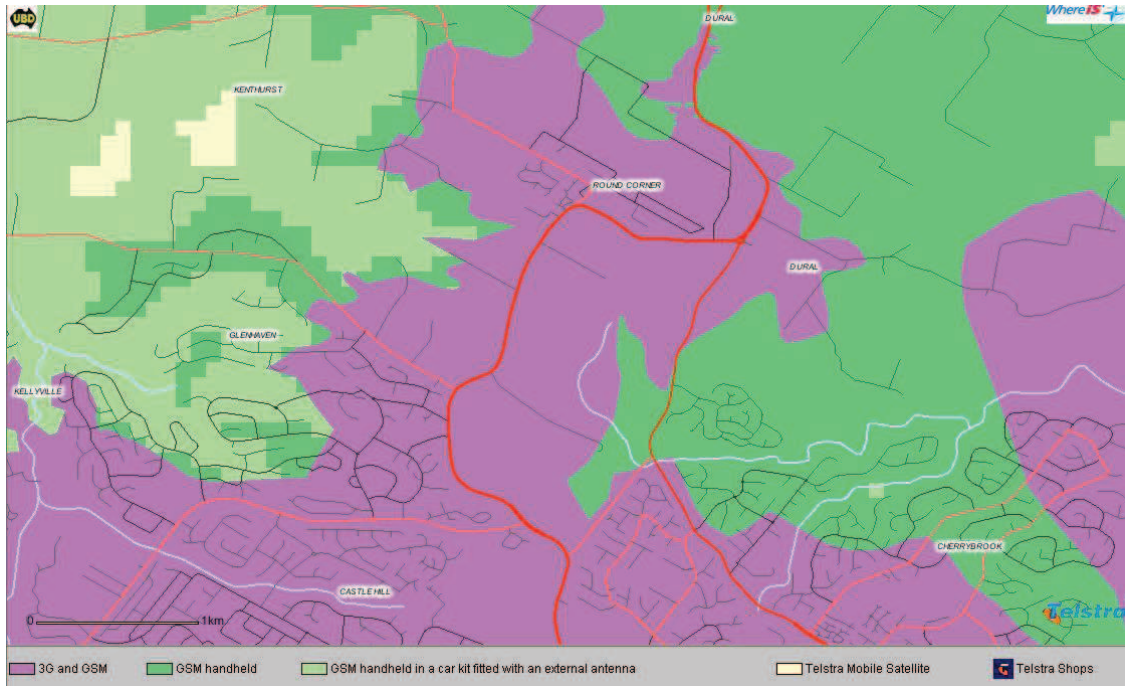


Figure 2 – Telstra Mobile Phone Network Coverage

Similarly the site is also within Optus' 3G mobile network, providing 3G coverage throughout the whole site. A map of the Optus mobile network in the area is also provided below.

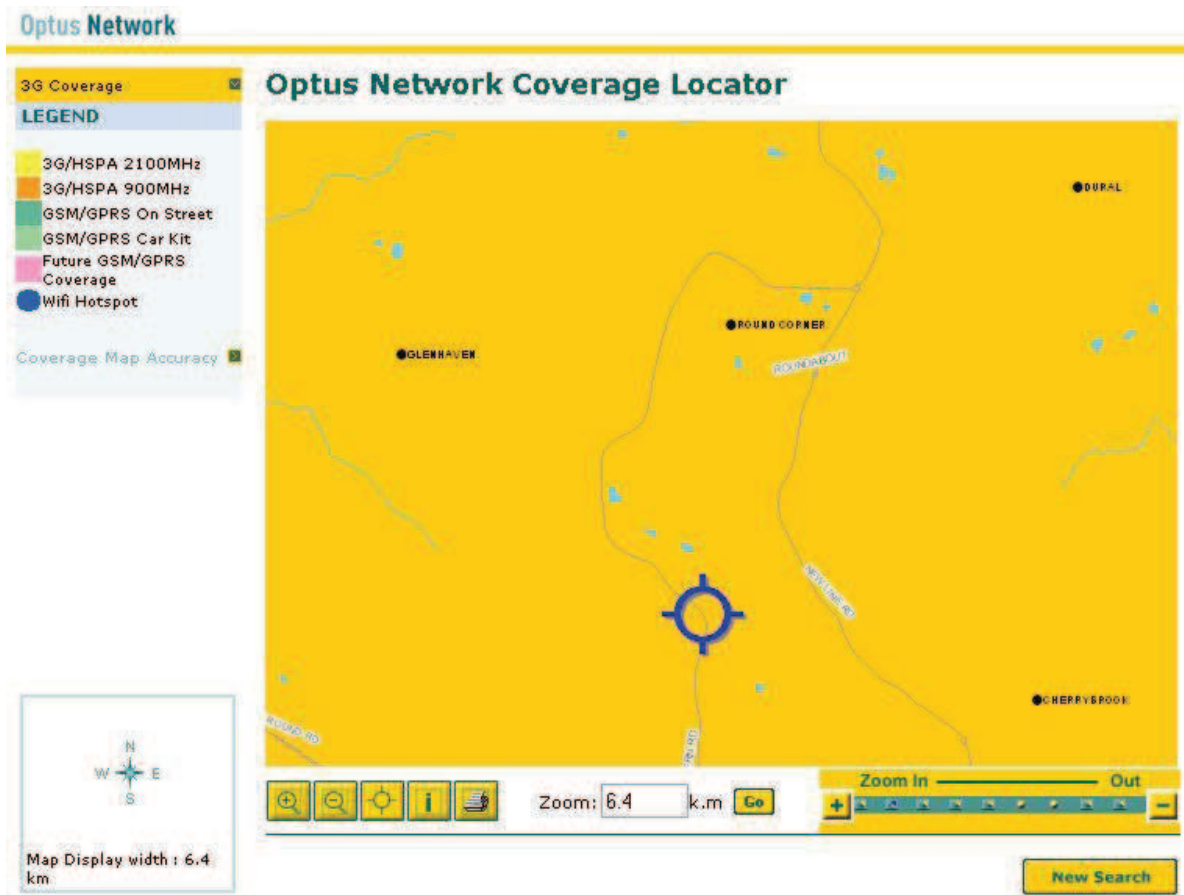


Figure 3 – Optus Mobile Network Coverage

5.3 Telecommunication Network Demands

As stated earlier Telstra is wholly responsible for standard copper cable infrastructure up to the point of connection. Telecommunications network demand is calculated on a land use basis, which is performed by Telstra.

5.4 Telecommunication Network Servicing Options

Option 1 – Standard Copper Cabling

Telstra, as the primary universal service provider has an obligation to provide at no cost single line voice telephony and a basic 64kbps ISDN connection to each lot. Telstra will provide ADSL1 as standard in preference to the basic ISDN thus providing limited broadband services at no extra cost. Costs associated with these services are operationally based not based on capital.

ADSL1 (Asymmetric Digital Subscriber Line) provides data rates of up to 8 Mbps at the exchange. However, the actual speeds experienced at the user's point of connection will depend on a number of factors including; network configuration, line quality & length, exchange type, customer premises interference, traffic and equipment.

Over time Telstra may upgrade this service to ADSL2+, a high-speed broadband internet service that can achieve data rates of up to 20Mbps at the exchange, subject to the same de-rating factors and commercial viability.

Standard deployment is provided by Telstra at no cost to the developer provided that the developer provides a suitable trench that complies with Telstra's specifications. It is cost effective for the developers to coordinate the laying of cables with the power and gas installation so that the services share a common trench. The shared trench would be within the standard footpath allocation and will follow the subdivision road layout.

Option 2 – Fibre Optic Cable

If Telstra determines upgrading the proposed system to be feasible and the developer considers upgrades to be of importance, the most logical upgrade would be to upgrade the standard copper cable to a fibre optic cable. Installation of fibre optic cable provides high speed broadband scalable to 100 Mbps, free to air digital TV, Foxtel and 4 telephone services for each lot. It also provides the option of possible upgrades such as gaming, interactive education, business from home applications at office speeds should the future customer require it. It is more expensive for the developer but does provide a far superior service which makes the site more appealing to prospective buyers. As the development area is split across two ESA's the fibre optic cable would come from Castle Hill exchange for the south of the site and Dural exchange for the north of the site. Due to the sharing of the ESA's the cost of servicing with fibre optic cable could potentially be increased. This study has not looked further into costing of the telecommunications infrastructure, Telstra should be approached for further information.

5.5 Telstra Smart Community

Telstra recommends the developer lodge the development with the Telstra Smart Community website www.telstrasmartcommunity.com as soon as possible to initiate Telstra's reticulation process. Subject to sufficient lead time, Telstra's network build would be carried out in a timeframe to meet expected first service requirements in the estate (network construction timeframe is generally 6-9 months for equipment of this nature, depending on the scope required).

Registration with Telstra on their web site requires the following information;

- Total lots and type of service required;
- A hard and digital copy of the development plan;

- Staging details;
- A copy of the proposed construction plan including indicative trench opening dates;
- First customer required service date; and

Telstra advised six months in advance to supply and construction of technology

5.6 Conclusions & Recommendations

It has been determined that telecommunication services can be provided within the South Dural development area. Telstra currently meets its regulatory requirements to the area by providing voice services which could possibly provide a limited Broadband service and at this stage can only provide ADSL1(Asymmetric Digital Subscriber Line) of up to 8 Mbps at best. To provide a standard copper cable service the telecommunications network in the area requires upgrade.

Should the developer wish to do so, a commercial agreement can be entered into with Telstra where improved data services in the form of fibre optic cable would be provided to the site. It should be noted that this agreement would be on a commercial basis and would need to be negotiated.

It is recommended that further discussions are held with Telstra regarding detailed costing and timings for the provision of a fibre to the home network expansion as detailed planning for the development progresses. To initiate the process it is recommended that the developer inform Telstra of likely commencement of this development and to register this development on the Telstra Smart Community website: <http://www.telstrasmartcommunity.com>.

Telstra require a lead time of approximately 3 months from trench open date for the estate reticulation. If any display homes are to be constructed, or telecommunications requirements are expected in advance of the release of lots to the public, this should be communicated to Telstra as early as possible.

6.0 Gas Servicing

6.1 Introduction

Alinta is currently the main gas utility provider for the area. It should be noted that gas is a non essential service and as such Alinta provides gas services to meet system demands on a commercial basis.

It is however, generally accepted that properties are more marketable with both gas and electricity available. Gas is also more energy efficient for water heating and therefore assists the development to achieve its BASIX requirements for energy efficiency.

6.2 Existing Gas Infrastructure

Currently there is existing gas infrastructure in all the areas adjacent to the development area. Alinta has indicated that the networks extending along Old Northern Road and New Line Road are currently at their maximum servicing capacity. There is currently no gas network along Hastings Road or within the development area.

6.3 Gas Network Servicing Options

Should AGL (via its contracting arm Alinta) decide that servicing the development area is feasible, Alinta has indicated that at this stage there is only one gas servicing option for the development area. That is, by augmentation of the existing network. Alinta has indicated that the implementation of gas servicing would occur on a staged basis once more accurate dwelling numbers are

determined. They have also stated that “the current mains would require supply from the high pressure network in Castle Hill”.

Gas reticulation infrastructure is generally laid within common services (telecommunications, electricity) trenching to reduce construction costs and avoid disorganised service layout. To further explore utility requirements, it is recommended the developer contact Alinta to arrange for the design of the extension of the local gas mains to the estate on completion of a fixed site layout and preliminary electrical utility design.

6.4 Costs

As stated previously, Alinta have advised that costs to the developer can arise if the returns are insufficient to cover the infrastructure costs. Alinta also advised that it is their preference to attempt to provide gas at no cost to the developer although this is not always the case. Factors that could influence costs being borne by the developer include (but are not limited to):

- Lot frontages – Lots having larger frontages require additional piping compared to smaller lots and thus are less financially beneficial to Alinta. Developer contributions could be required following negotiations with Alinta.
- Lot Layout and Electrical Services Design – generally gas utilities are designed to compliment the electrical layout to utilise common trenching, however some developments require designs where this is not feasible. Some contributions could be required pending consultation with Alinta.

For Alinta to accurately provide cost estimates and hence developer contributions for the installation of gas services, they require frozen (or near complete) lot layout plans and associated service design drawings (i.e. telecommunications and electrical). This will enable them to compile a design that best suits the development.

6.5 Conclusions & Recommendations

Alinta has indicated that servicing of the proposed South Dural development area is possible through the augmentation of the existing network.

It is recommended that negotiations with Alinta commence regarding the cost of the provision of gas services for South Dural. The installation of the services within the site should be coordinated so that they are laid in a common trench. This reduces construction costs as well as minimises the impact on the existing surface.

Yours sincerely



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Attachment List

Attachment A	Contact List
Attachment B	Sydney Water - Wastewater System Drawings
Attachment C	Potential Water & Recycled Water Pipeline Route (Hornsby)
Attachment D	Potential Recycled Water Pipeline Route (Castle Hill)
Attachment E	Power Infrastructure Drawing

Attachment A Contacts

Telstra

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Sydney Water

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Attachment B Sydney Water - Wastewater System Drawings

HORNSBY HEIGHTS AND WEST HORNSBY SEWERAGE CATCHMENTS

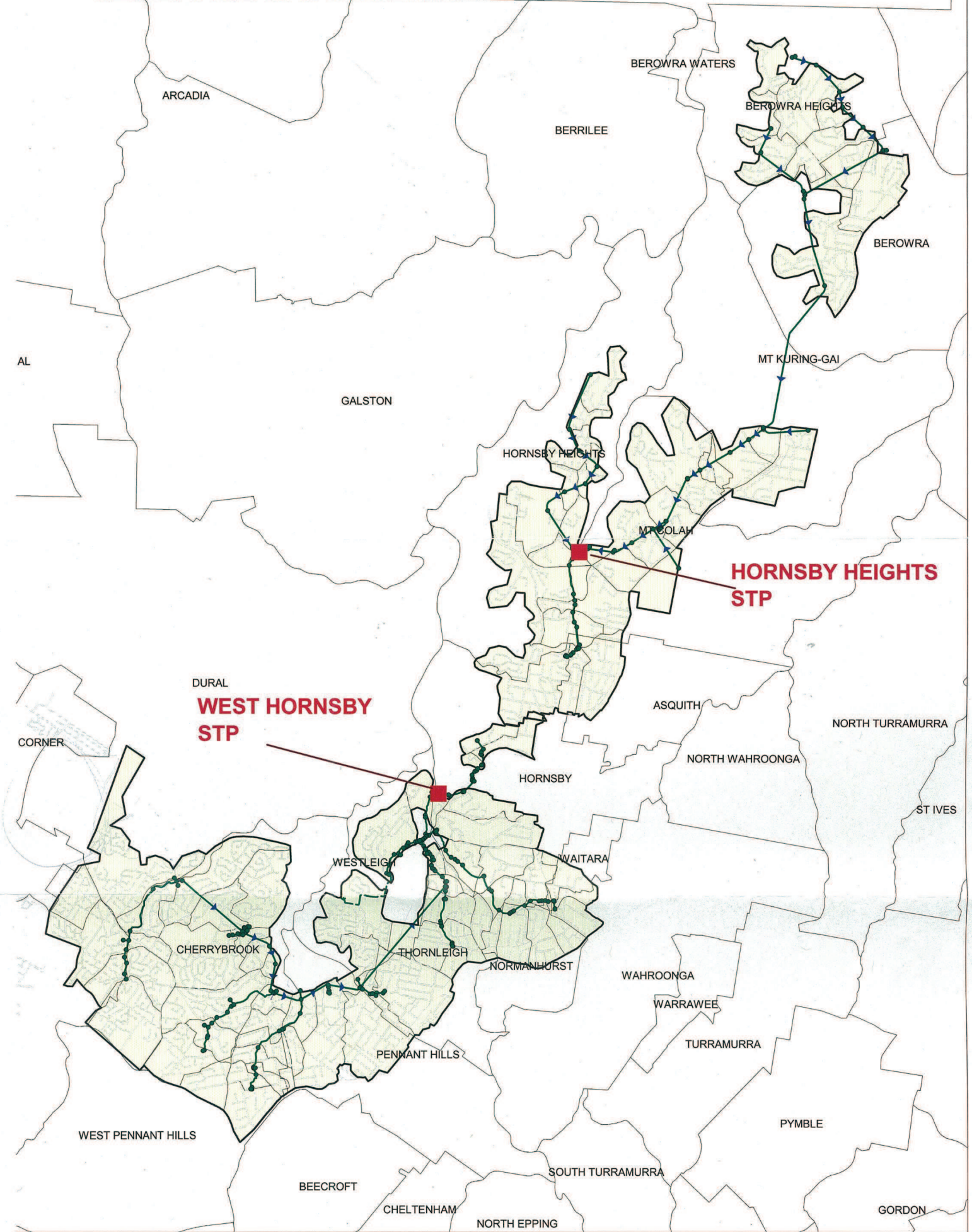














FIGURE 1



Rehab / Reticulation Options

-  Retic Amp. Only (0)
-  Sewer Rehab. Only (0)
-  Sewer Rehab. & Retic. Amplification (0)

-  >\$2M (0)
-  \$1M - \$2M (2)
-  \$500K - \$1M (2)
-  \$100K - \$500K (9)
-  >\$100K (6)
-  No Cost (111)

-  Storage Considered (4)
-  Storage Required (1)
-  Upgrade Pump (1)

KEY

-  Sewage Treatment Plant
-  Pump Station

Capital Works	Total_Cost_M	Growth_Cost_M
Sewer Rehabilitation	0.000	0.000
Reticulation Amplification	7.418	0.000
Site Storage	0.000	0.000
Trunk Amplification	4.620	4.019
STP Amplification	0.083	0.026
Pump Upgrade	1.691	0.423
TOTAL COST	13.812	4.468

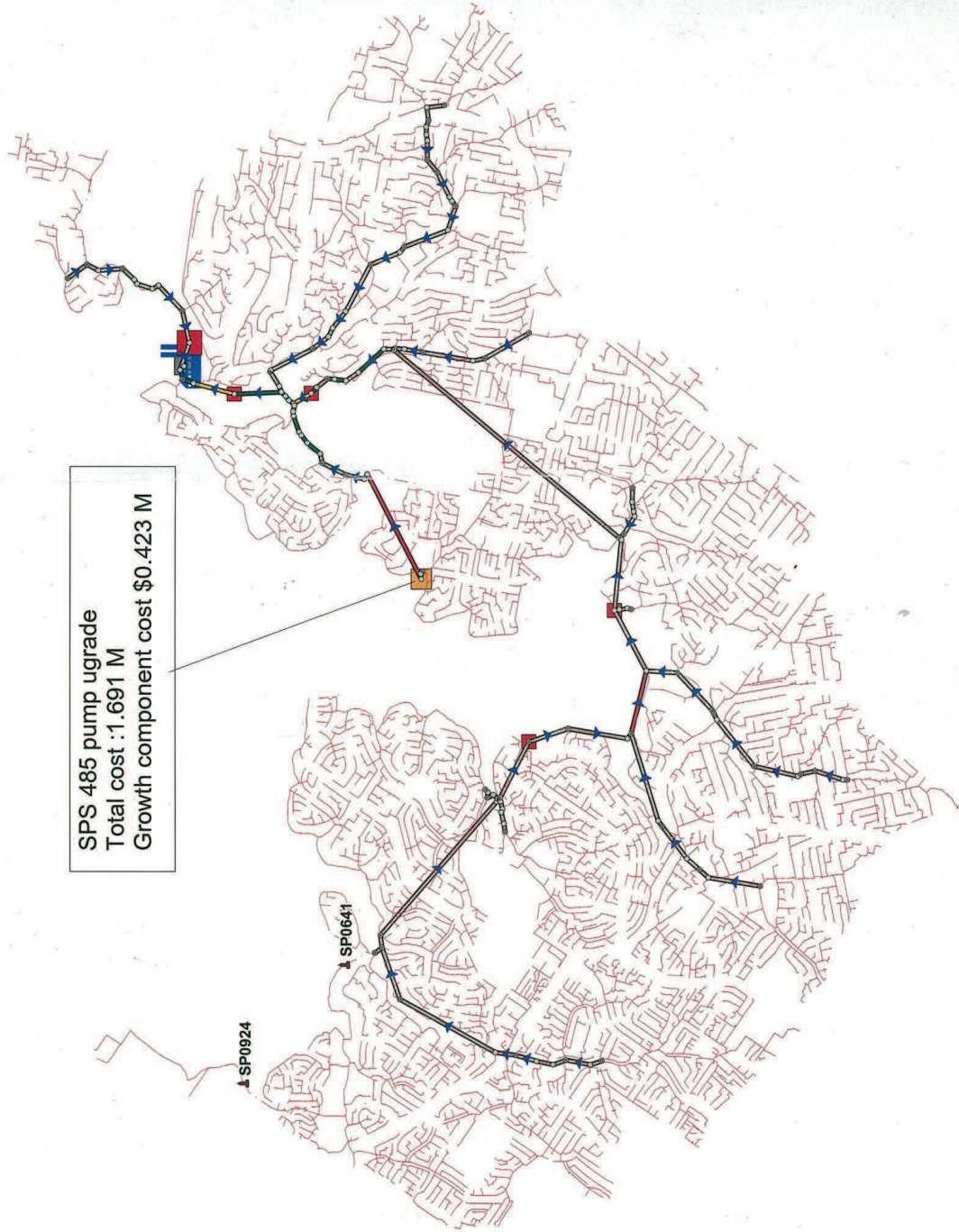


GROWTH RELATED ASSETS 2005/06 TO 2010/11

WEST HORNSBY DSP

Note: Only growth related asset upgrades are shown in colour

P/OSP charges 2005/06/WestHornsby Figure/FIGURE1.WOR	Drawn	NS	Chkd	PU
	Approved	BS		
	Scale	NTS		
	Date	October 2005		
				01

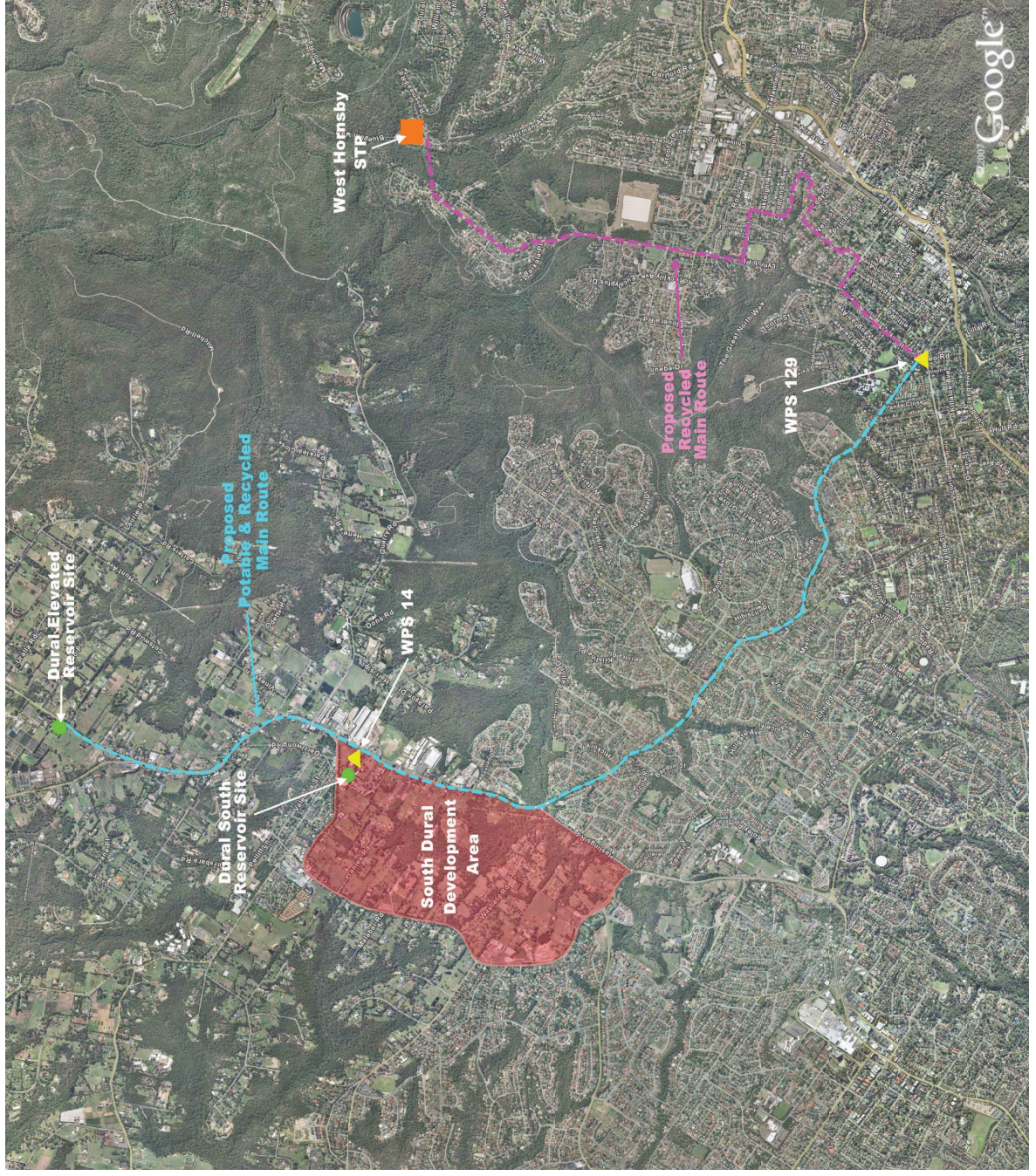


SPS 485 pump upgrade
Total cost : 1.691 M
Growth component cost \$0.423 M

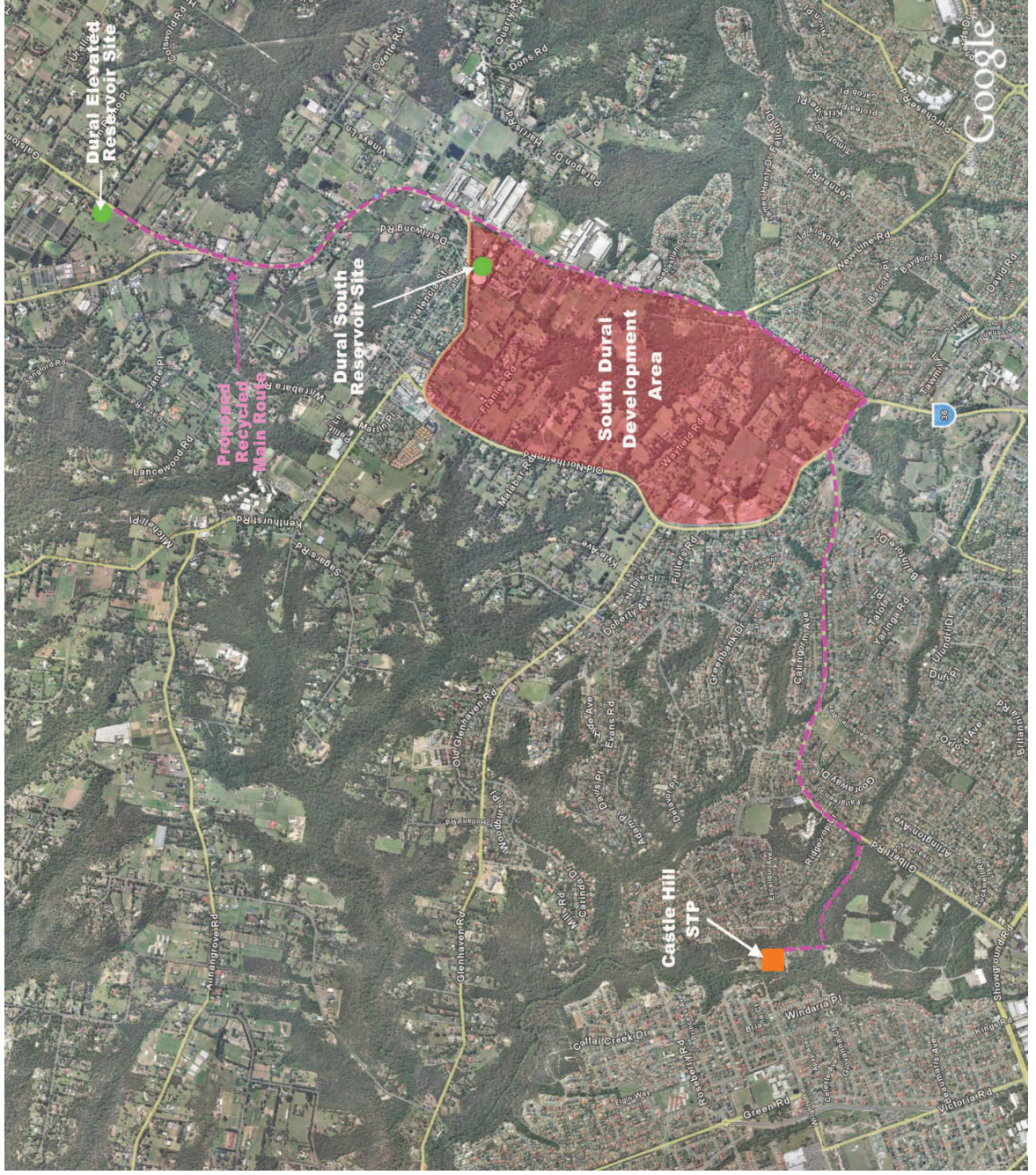
▲ SP0924

▲ SP0641

Attachment C Potential Water & Recycled Water Pipeline Routes (Hornsby)



Attachment D Potential Recycled Water Pipeline Route (Castle Hill)



Attachment E – Power Infrastructure Drawing

