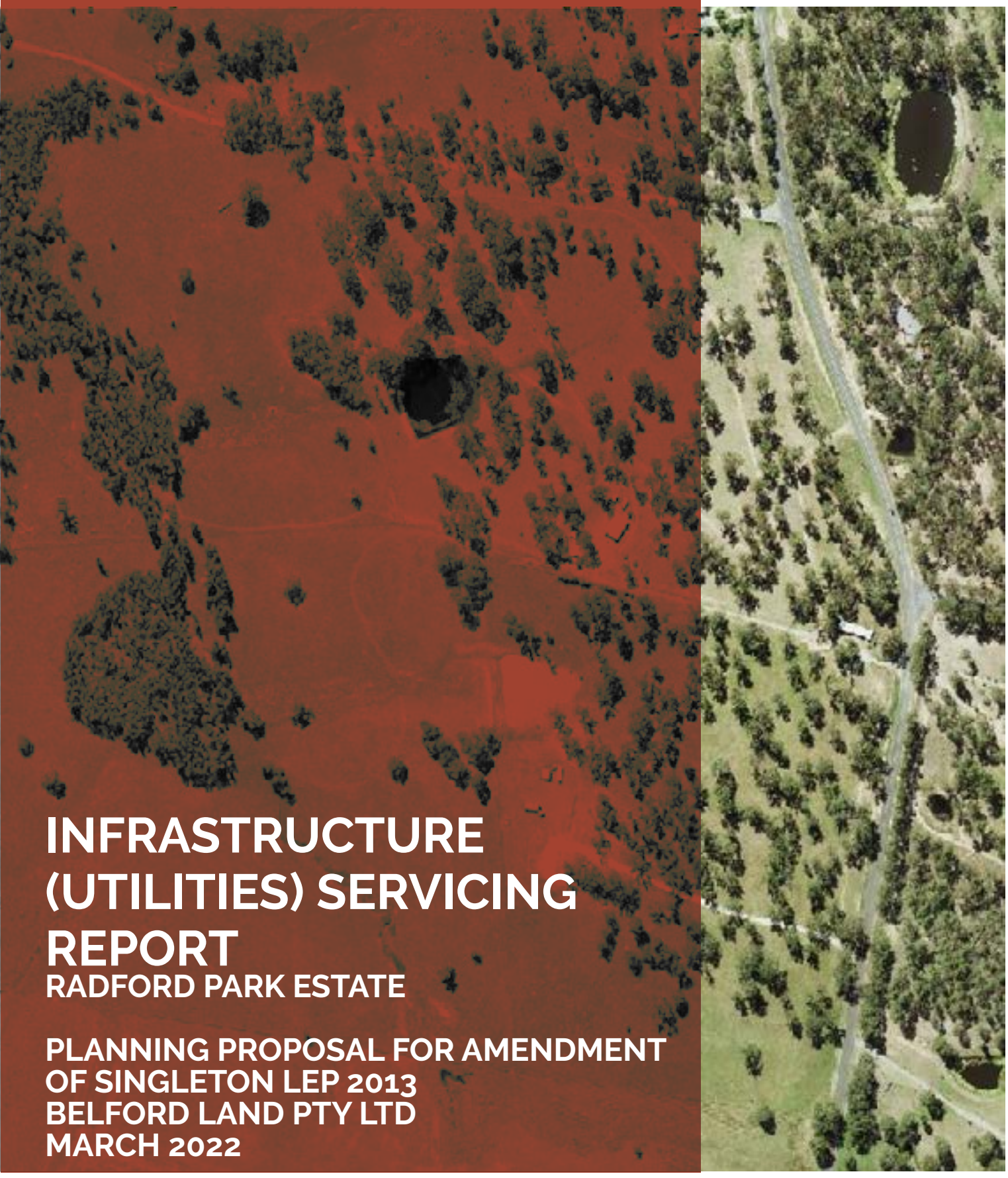


INFRASTRUCTURE (UTILITIES) SERVICING REPORT

RADFORD PARK ESTATE

PLANNING PROPOSAL FOR AMENDMENT OF SINGLETON LEP 2013

BELFORD LAND PTY LTD

MARCH 2022

adw johnson

HUNTER OFFICE
7/335 Hillsborough Road,
Warners Bay NSW 2282
(02) 4978 5100

CENTRAL COAST OFFICE
5 Pioneer Avenue,
Tuggerah NSW 2259
(02) 4305 4300

SYDNEY OFFICE
Level 35, One International Towers
100 Barangaroo Avenue,
Sydney NSW 2000
(02) 8046 7412

www.adwjohnson.com.au

Document Control Sheet

Issue No.	Amendment	Date	Prepared By	Checked By
A	Draft Issue to Client	March 2022	DH	DH
B	Reissue to Client. Included Electrical Servicing	March 2022	DH	DH
C	Revision with Client comments	March 2022	DH	DH

Table of Contents

1.0 Introduction

ADW Johnson (ADWJ) has been engaged by Belford Land Pty Ltd to prepare this infrastructure (utilities) servicing report to support the Planning Proposal for an amendment to the Singleton Local Environmental Plan 2013 (LEP).

This report is specific to an 82-hectare parcel of land located on the western side of Elderslie Road, approximately 1.5km north of Branxton (hereafter referred to as 'the site'). The site is an expansion of the existing Radford Park Estate approved under DA143/2011. Refer to **Figure 1** for the site location.

The proposal to develop the site would seek to expand the existing Radford Park Estate, which is located immediately adjacent to the site and shares common boundaries. The site is comprised of the following land parcels:

- Lot 1 DP 1124566;
- Lot 111 DP 850244;
- Lot 122 DP 1165184; and
- Lot 300 DP 1248134.

The site is owned by Belford Land Pty Ltd, except for Lot 122 DP 1165184.

This report provides commentary on the engineering principles which underpin the developability of the site. It includes an infrastructure (utilities) assessment for water and wastewater servicing, and also provides an assessment for the availability of power and telecommunications network at the site.

The site is strategically well-located and extends to the north-western edge of the Greater Newcastle Metropolitan Plan Area. This is a regionally significant catchment and growth area, with the site being conveniently located to both the New England Highway and the Hunter Expressway. The site and the surrounding area include local open space, recreation and sporting areas that will continue to be enhanced and expanded.

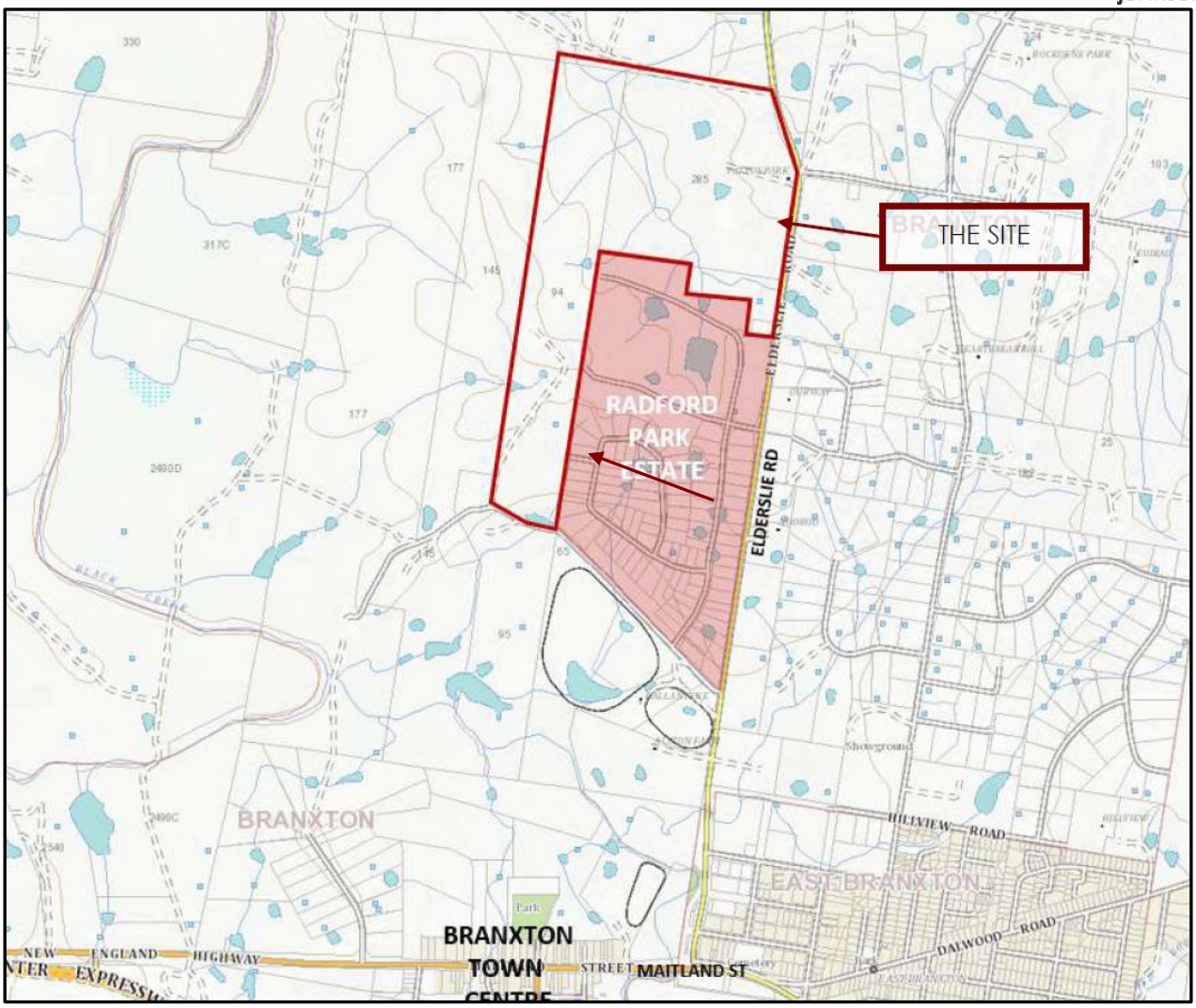


Figure 1: Site Location.

1.1 LOCATION/EXISTING LAND USE

The site is located within the suburb of Branxton and is noted to be within the Singleton Council LGA.

The site covers an area of approximately 82ha and includes the following land parcels:

- Lot 1 DP 1124566;
- Lot 111 DP 850244;
- Lot 122 DP 1165184; and
- Lot 300 DP 1248134.

The site is owned by Belford Land Pty Ltd, except for Lot 122 DP 1165184

The following are notable site attributes:

- Within 5km to the north of site is the Elderslie Airport;
- Within 4km to the north of site is the Hunter River;
- To the east of the site the land is bound by Elderslie Road;
- To the south of the site is the New England Highway; and
- The site contains watercourses with connectivity to Black Creek to the north of the site discharging into the Hunter River.

1.2 TOPOGRAPHY

The site comprises a generally undulating landscape, with local high points, ridges and gullies traversing the site.

The majority of the site is of moderate slope (5-15% in grade) although some sections of the site have steep slopes (exceeding 20%). The steeper slopes are primarily associated with the watercourses that runs through the site.

The site includes largely cleared areas, which is consistent to adjacent lots. Concentrations of vegetation are present adjacent to Elderslie Road.

2.0 Intended Land Use

2.1 INTENDED LAND USE

The Planning Proposal seeks to rezone land suitable for development from RU1 Primary Production to R5 Large Lot Residential. It is envisaged to be an extension to the existing Radford Park Estate, which comprises around 150 Torrens Title rural residential lots with lot sizes averaging around 2,000m^2. An estimated yield of between 150-200 additional Torrens Title rural residential lots has been used for assessment purposes in this report, with development staging assumed as below:

- Stage 1 – 70 to 80 lots;
- Stage 2 – 50 to 70 lots; and
- Stage 3 – 30 to 50 lots

3.0 Engineering Principles

3.1 BULK EARTHWORKS

The topography of the site is a generally undulating landscape, with local ridges and gullies traversing the site.

The site includes first-order and second-order watercourses which discharge to the north-western corner of the site, and also to the west and south of the site.

The majority of the site is of slope (5-15% in grade) although some sections of the site have steeper slopes (> 15%) where adjacent to existing watercourses.

3.2 SERVICES

ADWJ have carried out a review of servicing requirements for the development of the site including:

- Water;
- Wastewater;
- Electrical;
- Communication; and
- Gas.

3.2.1 Water – Hunter Water Corporation

ADW Johnson have consulted with Hunter Water Corporation (HWC) with regard to the Water Servicing Strategy for the development.

It is noted that there are two supply zones which will supply the rezoning area being:

- North Rothbury 1 Reservoir; and
- Branxton 1 PRV.

Between the two supply zones, the proposed rezoning area will be able to meet HWC's servicing requirements.

A summary of the water service strategy for the study area consists of the following:

- Connection to the North Rothbury 1 Reservoir supply and Branxton 1 Pressure Reducing Valve supply zones in Radford Parkway;
- Reservoir to supply lots generally lower than RL 75m and PRV zone to supply the lots elevated above;
- A new PRV proposed on the lead in water main along Elderslie Road adjacent to the East Branxton 1 WWPS on the North Rothbury 1 Reservoir supply;
- Construction of a series of DN100 and DN150 mains; and
- Cross connection between the two supply zones via a normally closed zone valve providing the required security of supply.

The Water Servicing Strategy for the development is included in **Appendix A**.

3.2.2 Wastewater – Hunter Water Corporation

ADWJ have consulted with Hunter Water Corporation (HWC) with regard to the Wastewater Servicing Strategy for the development.

It is noted that in 2018 HWC have approved the Wastewater Servicing Strategy for the expansion of Radford Park that would be facilitated by this Planning Proposal. From this Strategy it is noted that:

- The majority of the wastewater will drain to the proposed East Branxton 2 Waste Water Pump Station (WWPS); and
- Alternatively, the southern section will drain to the existing Branxton 1 Waste Water Pump Station (WWPS)

The Wastewater Servicing Strategy for the development is included in **Appendix B**.

The full site is able to be serviced by sewer infrastructure. Due to its proximity to, and capacity within the existing network, sewer infrastructure works to service the site are considered to be low with regard to normal development practices.

3.2.3 Electricity – Ausgrid

An electrical infrastructure overview has been undertaken by Power Solutions Pty Ltd for the site (**Appendix C**).

Power Solutions have confirmed that the site is likely capable of being serviced by the existing HV feeder in proximity to the site, feeder 83742, sourced from Branxton Zone Substation, ZN00512. It is noted that HV feeder 83743 predominantly supplies small rural residences to the North, East and West of the site.

Power Solutions identify that based upon 160 additional rural residential lots at the site, the proposed development load would represent approximately 10% of the feeder rating.

It is anticipated that the existing HW feeder capacity will be sufficient without lead-in upgrades.

The proposed development has access to an existing fit-for-purpose HV feeder and presents no unusual electrical supply risks. Electrical servicing does not inhibit the developability of the site and therefore the development can be serviced via the standard Ausgrid Contestable process.

3.2.4 Communications – NBN Co.

NBN Co are obligated to provide NBN telecommunications connection to all new developments. It is noted that there is existing fixed line NBN infrastructure surrounding the site, including the existing Radford Park Estate. It is likely that some infrastructure backhaul will be required; the extent of works will be determined by NBN Co once an application for connection is made. It is noted that this is routine development practice.

Communications infrastructure will be available as development proceeds and as such, communications servicing does not inhibit the developability and potential rezoning of the site.

3.2.5 Gas – Jemena

There is an existing gas main which services the existing development within Radford Park Estate. This includes a 400kPa polyethylene medium pressure gas main.

Jemena will not provide conclusive servicing advice until a connection application is made. It is noted that where supply is available that Jemena will typically provide mains and reticulation at no cost where a common services trench is provided to them. Although it is not essential to the development, it appears that gas connection is available which could service the subdivision from the existing Radford Park Estate, however this cannot be confirmed until a connection application is made.

Gas is not a necessity for the development process however, it appears that connection can be made. Gas servicing does not inhibit the developability of the site.

4.0 Conclusion

The Planning Proposal seeks to rezone land suitable for development from RU1 Primary Production to R5 Large Lot Residential. It is envisaged to be an extension to the existing Radford Park Estate, which comprises around 150 Torrens Title rural residential lots with lot sizes averaging around 2,000m^2. An estimated yield of between 150-200 additional Torrens Title rural residential lots has been used for assessment purposes in this report, with development staging assumed as below:

- Stage 1 – 70 to 80 lots;
- Stage 2 – 50 to 70 lots; and
- Stage 3 – 30 to 50 lots.

We have carried out a review of engineering principles related to planning of the site in accordance with the structure plan.

Our review included investigation of the following principles to ascertain the developability of the site in support of the rezoning;

- Services Infrastructure:
    - Water – Hunter Water Corporation;
    - Wastewater – Hunter Water Corporation;
    - Electricity – Ausgrid;
    - Communications – NBN Co; and
    - Gas – Jemena.

Our review and investigation found the following;

Services

Water – Hunter Water Corporation

The full site is able to be serviced by water infrastructure. Due to the proximity to, and capacity within the existing water network, water infrastructure works to service the site are considered minimal with regard to normal development practices.

Wastewater – Hunter Water Corporation

The full site is able to be serviced by sewer infrastructure. Due to its proximity to, and capacity within the existing network, sewer infrastructure works to service the site are considered to be low with regard to normal development practices. The existing wastewater network is sized for the expansion of Radford Park that would be facilitated by this Planning Proposal.

Electricity – Ausgrid

The proposed development has access to an existing Ausgrid HV feeder. The development can be serviced via the standard Ausgrid Contestable process.

Communications – NBN Co.

Communications infrastructure will be available as development proceeds and as such, communications servicing does not inhibit the developability and potential rezoning of the site.

Gas – Jemena

Gas is not a necessity for the development process however, it appears that connection can be made. Gas servicing does not inhibit the developability or potential rezoning f the site.

Our review of engineering principles for infrastructure servicing supports development of the site on the basis that the development outcomes are achievable utilising standard engineering and construction practices. In the case of stormwater, water, wastewater and electrical servicing the site can be developed with greater efficiency than many other release areas in the Hunter owing to existing infrastructure on site and the site's proximity to, and capacity within the existing services networks.

Appendix A

WATER SERVICING STRATEGY

Ref: RCH: LCO: 239567(50): B

22nd December 2021

Hunter Water Corporation
PO Box 5171
HRMC NSW 2310

RE: RADFORD PARK WATER SERVICING STRATEGY ADDENDUM
ELDERSLIE ROAD, BRANXTON NSW 2335

To Developer Services Team – Hunter Water,

1.0 INTRODUCTION

ADW Johnson Pty. Limited (ADW Johnson) has been commissioned by Belford Land to prepare a local water servicing strategy addendum to build upon the outcomes of the *'Elderslie Road Potable Water Infrastructure Servicing Strategy'* previously undertaken by Hyder Consulting (2012). The addendum focuses on the Radford Park development off Elderslie Road and the future extensions into the Primary Production (RU1) zoned lands to the north and west proposed for future rezoning. The lots subject to the extension are generally described as Lot 111 DP850244 and Lot 1 DP1124566.

At the time of undertaking this strategy, Stage 1 has been constructed with the majority of residential development complete. Stages 2 and 3 are constructed with residential development yet to commence.

Discussions with Hunter Water (HWC) have been undertaken to inform the water strategy for the study area and clarify any required information. All correspondence with HWC is provided within ***Appendix 1***.

ADW JOHNSON PTY LIMITED
ABN 62 129 445 398

Sydney
Level 35 One International Towers
100 Barangaroo Avenue
Sydney NSW 2000
02 8046 7411
sydney@adwjohnson.com.au

Central Coast
5 Pioneer Avenue, Tuggerah NSW 2259
PO Box 3717, Tuggerah NSW 2259
02 4305 4300
coast@adwjohnson.com.au

Hunter
7/335 Hillsborough Road,
Warners Bay NSW 2282
02 4978 5100
hunter@adwjohnson.com.au

www.adwjohnson.com.au

2.0 POTABLE WATER CONNECTION

To date, the reticulation water mains are generally consistent with the previous strategy by Hyder Consulting. The water mains extend through Stages 1-3 as required with stubs left for the future adjacent stages.

The study area is serviced via two supply zones which are both provided into the study area and temporarily ended in Radford Parkway. These two supplies are:

- North Rothbury 1 water reservoir – supplied from the south along Elderslie Road; and
- Branxton 1 Pressure Reducing Valve (PRV) – supplied from Sutton Grove to the east of Elderslie Road.

The PRV zone generally has a higher pressure than the water reservoir supply and was proposed to service the topographical high areas within the study area. Stages 1-3 does not require a supply from the PRV zone, this is reflected by the constructed mains.

The connection points are represented in ***Figure 1*** in which the mains on the PRV zone are depicted in Blue while the mains from the reservoir zone are depicted in green. The related boundary conditions provided by HWC are summarised in ***Table 1***.

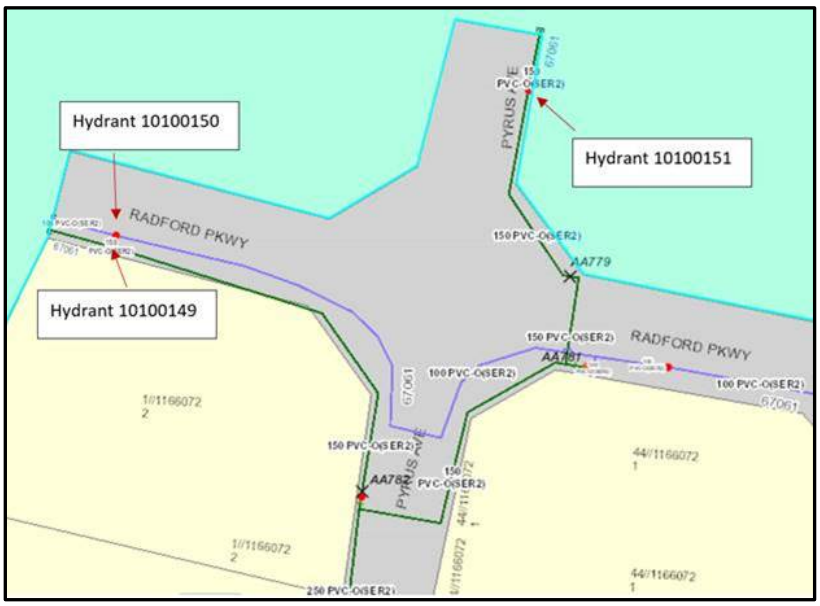


Figure 1 - Potable Water Connection Points (HWC)

Table 1 – Boundary Conditions

Parameter	Pressure HGL (m)		
	Hydrant 10100151 Reservoir Supply	Hydrant 10100149 Reservoir Supply	Hydrant 10100150 PRV Supply
Pipe Size	DN150	DN150	DN100
Elevation (m)	61.62	64.35	64.21
ADD	123	123	134
PDD	95	95	127
95% PDD + 10 L/s FF	95	95	108

**Acronyms: ADD – Average Day Demand, PDD – Peak Day Demand, FF – Fire Flow*

A boundary condition pressure of 95m during peak day demand scenarios was proposed by HWC for the reservoir supply to conservatively allow for effects on the water supply pressure once Huntlee reaches full development.

3.0 DESIGN WATER LOADING

The loading has been based on the DA approved lot layout of stages 4-8 of Radford Park and the concept layout provided by Belford Land within the areas zoned RU1.

A breakdown of lots and anticipated development year are summarised in the ***Table 2*** below.

Table 2 - Development Staging

Year	Development	Residential Lots
2022	Radford Park Stage 4	11
2022	Radford Park Stage 5	10
2022	Radford Park Stage 6	20
2022	Radford Park Stage 7	7
2023	Radford Park Stage 8	25
2026	Lot 1 DP 1124566	49
2028	Lot 111 DP 850244	50
Total		**172**

The lot layout is presented within the drawings attached within ***Appendix 2***.

Design water demands have been determined in accordance with *Water Supply Code of Australia, Hunter Water Edition Version 2 (WSA 03-2011)* assuming an average annual demand for Maitland and Cessnock Local Government Area of 285 kL/ET/yr for residential lots. This aligns with the modelling philosophy within the previous strategy.

Lots with a frontage reduced level greater than 75m are expected to require the high-pressure supply from the PRV zone, accordingly the modelling and demands were based on the expected supply zone arrangements. The water loadings are summarised in ***Table 3*** below.

Table 3 - Water Loadings

Supply Zone	Category	Lots	Average Day Demand (kL/day)	Peak Day Demand (kL/day)	Peak Hour Demand (L/s)	Extreme Day Demand (kL/day)
Low Pressure Reservoir Supply	Residential House	161	126	436	10.2	502
High Pressure PRV Supply	Residential House	11	9	40	2.3	46

4.0 WATER SERVICING

As previously outlined within ***Section 2***, the water servicing strategy for the development area has been undertaken to date in accordance with the previous strategy by Hyder Consulting. This strategy utilises a single transfer main along Elderslie Road as part of the North Rothbury 1 Reservoir supply and a supply from the Branxton 1 PRV. This option mitigates any requirement of a booster pump station due to the high supply pressures within the Branxton 1 PRV zone. The present strategy addendum builds upon the recommended option of the previous strategy.

Table 4 outlines the service pressure limits which have been applied for this water servicing strategy.

Table 4 - Service Pressure Limits

Service Pressure Limit	Demand	Pressure (m)
Maximum	All applications	60
Minimum	Peak hour flow on a peak day of a peak week	20
Minimum	Peak hour flow on an extreme day of an extreme week	12
Minimum	Peak four flow on a 95th percentile peak day plus firefighting flow at location of fire flow	15
Minimum	Peak hour flow on a 95th percentile peak day plus firefighting flow other than location of fire flow	3

It is noted that the Hyder Report utilised a maximum service pressure of 70m. HWC has revised this to be 60m and is therefore reflected in this strategy.

The reservoir supply will supply the areas generally lower than RL 75.0m whilst the PRV supply will supply lots at and above an RL of 75m. Both supply zones are to comprise of a series of DN100 and DN150 water mains. A cross connection between the two supply zones will be provided for security of supply, this is in addition to the existing cross connection provided at the entry into the Radford Park development located in Radford Parkway.

The proposed length of potable watermains is summarised below:

- DN100 – 5,026m:
  - PRV Supply – 360m; and
  - Reservoir Supply – 4,666m.
- DN150 – 2,384m:
  - PRV Supply – 480m; and
  - Reservoir Supply – 1,904m.

A drawing outlining the proposed water servicing strategy is provided in ***Appendix 2***.

The existing connections points, associated boundary conditions and proposed reticulation network have been modelled within Pipes++. A simulation period of 24 hours was adopted to enable the supply pressure to be established given residential diurnal patterns. Modelling is limited to Stages 4-8, Lot 1 DP 1124566 and Lot 111 DP 850244.

The Pipes++ modelling layout diagram is provided in ***Appendix 3***, the node ID and node elevation has also been included. The demand scenarios modelled and rationale are as follows:

- Average Day Demand (ADD) – assess maximum pressure;
- Peak Day Demand (PDD) – assess relevant minimum pressure limit;
- 95th Percentile Demand with Fire Flow (95PDD) – assess relevant minimum pressure limit; and
- Extreme Day Demand (EDD) - assess relevant minimum pressure limit.

Table 5 provides a summary of the resulting pressures from each demand scenario within both of the supply areas and number of lots which are noncompliant with the pressure limit as designated within ***Table 4***.

Table 5 – Study Area Pressure

Demand Scenario	Supply zone	Boundary Condition	Minimum Pressure (m)	Maximum Pressure (m)	Non-compliant Lots
ADD	Reservoir Supply	123m HGL	-	85m (N7 - RL 38m)	~67
ADD	PRV Supply	134m HGL	-	59m (N28 –RL 75m)	0
PDD	Reservoir Supply	95m HGL	20.8m (N26 - RL 74m)	-	0
PDD	PRV Supply	127m HGL	38 (N25 - RL 89m)	-	0
EDD	Reservoir Supply	95m HGL	20.7m (N26 - RL 74m)	-	0
EDD	PRV Supply	127m HGL	38 (N25 - RL 89m)	-	0

As indicated by the table above, the minimum service pressure limits are achieved. During average day demand scenarios pressures up to 85m are expected. Refer to ***Section 4.1*** for further discussion on the lots receiving the non-compliant high pressures.

A fire flow analysis nested within the 95th percentile peak day demand was undertaken within Pipes++ at the peak domestic diurnal variation of 20:00 hours. The software analyses each node due to a fire anywhere in the network, including a fire at the node being assessed. The software provides the minimum pressure at each of the assessed nodes whether it be a resultant of a fire at the node or elsewhere. A residential fire flow demand of 10 L/s was applied. The systems performance is outlined in ***Table 6*** below.

Table 6 - Study Area Water Pressure During Fire Flows

Supply Zone	Minimum Supply Pressure (m)	Occurring at Node	Node Level (m AHD)	Fire at Node
Reservoir Supply	19.0	N26	71	N23
PRV Supply	15.4	N25	89	N25

WSA 03-2011 HWC Edition outlines a minimum requirement of 15m pressure at the location of fire flow, therefore it can be seen that the study area achieves the required minimum supply pressure during a 95th percentile peak day demand period. To achieve the required

pressures, sections of the proposed PRV supply were proposed to be upsized to a DN150 in lieu of the point of connection size being DN100.

4.1 Water Servicing High Pressure Lots

As outlined previously, the water servicing to the study area is non-compliant during average day demands due to high pressures within the reservoir supply zone. To manage the high pressures in the proposed and existing Radford Park development areas in addition to future development areas along Elderslie Road, a PRV is required on the incoming water main along Elderslie Road to manage the high pressures.

The proposed PRV would be utilised to reduce the downstream hydraulic grade line to less than or equal to 97m within the Reservoir supply zone. The PRV is proposed to be located in close vicinity to East Branxton 1 WWPS to utilise the existing services where possible, this location was discussed as the preferred location during a meeting held between HWC and ADW Johnson on 26th November 2021. It is subject to Council and Hunter Water approval as part of the detail design phase. The proposed PRV location and benefitting developments areas are indicatively shown in the DRL plans and are provided with **Appendix B**.

Table 7 – Study Area Pressure with Pressure Management

Demand Scenario	Supply zone	Boundary Condition	Minimum Pressure (m)	Maximum Pressure (m)	Non-compliant Lots
ADD	Reservoir Supply incl. Proposed PRV	97m HGL	-	59m (N7 - RL 38m)	0
ADD	PRV Supply	134m HGL	-	59m (N28 –RL 75m)	0
PDD	Reservoir Supply	95m HGL	20.8m (N26 - RL 74m)	-	0
PDD	PRV Supply	127m HGL	38 (N25 - RL 89m)	-	0
EDD	Reservoir Supply	95m HGL	20.7m (N26 - RL 74m)	-	0
EDD	PRV Supply	127m HGL	38 (N25 - RL 89m)	-	0

It is noted that in accordance with AS3500, properties which receive greater than 500kPa (~51m pressure) are to utilise an individual PRV.

There is no change to the fire flow results as presented within **Table 6** as the PRV would not affect the boundary condition utilises for the fire flow assessment.

4.2 Failure Scenarios

An assessment of key failure scenarios was undertaken during a peak day demand. The critical failure scenarios included:

- Failure Scenario 1 – PRV supply failure, study area supplied via reservoir supply only;

- Failure Scenario 2 – Reservoir supply failure, study area supplied via PRV supply only;
- Failure Scenario 3 – One of two reservoir supply mains fail, PRV supply uninterrupted; and
- Failure Scenario 4 – Failure of the other reservoir supply main, PRV supply uninterrupted.

Table 8 - Study Area Key Failure Scenarios

Failure Scenario	Boundary Condition	Min. Pressure (m)	# Lots Receiving <12m Pressure
1	95m HGL	5.7 (N25 - RL 89m)	5 (Lots >RL 82m)
2	127m HGL	36.8 (N25 - RL 89m)	0
3	95m HGL*	19.5 (N26 – RL 74m)	0
4	95m HGL*	20.3 (N26 – RL 74m)	0

*Assessment limited to reservoir supply area as the PRV supply area is uninterrupted.

It can be seen that the key failure scenarios modelled are able to provide sufficient pressure to the study area with the exception of Failure Scenario 1. Five lots with an elevation greater than 82m receive less than 12m of pressure, these lots are highlighted on the constrained lots drawing within ***Appendix 2***.

Whilst Failure Scenario 2 achieves the minimum pressure of 12m, generally, lots normally within the reservoir supply zone will see an increase in maximum pressure in the order of 4m during peak day demands and up to 37m during an average day demand. Under this scenario, the throttling of the zone valve could be utilised to manage the downstream pressures.

4.3 Water Servicing Cost

Based on the information presented, the costs are shown in ***Table 9***. See ***Appendix 4*** for detailed breakdown of costs.

Table 9 - Water Servicing Cost

Water Infrastructure Associated Works	Cost
Contract Award Sum	$1,345,370
5026m DN100 PVC	*$493,248*
2384m DN150 PVC	*$282,284*
Pressure Reducing Valve along Elderslie Road	*$250,000*
Other contract award costs excluded above	*$319,838*
Pre construction costs	$272,653
Construction management	$188,352
Construction contingency	$460,117
Total Estimate	**$2,266,492**

5.0 SUMMARY

The potable water service strategy for the study area consists of the following:

- Connection to the North Rothbury 1 Reservoir supply and Branxton 1 Pressure Reducing Valve supply zones in Radford Parkway;
- Reservoir to supply lots generally lower than RL 75m and PRV zone to supply the lots elevated above;
- A new PRV proposed on the lead in water main along Elderslie Road adjacent to the East Branxton 1 WWPS on the North Rothbury 1 Reservoir supply;
- Construction of a series of DN100 and DN150 mains; and
- Cross connection between the two supply zones via a normally closed zone valve providing the required security of supply.

Yours faithfully,

ROBERT CHAMPNESS
WSAA ACCREDITED CIVIL ENGINEER
ADW JOHNSON PTY LTD
HUNTER OFFICE

N:\239567\239567(50)\Design\Documents\Water Strategy\239567(50) - Radford Park Water Strategy Addendum - B.docx

APPENDICES:

- **Appendix 1** – Correspondence – Hunter Water Corporation;
- **Appendix 2** – Drawings;
- **Appendix 3** – PIPES++ model and Input; and
- **Appendix 4** – Water Strategy Cost Breakdown.

APPENDIX 1

CORROSPONDENCE – HUNTER WATER CORPORATION

MINUTES OF MEETING

DATE: 2 March 2021

ATTENDEES:

HWC: Chris Barker, Barry Calderwood, Ronald Bridge, Matthew Russell.

ADWJ: Cameron Black, Robert Champness.

APOLOGIES:

Andrew Williams (Belford Land)

Radford Park – Elderslie Rd, Branxton – Inception Meeting (2021-108)

Water Strategy Requirements

- NOR for Stage 4 (2021-108) states an update to the water strategy is required. Discussions were held about recent upgrades and providing updated boundary conditions to inform updated strategy.
- HWC provided the previous water servicing strategy by Hyder during meeting.
- HWC confirmed a whole new strategy would not be required. A simple addendum would be suitable with DRL to reconfirm updated supply zones and water servicing arrangement for development.
- HWC to provide updated boundary conditions to site under two scenarios:
    - Current boundary conditions;
    - Expected boundary conditions post construction of Harpers Hill to Greta main.
- HWC to provide PRV settings of CV1 PRV located on Brokenback Road, Branxton.

WWPS Inception

- Proposed to be generally consistent with servicing strategy.
- To be located within future development lot and therefore requiring temporary works.
- Submission expected within two weeks.
- Temporary works with regards to access track details and servicing of WWPS will be assessed as part of concept submission in lieu of the provision of preliminary advice.
- Proposed gravity main and rising main location will be assessed as part of concept submission in lieu of the provision of preliminary advice.
- The approved strategy outlined a DN300 along Elderslie Rd, HWC confirmed during the meeting this is predominately a DN225 main and is expected to have capacity for the additional loads.

- HWC to confirm capacity at East Branxton 1 WWPS (formerly known as Branxton 2 WWPS). BC indicated that existing East Branxton 1 WWPS may currently have limited capacity.
- ADWJ to provide preliminary staging and loads to inform HWC's response re: capacity at East Branxton 1 WWPS and associated constraints on development.
- Pump station proposed staging to be analysed with consideration of downstream capacity constraints, timing of WWPS catchment and impacts of staging pump stations (e.g., rising main velocities).

	ACTION	RESPONSIBILITY	TARGET DATE
Water Strategy Requirements			
1	Provide current boundary conditions	HWC	March 2021
2	Provide boundary conditions post construction of Harpers Hill to Greta main	HWC	March 2021
3	Provide PRV settings of CV1 PRV on Brokenback Rd	HWC	March 2021
WWPS Inception			
4	Concept (15%) design submission of WWPS	ADWJ	March 2021
5	**Provide preliminary staging timeframe and loadings to HWC**	**ADWJ**	**URGENT**
6	**Provide capacity and constraints associated with East Branxton 1 WWPS and proposed WWPS.**	**HWC**	**URGENT**

Robert Champness

From: Ronald Bridge <ronald.bridge@hunterwater.com.au>
Sent: Wednesday, 21 April 2021 9:57 AM
To: Robert Champness
Cc: Matthew Russell; Cameron Black; Andrew Williams; Barry Calderwood; Wesley Jones
Subject: RE: Radford Park Elderslie Rd Branxton - Inception Meeting - regional strategy underway

Dear Robert,

Regarding the previously issued comments regarding servicing boundary conditions and the impact of the Huntlee development on development in Branxton;

I can confirm that Hunter Water is undertaking a regional strategy for the Maitland-North Rothbury area, which will include modelling for future demands and upgrades such as the Huntlee development and duplication of the trunk water network and Harpers Hill Reservoir. This is expected to be completed in June 2021.

Until this time we are recommending a conservative reduction in peak day pressures at the Elderslie Road development to a HGL of 95m (down from 100m). This can be revised when results from the regional strategy are finalised.

Kind Regards,

Ron

-

Ron Bridge
Development Services Engineer | Hunter Water Corporation
36 Honeysuckle Drive Newcastle NSW 2300 | PO BOX 5171 HRMC NSW 2310
Ph: (02) 4064 7844 | ronald.bridge@hunterwater.com.au | hunterwater.com.au

HUNTER WATER

love water

Smart Water Choices

Water before 10am or after 4pm | Use a trigger nozzle | Sweep hard surfaces

Please consider the environment before printing this email.
Hunter Water acknowledges the Traditional Owners and Custodians of the land and we pay our respects to their Elders, past, present and future. We are an inclusive workplace that embraces diversity in all its forms.

From: Ronald Bridge
Sent: Wednesday, 14 April 2021 3:48 PM
To: 'Robert Champness' <robertch@adwjohnson.com.au>
Cc: Matthew Russell <matthew.russell@hunterwater.com.au>; Cameron Black <cameronb@adwjohnson.com.au>; Andrew Williams <andrew@belfordland.com.au>; Barry

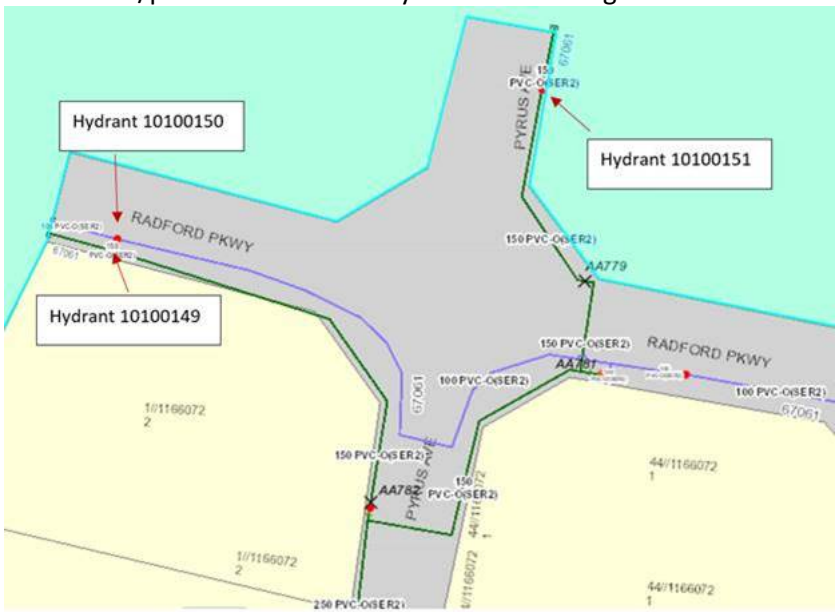
Calderwood <barry.calderwood@hunterwater.com.au>; Wesley Jones <wesley.jones@hunterwater.com.au>
Subject: RE: Radford Park Elderslie Rd Branxton - Inception Meeting

Hi Robert,

Regarding Servicing Requirements for Radford Park – Elderslie Road Branxton, please find below the requested boundary condition data and answers to your queries.

Boundary Condition Locations:

Water flow/pressure at these 3 hydrants at the edge of the Elderslie Development:



Current Boundary Conditions:

Flow/Pressure Results (note that zones match pipe colours indicated above):

Flow Scenario 1 - Existing Water Network Conditions

	Pressure HGL (m)		
	Hyd ID - 10100151	Hyd ID - 10100149	Hyd ID - 10100150
Pipe Size	DN150	DN150	DN100
Zone Supply	North Rothbury 1 Res	North Rothbury 1 Res	Branxton 1 PRV
Elevation (m)	61.62	64.35	64.21
ADD (Pmax)	123	123	134
PDD (Pmin)	100	100	126
95% PDD + 10 L/s FF	100	100	111

Note: North Rothbury 1 Res Network is dominated by the pressure of Harpers Hill Res (120m HGL)

Boundary Conditions Post Construction of Harpers Hill to Greta Trunk Water Main:

Note – also includes the construction of DN150 water main crossing Maitland St, between the two DN100 water mains, across the road from Lot 2//1094098.

Model Additions

Build 1 - New trunk main between Harpers Hill Res & Greta

Build 2 - DN150 water main crossing Maitland St between two DN100 mains, near Lot 2//1094098

Flow/Pressure Results

The modelling results show a slight change but not hugely significant:

Flow Scenario 2 - Harpers Hill to Greta Trunk Main, & DN150 connection on Maitland ST (not adding additional load at Huntlee Bulk Water Meter)

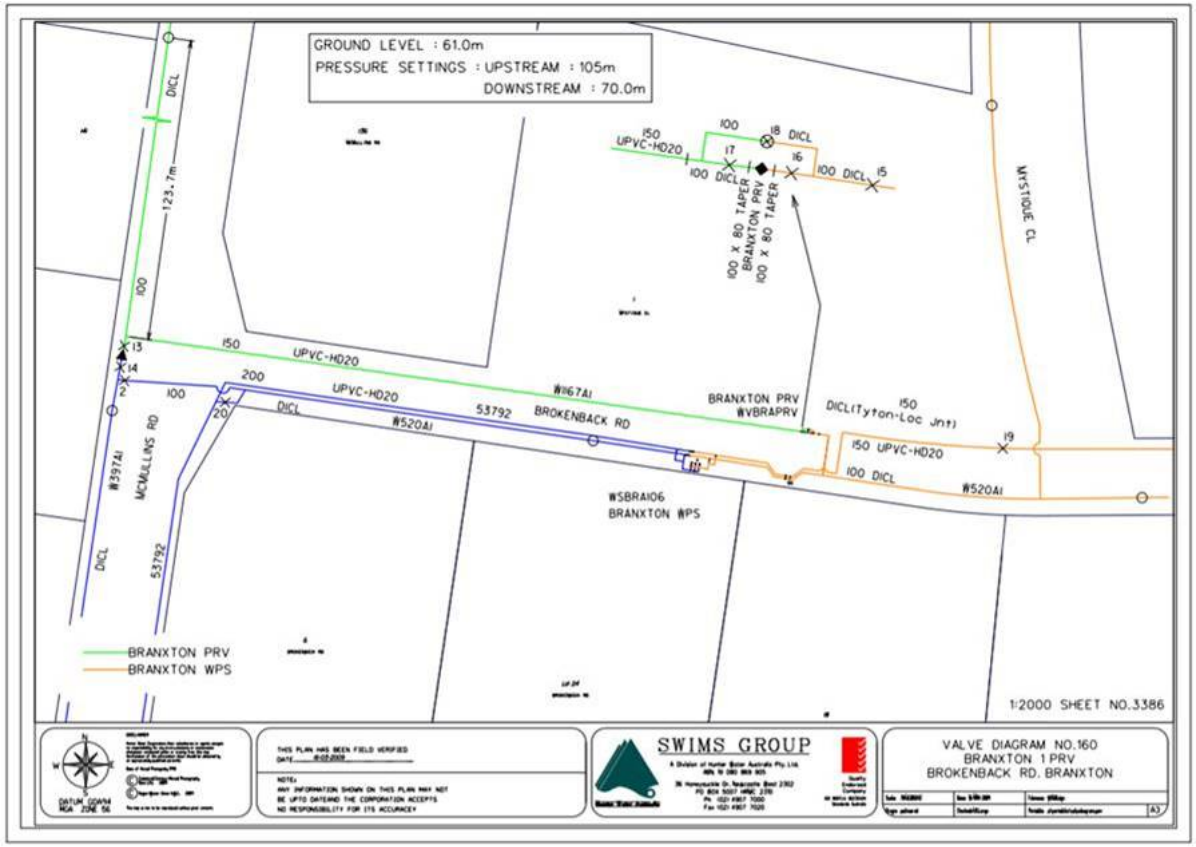
	Pressure HGL (m)		
	Hyd ID - 10100151	Hyd ID - 10100149	Hyd ID - 10100150
Pipe Size	DN150	DN150	DN100
Zone Supply	North Rothbury 1 Res	North Rothbury 1 Res	Branxton 1 PRV
Elevation (m)	61.62	64.35	64.21
ADD (Pmax)	123	123	134
PDD (Pmin)	100	100	127
95% PDD + 10 L/s FF	100	100	108

Note: North Rothbury 1 Res Network is dominated by the pressure of Harpers Hill Res (120m HGL)

Note – The results above may change significantly when Huntlee reaches full demand. Hunter Water is currently performing detailed modelling to understand the effect of this development on the boundary conditions provided above, and will provide this information when the internal review is completed.

PRV Settings of CV1 PRV on Brokenback Road:

PRV is set to 70m downstream side pressure:



Confirmation of Strategy Data:

Upon reviewing the previous water strategy by Hyder, the following details were used to inform the previous strategy:

- The DN250 at the intersection of Elderslie St & Maitland St - 95%PDD of 98m (residual + elevation) – **HWC providing results above within subdivision due to extension of water mains since initial strategy**

- The DN100 from Sutton Grove, Branxton (as part of PRV supply area) – PDD (residual + elevation + 166ET from the study area added) – **HWC providing results above within subdivision due to extension of water mains since initial strategy**

- Confirm no concerns with servicing the high level properties above RL 82m from the PRV zone – **due to reduction in PDD from North Rothbury Res, lots above approx. 78m will not receive sufficient pressure and will need to be serviced using the PRV zone.**

Selection of DN250 water main from Maitland St and the DN100 from Sutton Grove to service the area:
The selection of these two water mains is sufficient to service the area

Request to provide an updated DRL (incl. staging, existing and proposed mains) in lieu of an updated strategy:
Hunter Water would be satisfied with **an addendum to the strategy (required)** to bring it up to date, including **new DRL's and staging plan.**

Should you have any further queries, please let myself or Barry know.

Kind Regards,

Ron

-
Ron Bridge
Development Services Engineer | Hunter Water Corporation
36 Honeysuckle Drive Newcastle NSW 2300 | PO BOX 5171 HRMC NSW 2310
Ph: (02) 4064 7844 | ronald.bridge@hunterwater.com.au | hunterwater.com.au

From: Robert Champness <robertch@adwjohnson.com.au>
Sent: Wednesday, 31 March 2021 4:54 PM
To: Ronald Bridge <ronald.bridge@hunterwater.com.au>; Barry Calderwood <barry.calderwood@hunterwater.com.au>
Cc: Chris Barker <chris.barker@hunterwater.com.au>; Matthew Russell <matthew.russell@hunterwater.com.au>; Cameron Black <cameronb@adwjohnson.com.au>; Andrew Williams <andrew@belfordland.com.au>
Subject: FW: Radford Park Elderslie Rd Branxton - Inception Meeting

Good afternoon Barry and Ronald,

The action items listed within the attached meeting minutes included the three following items for the water strategy:

	ACTION	RESPONSIBILITY	TARGET DATE
	Water Strategy Requirements		
1	Provide current boundary conditions	HWC	March 2021
2	Provide boundary conditions post construction of Harpers Hill to Greta main	HWC	March 2021
3	Provide PRV settings of CV1 PRV on Brokenback Rd	HWC	March 2021

Are you able to provide a response on these three items asap as we are looking to progress this in April.

Upon reviewing the previous water strategy by Hyder, the following details were used to inform the previous strategy:

- The DN250 point of connection at the intersection of Elderslie St and Maitland St was stated to have a 95%PDD hydraulic head of 98m (residual pressure + ground elevation)
- The DN100 from Sutton Grove, Branxton (as part of the PRV supply area) was stated to have PDD hydraulic head (residual pressure + ground elevation), this included a proposed 166ET from the study area
- The PRV zone was confirmed by HWC that there were no concerns the high level properties above RL 82m were to be service from this supply zone.

Based on this information, it was determined that the DN250 water main from Maitland St and the DN100 from Sutton Grove were adequate to service the area.

I have extracted the relevant correspondence and attached for your reference. Could you please confirm if the three points above are still suitable and accurate from the previous strategy.
If determined suitable, are we able to provide an updated DRL outlining staging, existing watermains and proposed watermains to satisfy the requirements (in lieu of an updated strategy) ?

Kind Regards,

Robert Champness
CIVIL ENGINEER

Hunter Office
Ph. 02 4978 5100
Mob. 0423 620 213

ADW Johnson Pty Limited

SYDNEY	Level 35 One International Towers, 100 Barangaroo Avenue, Sydney NSW 2000	**Ph.** 02 8046 7411
CENTRAL COAST	5 Pioneer Avenue, Tuggerah NSW 2259	**Ph.** 02 4305 4300
HUNTER	7/335 Hillsborough Road, Warners Bay NSW 2282	**Ph.** 02 4978 5100

From: Robert Champness
Sent: Wednesday, 3 March 2021 8:46 AM
To: Barry Calderwood <barry.calderwood@hunterwater.com.au>; Chris Barker <chris.barker@hunterwater.com.au>; Ronald Bridge <ronald.bridge@hunterwater.com.au>; Matthew Russell <matthew.russell@hunterwater.com.au>
Cc: Andrew Williams <andrew@belfordland.com.au>; Cameron Black <cameronb@adwjohnson.com.au>
Subject: Radford Park Elderslie Rd Branxton - Inception Meeting

Good morning all,

Please find attached the meeting minutes and action items from the inception meeting on 2/03/2021 for HWC review and acceptance. Please let me know if you have any comments.

As requested, please find the estimated development staging timeframes and associated loadings below.
I do note the loadings have been updated from the ultimate 231 ET in the approved strategy to 221 ET based on preliminary investigations into the lot layout over the unzoned lands.

DESCRIPTION	YEAR	ET	Cumulative ET	ADWF (L/s)	PDWF (L/s)	*SA*	PWWF (L/s)
Radford Park Stages 4, 5, 6	2022	41.0	41.00	0.45	1.71	2.38	4.09
Radford Park Stage 8	2023	25.0	66.00	0.73	2.54	3.83	6.37
(rezoning in progress)	2024	0.0	66.00	0.73	2.54	3.83	6.37
(rezoning in progress)	2025	0.0	66.00	0.73	2.54	3.83	6.37
Radford Park Extension 1	2026	10.0	76.00	0.84	2.85	4.41	7.26
Radford Park Extension 2 A	2027	35.0	111.00	1.22	3.91	6.44	10.35
Radford Park Extension 2 B	2028	35.0	146.00	1.61	4.92	8.47	13.38
Radford Park Extension 2 C	2029	35.0	181.00	1.99	5.89	10.50	16.38
Radford Park Extension 3	2030	40.0	221.00	2.43	6.96	12.82	19.78

Kind Regards,

Robert Champness
CIVIL ENGINEER

Hunter Office
Ph. 02 4978 5100
Mob. 0423 620 213

ADW Johnson Pty Limited
SYDNEY Level 35 One International Towers, 100 Barangaroo Avenue, Sydney NSW 2000 **Ph.** 02 8046 7411
CENTRAL COAST 5 Pioneer Avenue, Tuggerah NSW 2259 **Ph.** 02 4305 4300
HUNTER 7/335 Hillsborough Road, Warners Bay NSW 2282 **Ph.** 02 4978 5100

Robert Champness

From: Cameron Black
Sent: Tuesday, 23 November 2021 5:24 PM
To: Barry Calderwood; Robert Champness
Cc: Andrew Williams; Wesley Jones
Subject: RE: Radford Park Water Servicing Strategy Comments

Thanks Barry – Understood.

Regards,

Cameron Black
Senior Engineer
Hunter Office
Ph: 02 4978 5100
Mob: 0422 053 855
Email : cameronb@adwjohnson.com.a
Website: www.adwjohnson.com.au

ADW Johnson Pty Limited

Hunter	7/335 Hillsborough Road, Warners Bay NSW 2282	Ph. 02 4978 5100
Central Coast	5 Pioneer Avenue, Tuggerah NSW 2259	Ph. 02 4305 4300
Sydney	Level 35 One International Towers, 100 Barangaroo Avenue, Sydney NSW 2000	Ph. 02 8046 7411

From: Barry Calderwood <barry.calderwood@hunterwater.com.au>
Sent: Tuesday, 23 November 2021 5:23 PM
To: Cameron Black <cameronb@adwjohnson.com.au>; Robert Champness <robertch@adwjohnson.com.au>
Cc: Andrew Williams <andrew@belfordland.com.au>; Wesley Jones <wesley.jones@hunterwater.com.au>
Subject: RE: Radford Park Water Servicing Strategy Comments

Hi Cameron

No, the diagram was not included and Wes said to call him instead.

Regards

Barry Calderwood
Account Manager Major Development **(Blue Team)** | Hunter Water Corporation
36 Honeysuckle Drive Newcastle NSW 2300 | PO BOX 5171 HRMC NSW 2310
T 02 4979 9721 | **F** 02 4979 9711 | Twitter: @hunterwater
barry.calderwood@hunterwater.com.au | hunterwater.com.au

From: Cameron Black [mailto:cameronb@adwjohnson.com.au]
Sent: Tuesday, 23 November 2021 5:22 PM
To: Barry Calderwood <barry.calderwood@hunterwater.com.au>; Robert Champness <robertch@adwjohnson.com.au>

Cc: Andrew Williams <andrew@belfordland.com.au>
Subject: RE: Radford Park Water Servicing Strategy Comments

Barry,

The comment from WJ refers to an attachment but I'm not sure what attachment he is referring to. I couldn't see anything embedded into the excel spreadsheet. Can you confirm if there should be another attachment provided?

Regards,

Cameron Black
Senior Engineer
Hunter Office
Ph: 02 4978 5100
Mob: 0422 053 855
Email : cameronb@adwjohnson.com.a
Website: www.adwjohnson.com.au

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Hunter	**7/335 Hillsborough Road, Warners Bay NSW 2282**	**Ph. 02 4978 5100**
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Sydney	**Level 35 One International Towers, 100 Barangaroo Avenue, Sydney NSW 2000**	**Ph. 02 8046 7411**

From: Barry Calderwood <barry.calderwood@hunterwater.com.au>
Sent: Tuesday, 23 November 2021 4:44 PM
To: Robert Champness <robertch@adwjohnson.com.au>
Cc: Cameron Black <cameronb@adwjohnson.com.au>; Andrew Williams <andrew@belfordland.com.au>
Subject: RE: Radford Park Water Servicing Strategy Comments

Hi Rob

Please find attached the Working Paper containing comments for the Radford Park Water Strategy.

Can you please provide your response to the comments on the Working Paper and amend the Strategy as required.

The Working Paper and revised Strategy should be emailed back to me.

Please give me a call if you have any questions regarding the comments.

Regards

Barry Calderwood
Account Manager Major Development **(Blue Team)** | Hunter Water Corporation
36 Honeysuckle Drive Newcastle NSW 2300 | PO BOX 5171 HRMC NSW 2310
T 02 4979 9721 | **F** 02 4979 9711 | Twitter: @hunterwater
barry.calderwood@hunterwater.com.au | hunterwater.com.au

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From: Robert Champness [mailto:robertch@adwjohnson.com.au]
Sent: Tuesday, 23 November 2021 1:14 PM
To: Barry Calderwood <barry.calderwood@hunterwater.com.au>
Cc: Cameron Black <cameronb@adwjohnson.com.au>; Andrew Williams <andrew@belfordland.com.au>
Subject: Radford Park Water Servicing Strategy Comments

Good afternoon Barry,

Following on from our conversation last week, when can we expect a response on the water servicing strategy for Radford Park?
Construction is looking to commence on site asap, with the sewer major routine works package (2021-108) submitted to HWC last week.
We would like to get the water strategy approved to ensure we can get the water major routine works package submitted to water asap.

Kind Regards,

Robert Champness
CIVIL ENGINEER

Hunter Office
Ph. 02 4978 5100
Mob. 0423 620 213

ADW Johnson Pty Limited

SYDNEY	Level 35 One International Towers, 100 Barangaroo Avenue, Sydney NSW 2000	**Ph.** 02 8046 7411
CENTRAL COAST	5 Pioneer Avenue, Tuggerah NSW 2259	**Ph.** 02 4305 4300
HUNTER	7/335 Hillsborough Road, Warners Bay NSW 2282	**Ph.** 02 4978 5100

Table 1 – Review of Radford Park Water Servicing Strategy Addendum - 2021-108/6/4 file:\\trim\TRIMREFERENCE\3671909.tr5

STATUS	Item	Reviewer Name	Page	Section	Hunter Water Comment	Consultant Response	Hunter Water Response	Consultant Response
OPEN (CONSULTANT)	1	RB	4	4.0	Comment under Table 4 - spelling error to be corrected to read "As adopted from"			
OPEN (CONSULTANT)	2	RB	4	4.0	Paragraph under Table 4 - spelling error to be corrected - "Both supply zones are to comprises of a series of DN100 and DN150 water mains."			
OPEN (CONSULTANT)	3	RB	4	4.0	Service pressure limit is 60m (refer to WSAA Water Code - Hunter Water Edition V2, Table HW 2.7 - changed from the 70m mentioned in the previous Hyber report). Design will need to be adjusted accordingly and strategy resubmitted. Please ensure whole strategy revised to ensure alignment with WSAA code.			
OPEN (CONSULTANT)	4	RB	4	4.0	Also note, as per WSAA Water Code, Section 2.5.3.2, PRV required for each individual premise affected by >500 kPa - include reference to WSAA please			
OPEN (CONSULTANT)	5	RB	5	4.0	Clarify the number of lots that receive high pressures under new max service pressures, include a table with number of lots over 60m, 70m and 80m.			
OPEN (CONSULTANT)	6	RB	5	4.0	Separately indicate servicing arrangement where lots receive over 60m, 70m and 80m pressure			
OPEN (CONSULTANT)	7	RB	5	4.0	Explain the security of supply proposal, and how high pressures will be managed under this proposal. Explain management of maximum service pressures if pressures are increased under the failure scenarios - will a number of these failure scenarios impose >70m on customers without individual PRV's? Similarly, how will low pressures at high elevations be managed under the failure scenarios?			
OPEN (CONSULTANT)	8	RB	5	4.0	Grammatical error - "sections of the proposed PRV supply was" - should be "were"			
OPEN (CONSULTANT)	9	RB	6	4.1	As the max service pressure is now 60m, this section needs to be updated.			
OPEN (CONSULTANT)	10	RB	Appendix	Appendix	Update DRL and existing development area to suit 60m maximum service pressure.			
OPEN (CONSULTANT)	11	RB	DRL	DRL	Change colours of the staging lines to make DRL clearer to understand			
OPEN (CONSULTANT)	12	RB	DRL	DRL	Road on white completed stage not extended onto pink proposed development (lower left, by the "RESERVOIR SUPPLY" text.			

OPEN (CONSULTANT)	13	RB	DRL	DRL	Explain the various proposed easements and what is planned for the future extension at points indicated.			
OPEN (CONSULTANT)	14	WJ	General		New PRV to be included on the lead-in main to minimise the areas receiving greater than 60m pressure. This should extend to existing lots where possible. Hunter Water may be willing to permit stages to connect while design and construction are ongoing, so as to not constrain development. Please refer to layout attached in design review comments email. liaise with Hunter Water to determine a possible location for future PRV			

APPENDIX 2

DRAWINGS

239567(50)-STRAT-001_B

STUDY AREA

RUSTY LANE

CLARET AVENUE

RADFORD PARKWAY

HIGHFIELDS WAY

SUTTON GROVE

EXISTING STAGES OF RADFORD PARK

ELDERSLIE ROAD

McMULLINS ROAD

BRANXTON #1 PRESSURE REDUCING VALVE

BRANXTON #1 PUMPING STATION

BRANXTON

EAST BRANXTON

NEW ENGLAND HIGHWAY

STATION STREET

DESSNOCK ROAD

DN250 SUPPLY MAIN FROM NORTH ROTHBURY #1 RESERVOIR

EXISTING MAIN RESERVOIR SUPPLY

EXISTING MAIN PRV SUPPLY

1 of 5

ver.	date	comment	drawn	pm	level information	scale (A3 original size)
B	15/12/21	PRV PLAN ADDED	MS	RCh	DATUM: AHD CONTOUR INTERVAL: 1m	

working beyond expectations

drawing title:

WATER STRATEGY OVERVIEW

location:	RADFORD PARK ELDERSLIE ROAD, BRANXTON
council:	SINGLETON
dwg ref:	239567(50)-STRAT-001_B
client:	BELFORD EST. 2006

adw johnson

central coast office ph: (02) 4305 4300
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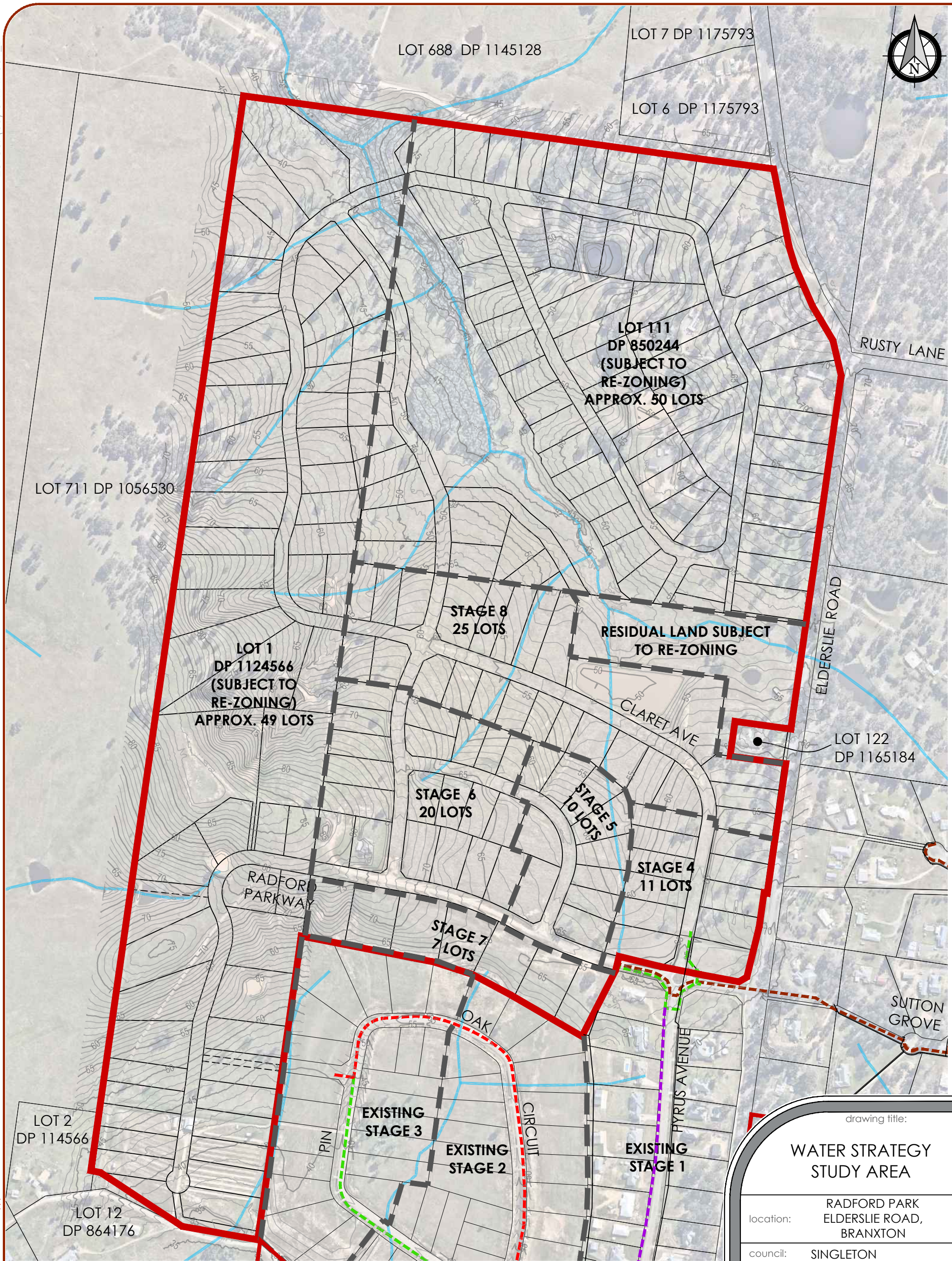
239567(50)-STRAT-001_B



STUDY AREA
EXISTING DN100 PRV SUPPLY
EXISTING DN100 RESERVOIR SUPPLY
EXISTING DN150 RESERVOIR SUPPLY
EXISTING DN250 RESERVOIR SUPPLY

2 of 5

ver.	date	comment	drawn	pm	level information	scale (A3 original size)
B	15/12/21	PRV PLAN ADDED	MS	RCh	DATUM: AHD CONTOUR INTERVAL: 1m	0 125 250m SCALE: 1:5000 (FULL)

working beyond expectations

drawing title:

WATER STRATEGY STUDY AREA

location:	RADFORD PARK ELDERSLIE ROAD, BRANXTON
council:	SINGLETON
dwg ref:	239567(50)-STRAT-001_B

client: BELFORD EST. 2006

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central coast office ph: (02) 4305 4300
hunter office ph: (02) 4978 5100
sydney office ph: (02) 8046 7411

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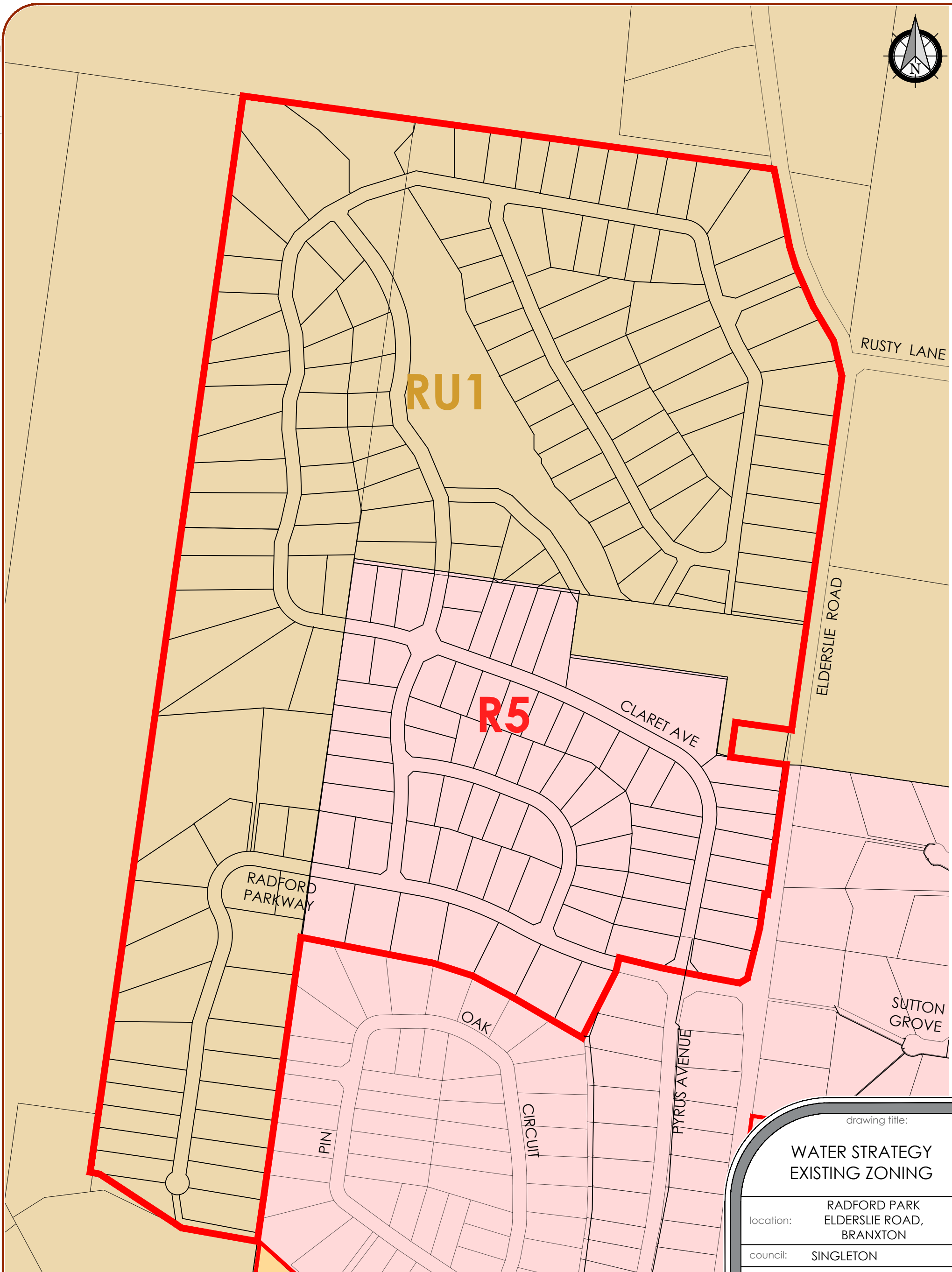

R5 Large Lot Residential

RU1 Primary Production

3 of 5

ver.	date	comment	drawn	pm	level information	scale (A3 original size)
B	15/12/21	PRV PLAN ADDED	MS	RCh	DATUM: N/A CONTOUR INTERVAL: N/A	0 125 250m SCALE: 1:5000 (FULL)

working beyond expectations

drawing title:

WATER STRATEGY EXISTING ZONING

location:	RADFORD PARK ELDERSLIE ROAD, BRANXTON
council:	SINGLETON
dwg ref:	239567(50)-STRAT-001_B
client:	BELFORD EST. 2006

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central coast office ph: (02) 4305 4300
hunter office ph: (02) 4978 5100
sydney office ph: (02) 8046 7411

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FUTURE EXTENSION

RUSTY LANE

ELDERSLIE ROAD

ALIGNMENT SUBJECT TO RE-ZONING

CLARET AVE

75m

75m

FUTURE EXTENSION

RADFORD PARKWAY

PROPOSED EASEMENTS

PROPOSED DN150 CROSS CONNECTION WITH ZONE VALVE

OAK

PRV SUPPLY

SUTTON GROVE

EXISTING DN100 CROSS CONNECTION WITH ZONE VALVE

RESERVOIR SUPPLY

PIN

CIRCUIT

RESERVOIR SUPPLY

PYRUS AVENUE

RESERVOIR SUPPLY ZONE

PRV SUPPLY ZONE

STUDY AREA

STAGE BOUNDARY

EXISTING DN100 PRV SUPPLY

PROPOSED DN100 PRV SUPPLY

PROPOSED DN150 PRV SUPPLY

EXISTING DN100 RESERVOIR SUPPLY

PROPOSED DN100 RESERVOIR SUPPLY

EXISTING DN150 RESERVOIR SUPPLY

PROPOSED DN150 RESERVOIR SUPPLY

EXISTING DN250 RESERVOIR SUPPLY

4 of 5

ver.	date	comment	drawn	pm	level information	scale (A3 original size)
B	15/12/21	PRV PLAN ADDED	MS	RCh	DATUM: AHD CONTOUR INTERVAL: 1m	0 125 250m SCALE: 1:5000 (FULL)

working beyond expectations

drawing title:

WATER STRATEGY DRAFT RETICULATION LAYOUT

location: RADFORD PARK ELDERSLIE ROAD, BRANXTON

council: SINGLETON

dwg ref: 239567(50)-STRAT-001_B

client: BELFORD EST. 2006

adw johnson

central coast office ph: (02) 4305 4300
hunter office ph: (02) 4978 5100
sydney office ph: (02) 8046 7411

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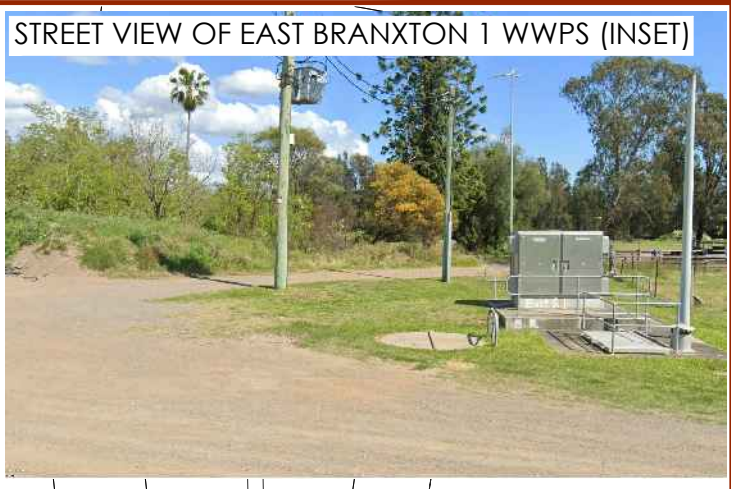
• project management

239567(50)-STRAT-001_B

STREET VIEW OF EAST BRANXTON 1 WWPS (INSET)



RUSTY LANE

CLARET AVENUE

RADFORD PARKWAY

HIGHFIELDS WAY

SUTTON GROVE

EXISTING STAGES OF RADFORD PARK

ELDERSLIE ROAD

POTENTIAL FUTURE DEVELOPMENT AREA

McMULLINS ROAD

BRANXTON #1 PRESSURE REDUCING VALVE

BRANXTON #1 PUMPING STATION

POTENTIAL FUTURE DEVELOPMENT AREA

WWPS EAST BRANXTON 1

PROPOSED PRV

EXIST DN200 RISING MAIN

EXIST DN250 WATERMAIN

ELDERSLIE ROAD

INSET

PROPOSED PRV

EAST BRANXTON

NEW

STATION STREET

GESSNOCK ROAD

ENGLAND

HIGHWAY

DN250 SUPPLY MAIN FROM NORTH ROTHBURY #1 RESERVOIR

EXISTING MAIN RESERVOIR SUPPLY

EXISTING MAIN PRV SUPPLY

5 of 5

ver.	date	comment	drawn	pm	level information	scale (A3 original size)
B	15/12/21	PRV PLAN ADDED	MS	RCh	DATUM: AHD CONTOUR INTERVAL: 1m	

working beyond expectations

drawing title:

WATER STRATEGY PROPOSED PRV

location: RADFORD PARK ELDERSLIE ROAD, BRANXTON

council: SINGLETON

dwg ref: 239567(50)-STRAT-001_B

client: BELFORD EST. 2006

adw johnson

central coast office ph: (02) 4305 4300
hunter office ph: (02) 4978 5100
sydney office ph: (02) 8046 7411

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• project management • civil engineering • infrastructure • superintendency • economic analysis • social impact • town planning • surveying • development feasibility • visualisation • urban design

Plotted By: Mark Spitzkowsky Plot Date: 21/12/21 11:25:44AM Cad File: N:\239567\239567(50)\DWG\WATER & SEWER\STRAT\239567(50)-STRAT-001_B.DWG

This plan includes coloured information. If you have a black and white copy you do not have all of the information. This note is coloured RED.

239567(50)-STRAT-001_B

CONSTRAINED AREA.
LESS THAN 12m PRESSURE
(FAILURE SCENARIO 1)

82m

RUSTY LANE

ELDERSLIE ROAD

CLARET AVE

RADFORD PARKWAY

OAK

PIN

CIRCUIT

RESERVOIR SUPPLY

RESERVOIR SUPPLY

PYRUS AVENUE

P.R.V. SUPPLY

SUTTON GROVE

NOTES:

1. 5 lots with an elevation greater than RL 82m receive less than 12m pressure if PRV supply was to fail.

- STUDY AREA
- STAGE BOUNDARY
- EXISTING DN100 PRV SUPPLY
- PROPOSED DN100 PRV SUPPLY
- PROPOSED DN150 PRV SUPPLY
- EXISTING DN100 RESERVOIR SUPPLY
- PROPOSED DN100 RESERVOIR SUPPLY
- EXISTING DN150 RESERVOIR SUPPLY
- PROPOSED DN150 RESERVOIR SUPPLY
- EXISTING DN250 RESERVOIR SUPPLY

6 of 5

ver.	date	comment	drawn	pm	level information	scale (A3 original size)
B	15/12/21	PRV PLAN ADDED	MS	RCh	DATUM: AHD CONTOUR INTERVAL: 1m	0 125 250m SCALE: 1:5000 (FULL)

working beyond expectations

drawing title:

WATER STRATEGY CONSTRAINED LOTS

location:	RADFORD PARK ELDERSLIE ROAD, BRANXTON
council:	SINGLETON
dwg ref:	239567(50)-STRAT-001_B

client: BELFORD EST. 2006

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central coast office ph: (02) 4305 4300
hunter office ph: (02) 4978 5100
sydney office ph: (02) 8046 7411

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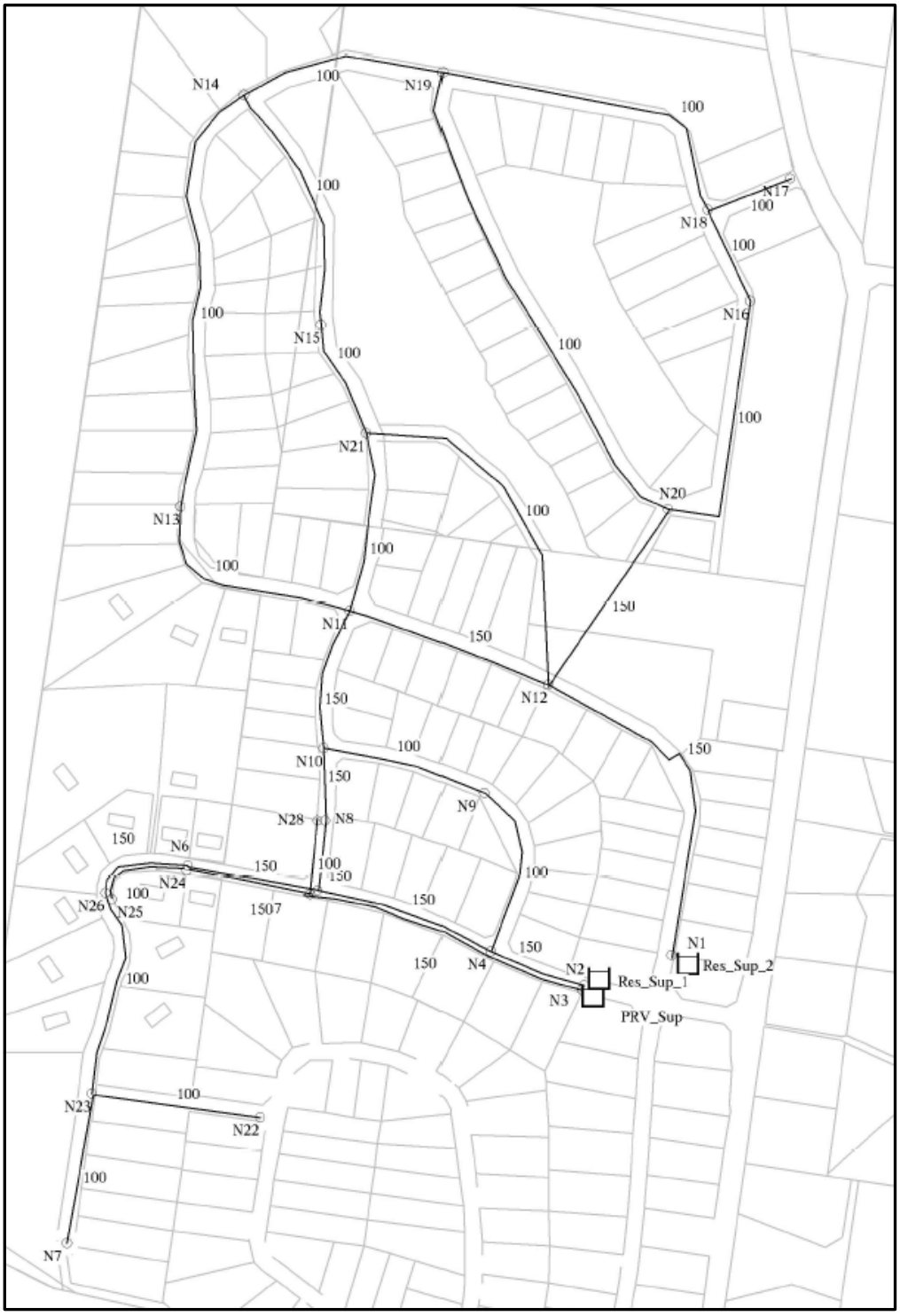
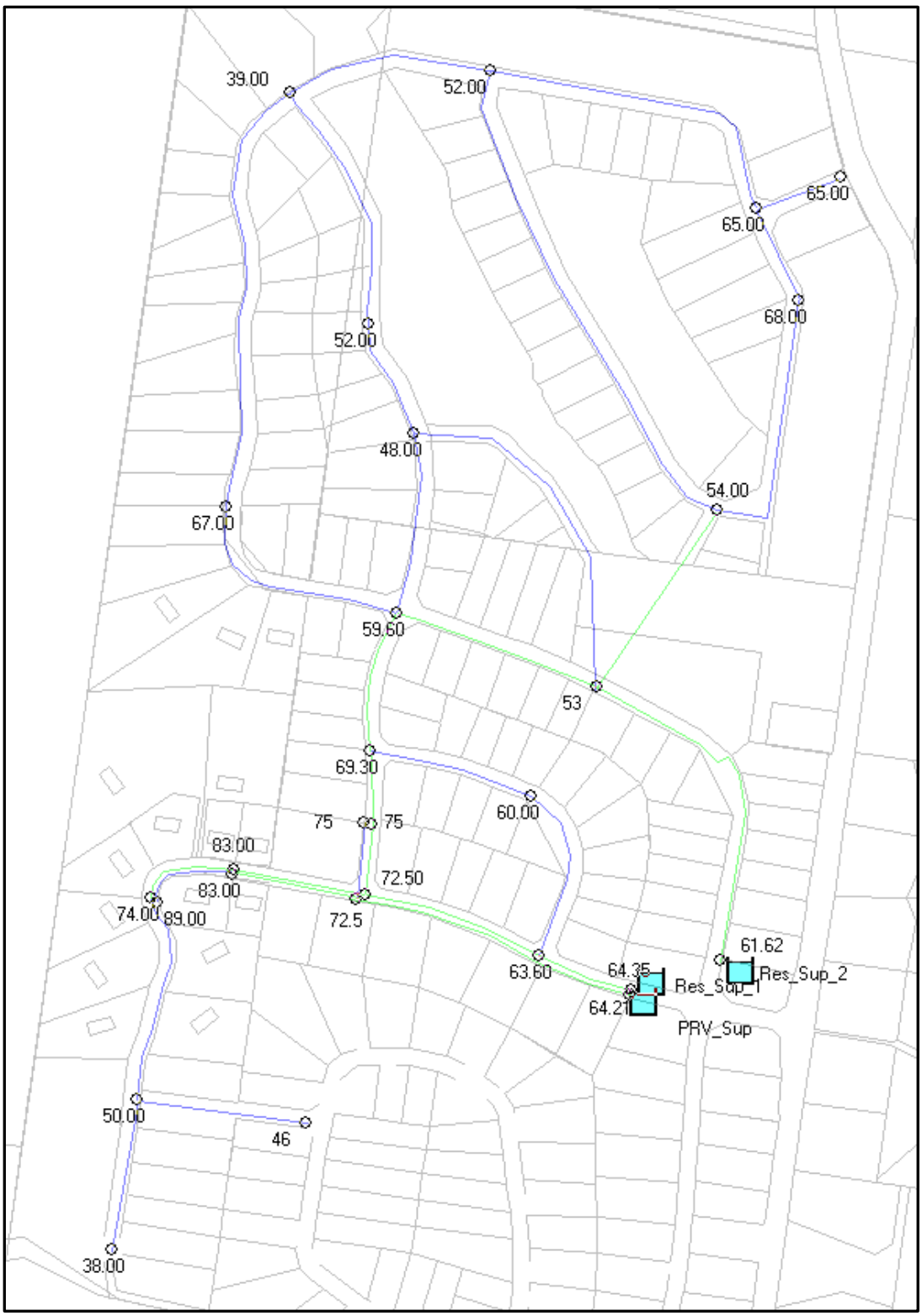
APPENDIX 3

PIPES++ MODEL



Note: No Lots serviced off Reservoir supply at Nodes 6, 8 and 26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PRV_Sup
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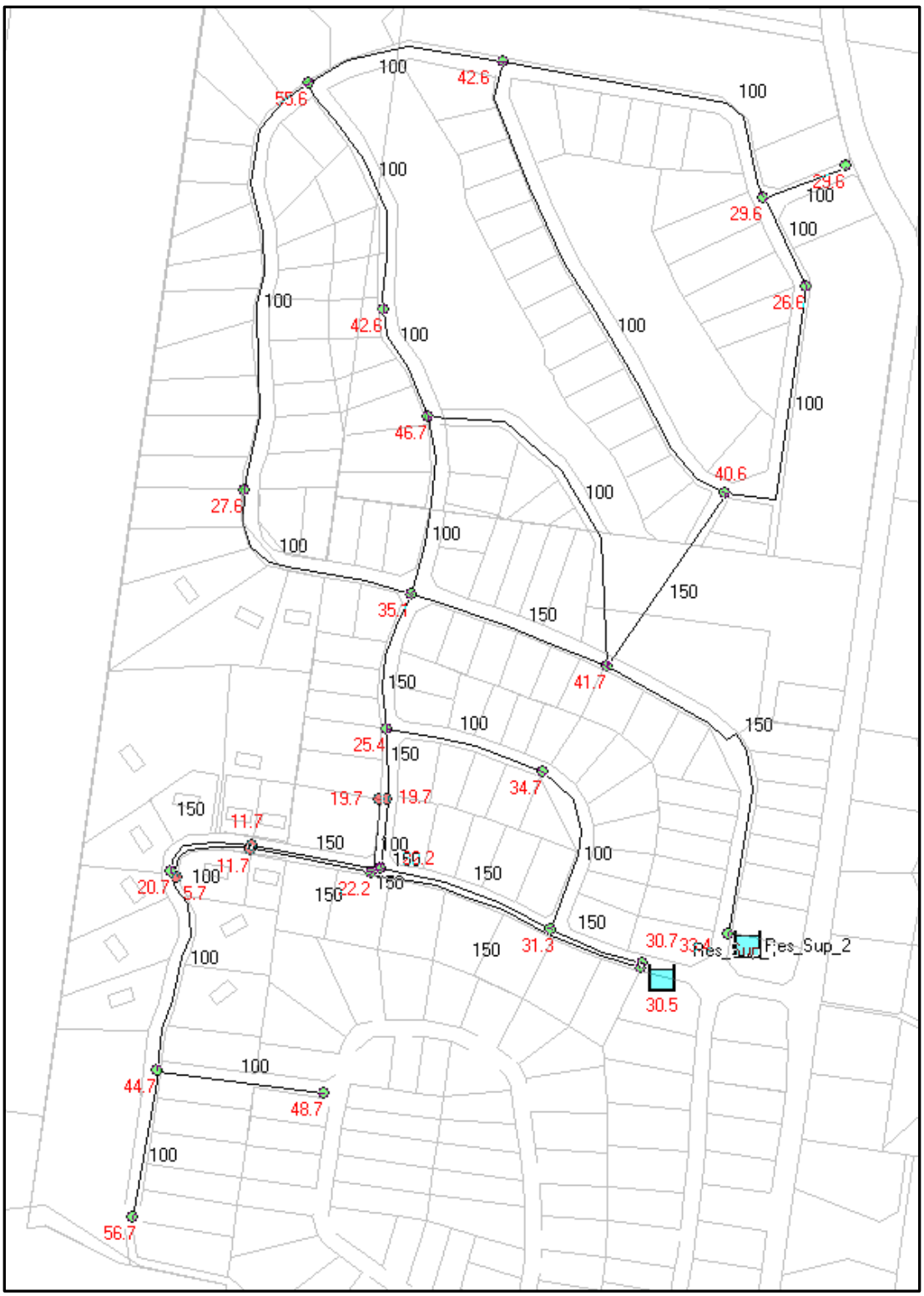
38.00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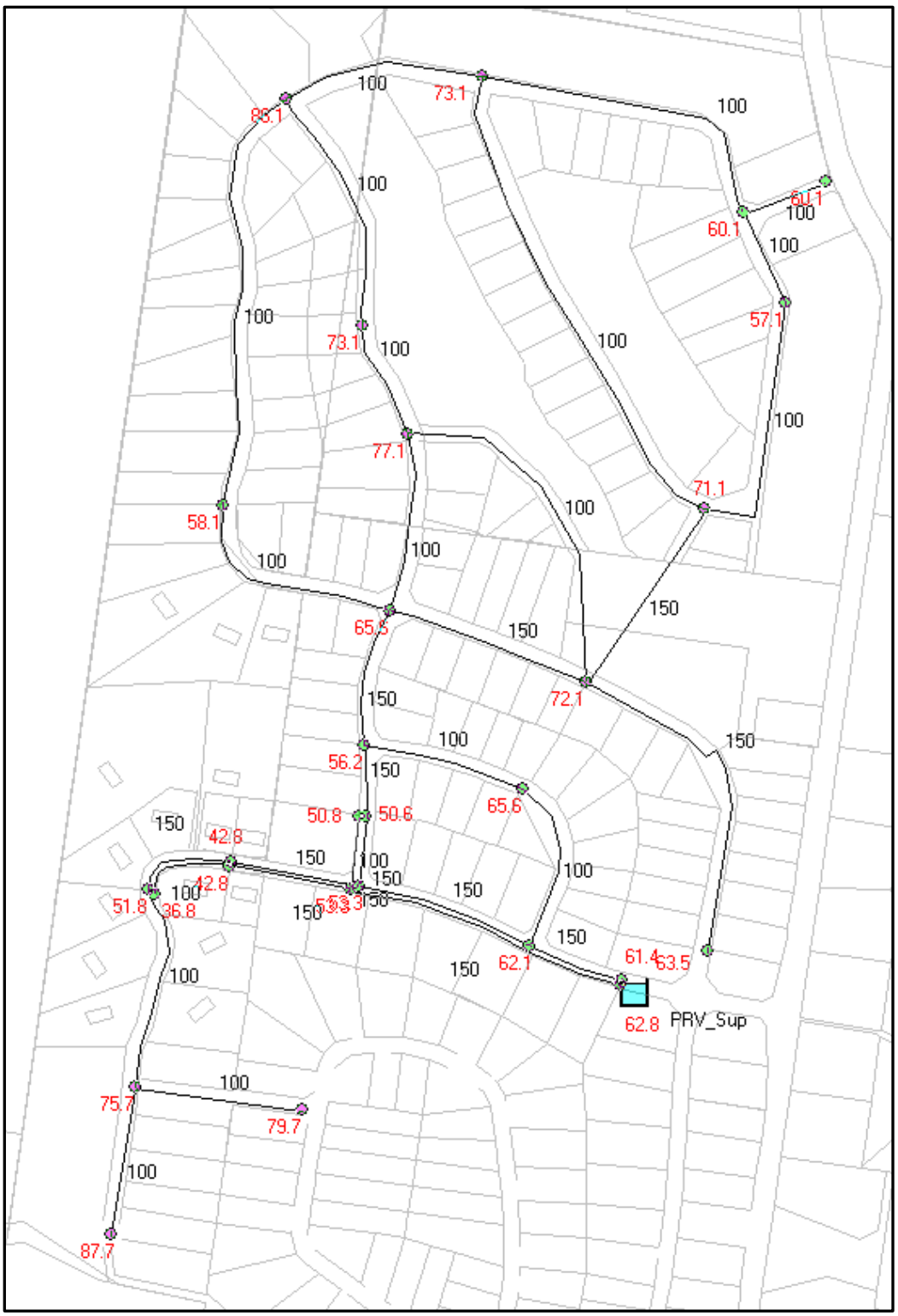
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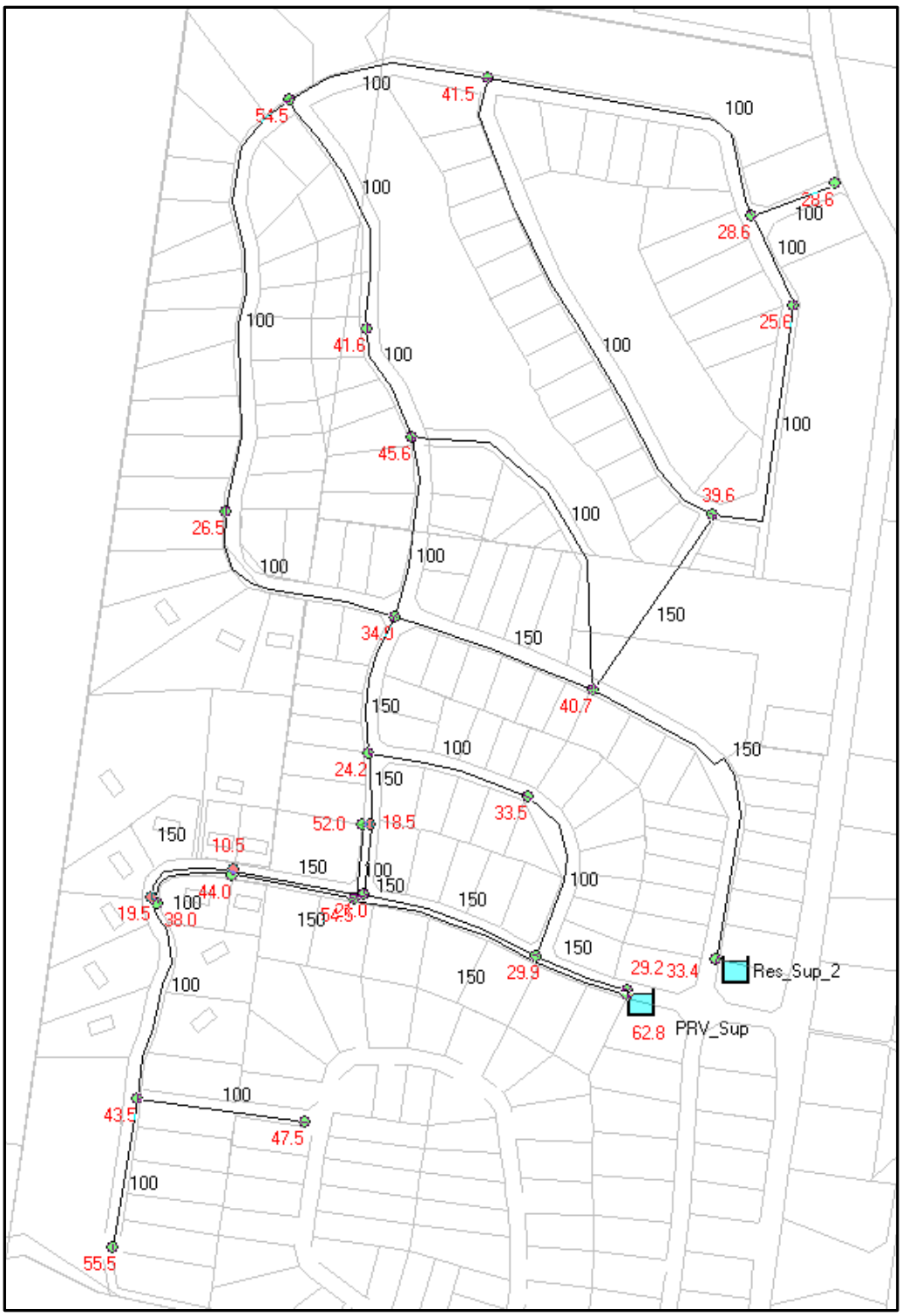
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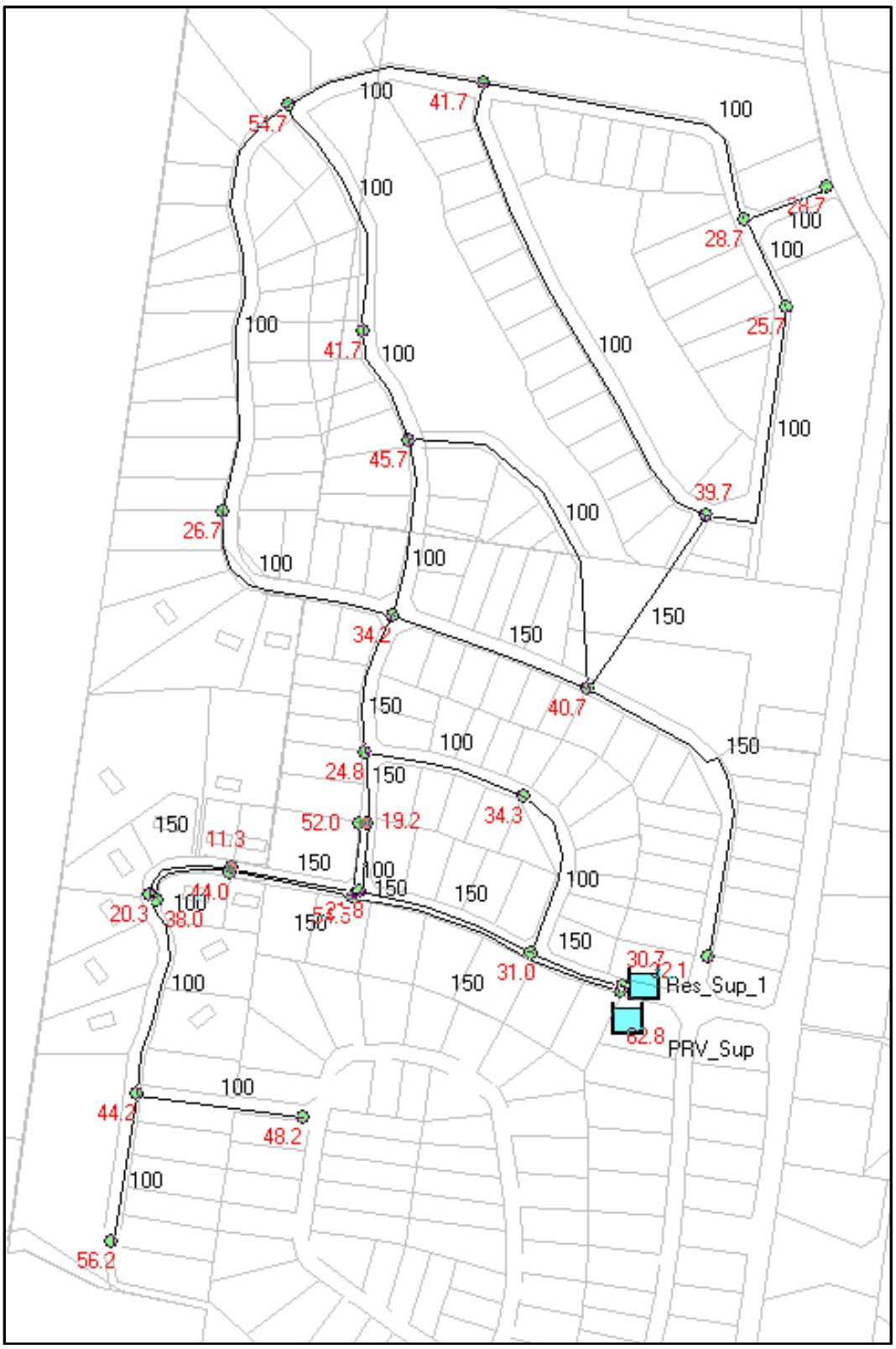
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PRV_Sup
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44.2
48.2
100
56.2

					AVERAGE				PEAK							EXTREME		95th PERCENTILE (FIRE FLOWS)				
TYPE	Yr	ET	Area (ha)	Private Units	AVERAGE ANNUAL DEMAND (kL/yr/ET) (T HW 2.4)	AVERAGE ANNUAL DEMAND (kL/yr/ha) (T HW 2.4)	TOTAL ANNUAL CONSUMPTION (kL/yr)	AVERAGE DAY DEMAND (kL/day)	PEAK DAY FACTOR (T H 2.4)	DIVERSITY FACTOR (§2.3.4.2)	PEAK DAY DEMAND (kL/day)	PEAK HOUR FACTOR (T HW 2.4)	DIURNAL DIVERSITY FACTOR (§HW 2.3.4.7)	PEAK HOUR DEMAND (kL/day)	PEAK HOUR FLOW (L/s)	EXTREME DAY FACTOR (T HW2.4)	EXTREME DAY DEMAND (kL/day)	95th % PEAK DAY FACTOR (T HW 2.4)	95th % PEAK DAY DEMAND (kL/day)	95th % PEAK HOUR DEMAND (kL/day)	95th % PEAK HOUR DEMAND (L/s)	95th % PEAK HOUR DEMAND (L/s) + FIRE FIGHTING
							AD	ADD	PDF	DF	PDD	PHF	DDF	PHD		EDF	EDD	95F	95PDD	95PHD		
1 - Residential Res Supply	ULTIMATE	161	-	-	285	-	45885	126	2.25	1.54	436	2.02	1.00	881	10.2	1.15	502	1.8	226	457	5.29	15
2 - Residential PRV Supply	ULTIMATE	11	-	-	285	-	3135	9	2.25	2.05	40	2.02	2.44	196	2.3	1.15	46	1.76	15	75	0.86	11

PIPES++ MODEL

ADD Model			PDD Model			95PDD Model			EDD Model		
1 - Residential Res Supply			1 - Residential Res Supply			1 - Residential Res Supply			1 - Residential Res Supply		
Average Day Demand	126	kL/day	Peak Day Demand	436	kL/day	95% Peak Day Demand =	226	kL/day	Extreme Day Demand	502	kL/day
	0.780821918	kL/day/ET		2.710213116	kL/day/ET		1.405479452	kL/day/ET		3.116745083	kL/day/ET
ADD Multiplier =	**0.009037291**	**L/s/ET**	PDD Multiplier =	**0.031368207**	**L/s/ET**	95PDD Multiplier =	**0.016267123**	**L/s/ET**	EDD Multiplier =	**0.036073438**	**L/s/ET**
2 - Residential PRV Supply			2 - Residential PRV Supply			2 - Residential PRV Supply			2 - Residential PRV Supply		
Average Day Demand	9	kL/day	Peak Day Demand	40	kL/day	95% Peak Day Demand =	15	kL/day	Extreme Day Demand	46	kL/day
	0.780821918	kL/day/ET		3.608736433	kL/day/ET		1.374246575	kL/day/ET		4.150046898	kL/day/ET
ADD Multiplier =	**0.009037291**	**L/s/ET**	PDD Multiplier =	**0.041767783**	**L/s/ET**	95PDD Multiplier =	**0.015905632**	**L/s/ET**	EDD Multiplier =	**0.04803295**	**L/s/ET**

	Unaccounted Water (15% of ADD)		
	TYPE	MULTIPLIER	PIPES++ AREA
Res	Residential Res Su	0.00135559	7
Res	Residential PRV Su	0.00135559	8

APPENDIX 4

WATER STRATEGY COST BREAKDOWN

ESTIMATING SHEET

PROJECT DESCRIPTION: Radford Park Water Strategy

Date Priced: 02-Dec-2021

Date Cost Tables updated: 24-Oct-2018

Item No.	Item Description	Qty	Unit	Rate $/Unit	Amount $	Application of Schedule of Rates	Capital Project Estimate Code	WBS
HW0001	All work not included elsewhere in this schedule	Item	Lump Sum	$ 22,769.00	$ 22,769.00	**Payment**: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.	Delivery	
HW0002	Site Establishment <Insert Max $>	Item	Lump Sum	$ 85,000.00	$ 85,000.00	**Payment**: 100% after completion.		
HW0003	Site Disestablishment <Insert Min $>	Item	Lump Sum	$ 85,000.00	$ 85,000.00	**Payment**: 100% after completion.		
HW0004	Preparation and implementation of the Construction EMP	Item	Lump Sum	$ 9,600.00	$ 9,600.00	**Payment**: Maximum of 30% on submission of complying Construction EMP, then 10% per month up to maximum of 80%. Remainder at Practical Completion. **Submit:** Construction EMP.		
HW0005	Preparation and implementation of the Safety Management Plan.	Item	Lump Sum	$ 22,000.00	$ 22,000.00	**Payment**: Maximum of 30% on submission of complying plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion. **Submit:** Safety Management Plan.		
HW0006	Preparation and implementation of the Traffic Control Plan.	Item	Lump Sum	$ 7,200.00	$ 7,200.00	**Payment**: Maximum of 30% on submission of complying Traffic Control Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.		
HW0007	Preparation and Implementation of Quality Management Plan	Item	Lump Sum	$ 14,153.70	$ 14,153.70	**Payment**: Maximum of 30% on submission of complying Quality Management Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.		

Water Pipeline - Reticulation - section will be present if one or more reticulation watermains are specified

Item	Construction of Reticulation Watermains	Qty	Unit	Rate $/Unit	Amount $	Application of Schedule of Rates	Code	WBS
HWW001	Service Location	Item	Lump Sum	$ 5,129.00	$ 5,129.00	**Payment**: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.	Delivery	
HWW02.01	DN100 Valves / Flowmeters	Item	Lump Sum	$ 35,000.00	$ 35,000.00			
HWW02.02	DN150 Valves / Flowmeters	Item	Lump Sum	$ 23,600.00	$ 23,600.00			
HWW03.01	DN100 Fittings	Item	Lump Sum	$ 4,500.00	$ 4,500.00			
HWW03.02	DN150 Fittings	Item	Lump Sum	$ 3,360.00	$ 3,360.00			
HWW004	Supply all pipes materials including detector tape, pipe protection wrapping, rubber rings and lubricant for following pipe sizes:					**Measurement:** Actual metres (effective length) of pipe delivered to site. **Submit:** Relevant Quality Records including Compliance Certificates. Note: Limits of Accuracy to be inserted for each pipe size.		
20AVSS	Nominal DN100 PVC pipe	5026	m	$ 17.77	$ 89,286.89			
20FVSS	Nominal DN150 PVC pipe	2384	m	$ 35.53	$ 84,703.52			
HWW005	Clear, excavate, lay, join, bed, backfill & test pipelines (installation). Up to **1.5 m depth** to invert in OTR.					**Measurement:** Actual metres of pipe installed to design depth of excavation up to and including 1.5m. **Retention:** 10% <or other appropriate percentage> until satisfactory testing. **Submit:** Relevant Quality Records including as constructed lengths, levels and coordinates. **Limits of Accuracy:** <To be inserted>.		
20AV0B	Nominal DN100 PVC (Trench type B)	5026	m	$ 48.40	$ 243,258.40			
20FV0B	Nominal DN150 PVC (Trench type B)	2384	m	$ 56.40	$ 134,457.60			
HWW015	Supply & place ballast			$ 91.80		**Measurement:** Actual tonnes placed as directed. **Submit:** Relevant Quality Records including certified weighbridge dockets. **Limits of Accuracy:** <To be inserted>.		
HWW021	Supply and installation of pipe aerial creek crossing including supply of MSCL pipe with protection coating, internal and external welding, testing of welds. For the following MSCL pipe sizes:					**Measurement**: Length in metres of crossing installed in accordance with design. **Retention:** 10% <or other appropriate percentage> until satisfactory testing. *Note: Consider other milestone retentions.* **Submit:** Relevant Quality Records. **Limits of Accuracy:** <To be inserted>.		
HWW022.01	DN100 Bulkheads / Trenchstops	60	Each	$ 2,020.05	$ 121,202.90			
HWW022.01	DN150 Bulkheads / Trenchstops	30	Each	$ 1,205.42	$ 36,162.60			
HWW027	Preparation of line sheets	7410	m	$ 1.16	$ 8,595.60	**Measurement**: Length of pipelines constructed as per design. **Limits of Accuracy:** <To be inserted>.		
HWW029.01	Pressure Reducing Valve	1	Each	$ 250,000.00	$ 250,000.00			
HWW000	***Sub Total***				$1,039,257			

Item No.	Item Description	Qty	Unit		Amount $	Application of Schedule of Rates	Capital Project Estimate Code	WBS
HW0013	Work as Constructed Information <Insert Min $>	Item	Lump Sum	$ 60,391.50	$ 60,391.50	**Payment**: 100% at Practical Completion.		

A.	**TOTAL ESTIMATED CONTRACT AWARD SUM**	$ 1,345,370.71

B.	**PRE-CONSTRUCTION COST (Table 10)**	
HW0016	Design	$ 161,444.48
HW0017	Project Management of Design	$ 48,288.90
HW0024	Community Consultation	
	Sub Total(B1)	$ 209,733.38
	Pre construction contingency (30% of B1)	$ 62,920.01
	TOTAL PRE-CONSTRUCTION COST (B)	$ 272,653.40

Development

C.	**CONSTRUCTION COST**	
	Total Estimated Contract Award Sum (A)	$ 1,345,370.71
HW0023	Construction Management (Table 11)	$ 188,351.90
	Sub Total (C1)	$ 1,533,722.61
	Construction contingency (Table 12) (30% of C1) Preliminary Estimate	$ 460,116.78
	TOTAL CONSTRUCTION COST (C)	$ 1,993,839.39

Delivery

	TOTAL PRELIMINARY PROJECT ESTIMATE (B+C) (Preliminary Estimate)	$ 2,266,492.78

Total Cost

Appendix B

WASTEWATER SERVICING STRATEGY

ADW JOHNSON PTY LIMITED
ABN 62 129 445 398

Sydney
Level 35 One International Towers
100 Barangaroo Avenue
Sydney NSW 2000
02 8046 7411
sydney@adwjohnson.com.au

Central Coast
5 Pioneer Avenue
Tuggerah NSW 2259
02 4305 4300
coast@adwjohnson.com.au

Hunter Region
7/335 Hillsborough Road
Warners Bay NSW 2282
02 4978 5100
hunter@adwjohnson.com.au

Engineering

Working Beyond Expectations

Wastewater Servicing Strategy
Radford Park

Property:
Lot 45 in DP1166072 & Lot 1 DP1124566
Elderslie Road, East Branxton

Client:
Belford Land

Date:
December 2018

adw johnson

Project Management • Town Planning • Engineering • Surveying
Visualisation • Economic Analysis • Social Impact • Urban Planning

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Document Control Sheet

Issue No.	Amendment	Date	Prepared By	Checked By
A	Draft	08/06/2018	NA	CB
B	HWC Comments	28/08/2018	NS	CB
C	HWC Comments	17/12/2018	NS	CB

Executive Summary

ADW Johnson Pty. Ltd. (ADW Johnson) has been commissioned by Belford Land to prepare a wastewater servicing strategy for the proposed rezoning of Lot 1 in DP 1124566, for large lot residential development. The proposed rezoning will enable an extension of the previously approved Radford Park development which is situated off Elderslie Road, East Branxton on Lot 45 in DP 1166072.

An existing wastewater servicing strategy was prepared by Hyder Consulting Pty. Ltd. (Hyder) in 2012 which has been approved by the Hunter Water Corporation (HWC) for the current Radford Park extent.

This sewer servicing strategy has been prepared as an addendum to the Hyder strategy and aims to revise the proposed Wastewater Pump Station (WWPS) location and design loading as well as assessing any impacts on existing downstream infrastructure due to the additional proposed development.

The updated strategy will accompany a rezoning proposal for the additional extent of Radford Park on Lot 1 in DP 1124566, to be submitted to Singleton Council (Council).

The existing Radford Park site is located west of Elderslie Road, East Branxton on Lot 45 in DP 1166072. It is approximately 74 hectares in size and the proposed development will be made up of approximately 182 large lot residential lots. 44 of these lots have been developed under stage 1 and are already connected to HWC's wastewater network. Stages 2 and 3 are currently under construction.

The proposed extension to Radford Park will encompass the lot directly to the west of the existing Radford Park, in Lot 1 DP 1124566. It is approximately 38 ha in size and it is proposed that approximately 71 large lot residential lots will be developed on the site.

To service the proposed extension to Radford Park it is proposed that the overall strategy as outlined in the Hyder strategy be implemented with the location of the WWPS adjusted accordingly. The WWPS is now proposed to be located further to the north-west in proposed extension to Radford Park on Lot 1 DP 1124566. Lots positioned to the north of Radford Parkway will gravitate to the new WWPS, while lots to the south with gravitate to the existing HWC gravity network in the East Branxton 1 Wastewater Pump Station catchment.

From the WWPS a DN160 rising main will extend to the existing sewer network, constructed as part of Stage 1 of Radford Park.

The estimated capital cost for the proposed sewer infrastructure, servicing the extended Radford Park, is $3,070,455. The additional infrastructure and upgrades needed to service potential adjacent developments results in a further additional cost of $307,291 for a total ultimate cost of $3,377,746.

The proposed servicing option provides an effective solution to service the entire study area whilst meeting the technical requirements as specified by HWC and in the Sewerage Code of Australia, WSA 02-2014 Version 3.1.

Table of Contents

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

ADW Johnson has been commissioned by Belford Land to prepare a local wastewater servicing strategy to accompany a proposed rezoning of Lot 1 in DP 1124566, for large lot residential development to be submitted to Council. The proposed rezoning will enable an extension of the previously approved Radford Park development which is situated off Elderslie Road, East Branxton on Lot 45 in DP 1166072.

An existing wastewater servicing strategy was prepared by Hyder in 2012 which has been approved by HWC for the current Radford Park development extents.

This sewer servicing strategy has been prepared to replace the Hyder strategy and aims to revise the proposed WWPS location and design loading as well as assessing any impacts on existing downstream infrastructure due to the additional proposed development associated with the rezoning proposal. The Hyder Strategy should be read as preamble to this report this report is located in **Appendix F**.

2.0 SITE DESCRIPTION

The existing Radford Park site is located west of Elderslie Road, East Branxton on Lot 45 in DP 1166072. It is approximately 74 ha in size and the proposed development will be made up of 182 large lot residential lots, 44 of these lots have been developed and are already connected to HWC's wastewater network.

The proposed extension to Radford Park will encompass the lot directly to the west of the existing Radford Park, in Lot 1 in DP 1124566. It is approximately 38 ha in size and it is proposed that 71 large lot residential lots will be developed on the site.

The site is divided in two (2) halves by a ridge running east to west. The southern half slopes towards the south and is within the gravity catchment of East Branxton 1 WWPS. The northern half slopes towards the most northern end of the extension to Radford Park and will require a pump station to reach the East Branxton 1 WWPS gravity catchment.

The land to the west and north of the development site is presently zoned for Primary Production (RU1) and may be rezoned and developed in the future. Flows from these developments would gravitate towards the proposed WWPS and are therefore accounted for by this document. Because this area is bound to the west and east by ridgelines, and to the north by a gully, it therefore represents the maximum future area likely to be serviced by the proposed WWPS. The strategy articulated by this document therefore anticipates the maximal demand likely to exist on site in the future.

The planning context, and the proposed adjacent developments, of the proposed extension to Radford Park are shown in **Figure 1**. Additionally, drawing **239567-SST-002-A** in **Appendix A** shows the existing and proposed extension to Radford Park.

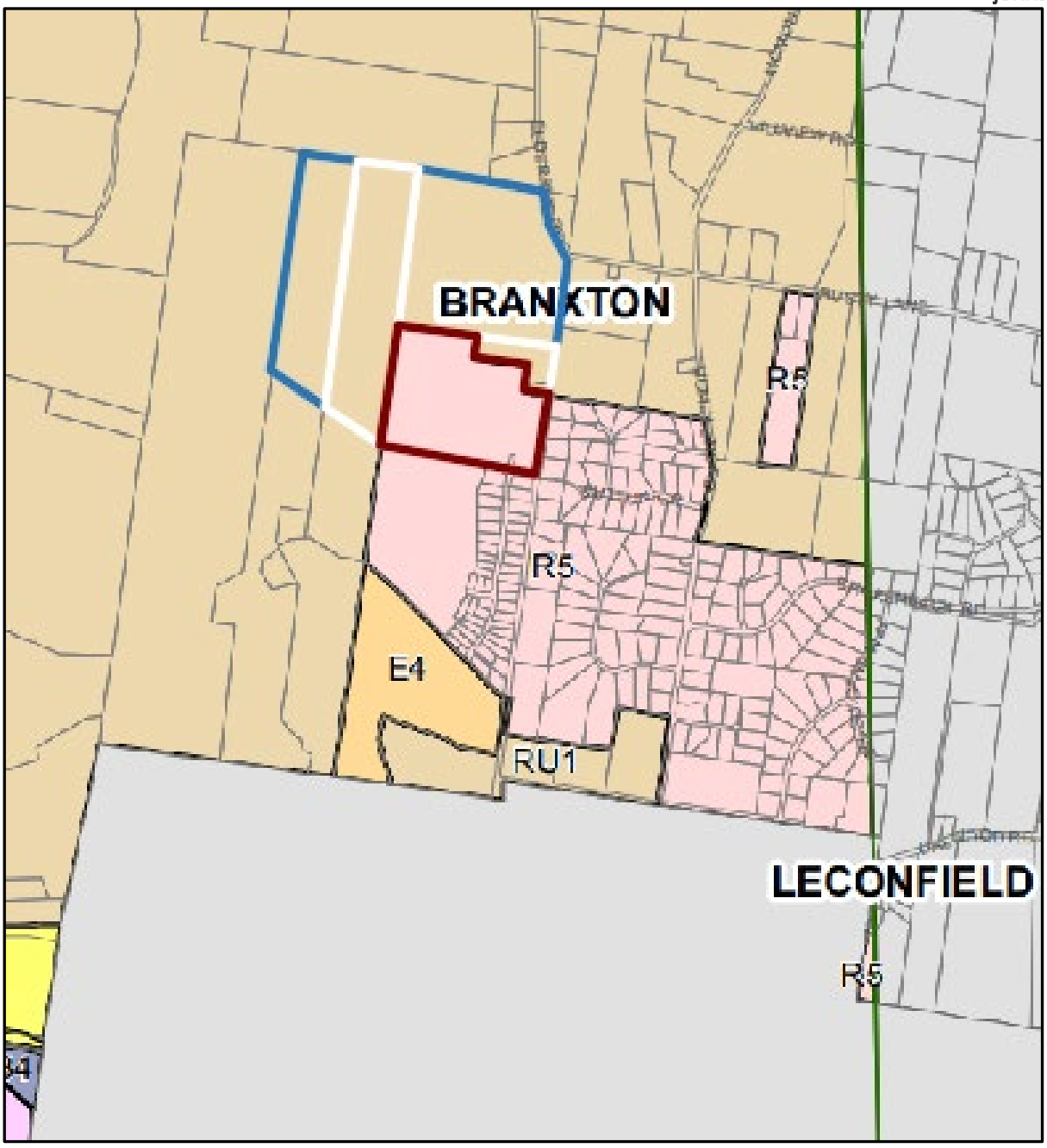

Figure 1 – The three potential development scenarios in a planning context. Scenario 1 in red, Scenario 2 in white, & Scenario 3 in blue. Refer Table 4 for details.

3.0 EXISTING WASTEWATER INFRASTRUCTURE

The current approved wastewater strategy (Hyder 2012) identifies East Branxton 1 WWPS (previously named Branxton 2 WWPS), as the ultimate downstream location for wastewater flows from Radford Park. Recent consultation with HWC has confirmed that the proposed extension to Radford Park should also be included in the East Branxton 1 WWPS (EB1 WWPS) catchment.

EB1 WWPS is located south of the development at the junction of Ellerslie Road and Lindsay Street and pumps directly to Branxton Wastewater Treatment Works (WWTW). Hunter Water has outlined that EB1 WWPS is close to its design capacity of 55L/s and currently has a gravity catchment of 632 ET or 53.7L/s PWWF. HWC also advised that EB1 WWPS has emergency storage time of close to 6 hours.

As identified in the Hyder strategy, and as constructed to service the first stage of Radford Park, a DN300 gravity trunk main extends north from EB1 WWPS along Elderslie Road to the southernmost extent of the Radford Park development. Stage 1 of Radford Park gravity reticulation sewerage system has been constructed utilising the DN300 trunk main on Elderslie Road. A short section of DN150 DICL PN35 rising main was also constructed at the top of the catchment, underneath Radford Parkway to facilitate the connection of future stages of Radford Park via a new WWPS and rising main.

HWC have provided the Work as Constructed plans for the DN150 rising main, and these are contained within **Appendix E.**

This strategy assesses the capacity of the existing sewerage system inclusive of the existing EB1 WWPS, the gravity mains upstream of EB1 WWPS and the small length of rising main installed under Radford Parkway.

Drawing **239567-SST-001-A** included in **Appendix A** shows the location of existing sewer infrastructure in relation to the proposed development site.

4.0 DEVELOPMENT STAGINGTHE NUMBER OF LOTS IN THE PROPOSED DEVELOPMENT SITE ARE AS FOLLOWS:

- Existing Radford Park - 182 large residential lots;
- Extension to Radford Park (rezoning proposal) - 71 large residential lots; and
- Total at Ultimate Development - 253 large residential lots.

The development is proposed to be constructed in stages. **Table 1** below includes the proposed staging and the estimated timing for construction of each stage.

Table 1 – Development Timing

Stage	Residential Lots	Estimated Timing
1	44	Constructed
2	32	Under Construction - 2018
3	22	Under Construction - 2018
4	7	2019
5	27	2020
6	22	2020
7	19	2021
Proposed Extension 1 (Stage 8)	9	2021
Proposed Extension 2 (South)	31	2022
Proposed Extension 2 (North)	40	2022
Total	**253**	

The drawing **239567-SST-002-A** in **Appendix A** shows the proposed development staging.

4.1 Potential Surrounding Developments

Based on the Hyder Strategy and consultation with HWC an investigation was undertaken of potential surrounding developments which may utilise the same infrastructure as the proposed development site. Potential wastewater loads from these sites have been calculated by multiplying the developable area by the proposed lot density of the existing Radford Park. The sites that have been considered are summarised in the table below:

Table 2 – Potential Surrounding Developments

ID	Location	Developable Area	Potential Residential Lots
A	103E Elderslie Rd, Lot 711 / DP 1056530	22 Ha	44
B	285 Elderslie Rd, Lot 111 / DP 850244	44 Ha	70
C	118, 144, 160 Elderslie Rd, Lot 101 / DP 1011385 Lot 2 / DP 618713 Lot 3 / DP 618713	10 Ha	24
D	85 McMullins Rd, A / DP 389886	8 Ha	17
E	97 Elderslie Rd	2 Ha	5
Total			**160**

Drawing **239567-SST-001-A** included in **Appendix A** shows the potential surrounding developments that have been considered.

5.0 WASTEWATER DESIGN LOADS

In accordance with WSA 02-2014-3.1 Appendix HW N, one (1) residential dwelling is equivalent to one (1) equivalent tenement (ET).

A summary of the theoretical design sewage loadings for the proposed development are shown in Table 3 and Table 4 below and overleaf. Design flows have been separated based on whether they can gravitate directly to East Branxton 1 WWPS or if they will gravitate towards the new proposed WWPS.

Table 3 – Wastewater Design Loads Gravitating directly to East Branxton 1 WWPS

Development Site	Resi. Lots	ET	ADWF (L/s)	r	PDWF (L/s)	SA (L/s)	PWWF (L/s)
Belford Land Stages							
Stage 1 (Existing)	44	44	0.5	3.1	1.5	2.6	4.1
Stage 2	32	32	0.4		1.1	1.9	2.9
Stage 3	22	22	0.2		0.7	1.3	2.0
Stage 4	7	7	0.1		0.2	0.4	0.6
Radford Park Extension 2 (south)	31	31	0.3		1.1	1.8	2.9
Subtotal		**136**	**1.5**		**4.6**	**7.9**	**12.5**
External Potential Future Developments							
External Potential Development C	24	24	0.3	3.7	1.0	1.4	2.4
External Potential Development D	17	17	0.2		0.7	1.0	1.7
External Potential Development E	5	5	0.1		0.2	0.3	0.5
Subtotal		**46**	**0.5**		**1.9**	**2.7**	**4.6**
Total		**182**	**2.0**	**3.0**	**5.9**	**10.6**	**17.1**

Sewage loads in the catchment of the proposed new WWPS have been separated into three (3) likely development scenarios for the purposes of designing the proposed infrastructure. The sewage loads for each of the development scenarios is represented in the table below.

Table 4 – Wastewater Design Loads to Proposed WWPS

Development Scenario	Development Site	Resi. Lots	ET	ADWF (L/s)	r	PDWF (L/s)	SA (L/s)	PWWF (L/s)
Belford Land Stages								
1	Stage 5	27	27	0.3				
	Stage 6	22	22	0.2				
	Stage 7	19	19	0.2				
	Scenario 1 - Subtotal		**68**	**0.7**	**3.5**	**2.6**	**3.9**	**6.5**
2	Radford Park Extension 1 (Stage 8)	9	9	0.1				
	Radford Park Extension 2 (North)	40	40	0.4				
	Scenario 2 - Cumulative Total		**117**	**1.3**	**3.2**	**4.1**	**6.8**	**10.9**
External Future Developments								
3	External Potential Development A	44	44	0.5				
	External Potential Development B	70	70	0.8				
	Scenario 3 - Cumulative Total		**231**	**2.5**	**2.8**	**7.2**	**13.4**	**20.6**

Appendix B contains detailed calculations of the sewage loads.

6.0 DESIGN CODE / OPTIONS ASSUMPTIONS

In developing the proposed wastewater infrastructure, the design requirements specified in the following manuals have been adhered to, unless otherwise stated:

- Gravity Sewer Code of Australia, WSA 02-2014 HWC Version 3.1;
- Sewerage Pumping Station Code of Australia, WSA 04-2005 Version 2.1; and
- HWC Standard – WWPS Technical Addendum – September 2016.

The Equivalent Tenement (ET), Average Dry Weather Flow (ADWF) and Storm Allowance (SA) assumption for the proposed development is as follows:

- Residential – 1 ET per residential lot, 0.011 L/s/ET (ADWF) and 0.058L/s/ET (SA).

All calculations have been completed using ET as opposed to EP.

All internal civil infrastructure has been sized for ultimate demands. It has been assumed that emergency relief structures will be included as part of the concept/detailed design.

This strategy is limited to major sewer infrastructure apart from Stages 2, 3 and 4 where detailed designs have been completed. Minor reticulation mains have been considered only as far as locating the pump station and will require investigation and design as part of future design stages.

7.0 OPTIONS DEVELOPMENT

As part of the Hyder wastewater servicing strategy various options were considered for servicing the site. This servicing strategy does not seek to alter the general intent of the Hyder strategy and as such only one option was considered. The main difference compared to the Hyder strategy being that the proposed WWPS will be relocated further to the northwest in the proposed extension to Radford Park.

8.0 DESIGN DETAILS

8.1 Summary

The Hyder strategy identified the preferred servicing for the site to consist of:

- Sewage flows from lots south of Radford Parkway to gravitate directly to East Branxton 1 WWPS via reticulation mains and a DN300 trunk main running adjacent to Elderslie Road;
- A new WWPS to be constructed at the north of the site to catch sewage flows from lots constructed north of Radford Parkway; and
- A rising main from the new WWPS that connects into the gravity reticulation mains south of Radford Parkway so that all sewage flows to East Branxton 1 WWPS.

To service the proposed extension to Radford Park it is proposed that the same overall strategy as outlined in the Hyder strategy be implemented. The key difference being that the new WWPS will be located further to the north-west in the proposed extension to Radford Park on Lot 1 in DP1124566.

Based on the existing topography of the site, gravity main routes were selected to enable all lots north of Radford Parkway to drain to a single point at the north-west of the development site at RL 40. This is the proposed location of the new WWPS.

For lots south of Radford Parkway, gravity reticulation for the existing extent of Radford Park (Stages 1, 2, 3 and 4) has been either detailed designed awaiting final approval or constructed. Gravity reticulation for the proposed extension of Radford Park south of Radford Parkway was selected so that it drains to the connection point at the rear of Lot 333 which has been included in the design for Stages 2 and 3.

A preliminary WWPS and rising main design was completed for each of the development scenarios as described in **Section 4.0**. Design calculations are contained in **Appendix C**.

Drawing **239567-SST-003-A** in **Appendix A** details the proposed servicing strategy.

The sections below describe the design assessment and proposed infrastructure.

8.2 New Gravity Mains

New gravity main routes were selected to ensure that the entire intended catchment could be serviced. Only the deepest and longest gravity mains were assessed as part of this strategy. These were chosen so that all lots were able to gravitate via relatively shallow reticulation mains into these deeper mains.

It is noted that for Stages 2, 3 and 4 a detailed design has been submitted to HWC. For these stages only lengths of pipe that will have new connections from the extension Radford Park have been assessed.

All new gravity mains are proposed to be DN150 PVC material.

8.3 WWPS & Rising Mains

The sizing of the proposed WWPS and rising mains were based on:

- The relevant catchment loading;
- Invert level of incoming mains;
- Surface RL at the proposed location;
- Rising main length and topography; and
- Emergency storage requirements.

8.4 WWPS

Pump station calculations were based on 10 pump starts per hour and a maximum control depth of 1m. The requirement for 4 hours emergency storage volume at ADWF conditions has also been taken into consideration.

To adequately service all stages of the development a 1.8m diameter wet well by 4.7m deep has been selected with control depths to be varied as the development progresses.

It is proposed that the internal station pipe work is initially installed as DN100 P35 DICL. While the pumped velocities in the station pipework of 1.35m/s for the first stage of development are less than the desired 2m/s, ultimately on development of scenario 3, and upgrades to the pumped flow rate, the velocities will become satisfactory.

It is considered better to accept the lower velocity in the initial development stage rather than be required to upgrade the internal pipework in future development scenarios.

Calculations for emergency storage found that only minor volumes above the capacity of the wet well were required for development scenarios 1 and 2. It is considered that this can be incorporated into the upstream catchment and it is proposed that additional emergency storage be deferred until ultimate development (development scenario 3).

Design calculations completed for the proposed WWPS are contained in **Appendix C.**

8.5 Rising Mains

The rising main diameter was selected to ensure minimum slime and solids velocities were achieved at the duty flow, while ensuring maximum velocities did not result in excessive head loss. Consideration was also made in relation to detention times within rising mains with the aim to keep this under 4 hours to reduce septicity and odour issues at discharge points and corrosion within rising mains.

Sizing of rising mains also considered the likely staging of the development and interim infrastructure requirements.

In order to achieve the required objectives across the three development stages it is proposed to provide a single DN160 PE100 rising main. This main is to extend from the

proposed WWPS to the existing DN150 DICL rising main previously installed underneath Radford Parkway, which terminates in front of Lot 501 at maintenance chamber J9132.

This rising main is proposed to be constructed from PN20 PE100 SDR9 pipe. This has been selected as it represents the optimal internal diameter for all stages of the development. It allows absolute minimum velocities to be achieved for the first stages of the development whilst ensuring that excessive heads aren't produced following the completion of external developments A & B. This rising main will therefore be able to cater for all of the currently approved Radford Park, which is described as development scenario 1, as well as likely future developments, described as scenarios 2 & 3. These scenarios are as outlined in **Section 5.0** of this report.

This rising main arrangement results in detention times under the recommended maximum of 4 hours following the commencement of the developments in scenario 3. For scenarios 1 & 2 the rising main detention time is 6.8 and 4.1 hours respectively. Therefore, temporary septicity control will be required during these early stages. **Section 8.6** contains a more detailed consideration of the options available, and presents a comparative NPV of each.

The proposed rising main was also assessed for derating, with the likely maximum pressure and pressure range being assessed using the software package WATHAM. It was found that the likely maximum pressure was **121m** with the maximum cyclic head being **124m.** These figures were assessed against the maximum allowable cyclic head for each pipe pressure rating, as outlined in the Plastics Industry Pipe Association of Australia (PIPA) guidelines:

Table 5 – Maximum allowable cyclic heads for PE rising mains

	Maximum Working Head (m)	Maximum Cyclic Head (m)	
		PE80	PE100
PN20	200	131.86	
PN16	160	105.49	
PN12.5	125	82.42	
PN10	100	65.93	

A review of **Table 5** would indicate that the proposed PN20 main is adequate both in terms of cyclical and working pressure heads and can therefore be confidently recommended.

Design calculations completed for the new WWPS and rising mains are contained in **Appendix C.**

8.6 Septicity Control Measures

As part of this strategy, it was found that temporary septicity control measures would be required during the earliest stages of the development. To that end, a comparative NPV was formulated to determine whether odour dosing with ferrous chloride or potable water top-up was the preferable solution.

The potable top-up figures are based on projected future price of water provided by HWC. Additionally, the costs for the odour dosing unit are in line with values provided by OdourPro, a reputable odour dosing firm, and a typical dosage rate of 70mg of ferrous

chloride per litre of sewage. As the dosing unit is only required for a 5year period rental options were also investigated with rental costs quoted to be $4,000 up front set up and then $1,400/mth for 5 years. Purchase cost of the unit was quoted at $119,660.

The result of this comparative analysis is presented below in **Table 6**:

Table 6 – Comparative NPV for temporary septicity control measures

Option	Total Cost (30 years @ 7% discount)	Capital Cost
Potable Water Top-Up	$ 113,076	$ 6,000
Odour Dosing Unit (Purchase)	$ 227,376	$119,660
Odour Dosing Unit (Rental)	$ 181,821	$ 4,000

Based on a review of **Table 6**, it is apparent that potable water top-up is the preferable option on the grounds of relative expense. Temporary potable water top-up is therefore recommended.

8.7 Existing Gravity Mains

The characteristics of existing gravity mains that are to be utilised to transfer flows from the proposed development, were obtained from HWC.

From this information the diameter of the gravity main was first assessed assuming minimum grade and maximum loading for the upstream catchment, against the requirements accordance with WSA 02-2014-3.1 Appendix HW R Table HWR 1. Three critical locations were assessed against WSA 02-2014-3.1 Appendix HW R Table HWR 1, as outlined in the table below:

Table 7 – Existing Gravity Main Assessment

Location and Size	Maximum Upstream ET		Max ET allowed for Min Grade
	Scenario 2	Scenario 3	
Lowest extent of DN150 main in Stage 1 adjacent lot 21 on Pyrus Ave.	92 (Stages 2,3,4 & ext1 (south))	92 (Stages 2,3,4 & ext1 (south))	135
Lowest extent of DN225 main on Elderslie Road.	253 (All Radford Park)	367 (All Radford Park & Pot. Dev. A & B)	339
Lowest extent of DN300 main on Elderslie Road at East Branxton 1 WWPS	253 (All Radford Park)	413 (All Radford Park & Pot. Dev. A, B, C, D, E)	648

It was found that the existing gravity mains were sufficiently sized in all cases except for at the lowest extent of the DN225 main during development Scenario 3. Specifically, this is where the existing DN225 gravity main runs at below minimum grade, between JP125 and JP126. It would therefore be necessary to upsize approximately 200m of pipe from DN225 to DN300 to satisfy the demands of Scenario 3.

Alternatively, this length of gravity main could be duplicated to cater for the gravity flows from the southern portion of Radford Park and so reduce the loading on the existing main from 367 ET to 275 ET. For the purposes of this document, the latter approach is assumed on the grounds of constructability, and this is reflected in the final estimated cost of the wastewater servicing infrastructure.

8.8 Existing Rising Mains and WWPS

HWC has outlined that East Branxton 1 WWPS is nearing capacity but can facilitate wastewater loads from Stages 1, 2, 3 and 4 of Radford Park. Beyond this the WWPS will need to be upgraded, something which Hunter Water will facilitate as part of regional asset upgrades. This strategy does not seek to assess the extent of required upgrade to East Branxton 1 WWPS including its rising main and downstream works.

9.0 PROPOSED INFRASTRUCTURE DETAILS

The table below details the proposed sewer infrastructure separated into the each of the development scenarios as described in **Section 5.0** previously.

Table 8 – Proposed New Infrastructure

Description		Pipe/Well Dia (mm)	Length/ Depth (m)
Development Scenario 1			
Gravity Mains (Reticulation)	Stage 1, 2, 3 & 4	150	2488
	Stage 5, 6 & 7	150	3545
Rising main – PE100 SDR9 PN20		160	1500
Wastewater Pump Station 1.8m diameter, 4.7m deep, 11.3 L/s, 37.5m duty head, variable speed		1800	4.7
Development Scenario 2			
Gravity Mains (Reticulation)	Extension 1 (Stage 8)	150	311
	Extension 2 (North)	150	422
	Extension 2 (South)	150	690
Development Scenario 3			
Wastewater Pump Station Upgrade pumps to 29.3 L/s, 59.4m duty head		1800	4.7
Gravity Main Duplication		300	200
Emergency Relief Structure 29.3m^3		2.1	7

9.1 Community/Stakeholder Constraints and Impacts

No community/stakeholder constraints in addition to what has been outlined in the Hyder strategy have been identified.

9.2 Environmental Constraints and Impacts

No environmental constraints in addition to what has been outlined in the Hyder strategy have been identified.

10.0 COST ESTIMATE

A capital cost estimate has been completed for the proposed sewer infrastructure, required for each of the development scenarios utilising HWC's Estimating Guidelines.

WWPS costs for development scenarios 2 and 3 have been priced as pump station upgrades assuming new pumps, PLC/telemetry and SCADA upgrades. Cost estimates include all internal gravity sewer reticulation, WWPS, and rising main costs.

Since DN160 PE is not a diameter allowed for by the HWC Estimating Guidelines, it has for the purposes of this document been costed as if it were DN200. These figures therefore represent a very conservative approximation.

A summary of total sewerage cost estimates is shown in **Table 9** below:

Table 9 – Total Sewer Infrastructure Cost Summary

Development Scenario	Cost
1 - Existing Extent of Radford Park Stages 2, 3, 4, 5, 6 & 7	$2,234,013
2 - Proposed Extension of Radford Park	$836,442
3 - Ultimate development including surrounding potential developments	$307,291

Cost schedules produced by Hunter Water's estimating guidelines are contained with **Appendix D.**

10.1 NPV Analysis

As there was only 1 strategy considered, a general NPV analysis was not completed. An NPV was completed for the different septicity control measures, and this is provided in **Section 8.6**.

11.0 CONCLUSION

It is concluded that the proposed extension to Radford Park development onto Lot 1 in DP 1124566 can be suitably serviced for sewer by relocating the proposed wastewater pump station which has previously been approved by Hunter Water via acceptance of the Wastewater Servicing Strategy completed by Hyder Consulting Pty Ltd.

The proposed new location of the WWPS is at the northern extent of DP 112566. This location enables the entire Radford Park development to be serviced as well as surrounding potential developments.

The proposed servicing option provides an effective solution to service the entire study area whilst meeting the technical requirements as specified by Hunter Water and in the Sewerage Code of Australia, WSA 02-2014 Version 3.1.

Drawing 239567-SST-003-A in **Appendix A** details the proposed sewer infrastructure.

Appendix A

DRAWINGS

239567-SST-001-004-C

PROPOSED WWPS

RADFORD PARK EXTENSION 2 (NORTH) 40 LOTS

POTENTIAL DEVELOPMENT 44 LOTS (A)

POTENTIAL DEVELOPMENT 70 LOTS (B)

RADFORD PARK EXTENSION 1 (STAGE 8) 9 LOTS

RADFORD PARK STAGES 5,6,7 68 LOTS

RADFORD PARK EXTENSION 2 (SOUTH) 31 LOTS

RADFORD PARK STAGES 2,3 & 4 61 LOTS

RADFORD PARK STAGE 1 CONSTRUCTED 44 LOTS

POTENTIAL DEVELOPMENT 24 LOTS (C)

POTENTIAL DEVELOPMENT 5 LOTS (E)

POTENTIAL DEVELOPMENT 24 LOTS (D)

BASIN

BASIN

BASIN

BASIN

EXISTING DN150 GM

EXISTING DN225 GM

DN150

DN225

DN300 TRUNK MAIN

EAST BRANXTON 1
EXISTING WWPS

BRANXTON 1
EXISTING WWPS

BRANXTON 3
EXISTING WWPS

RADFORD PARK

N

LEGEND

- EXISTING SEWER - GRAVITY
- EXISTING SEWER - RISING
- EXISTING WWPS
- PROPOSED WWPS

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
C	27/08/2018	REVISE GRAVITY AND RISING SEWER ALIGNMENT	SS	CB	DATUM: LPI CONTOUR INTERVAL: 5m	0 125 250m SCALE: 1:5000 (FULL)	

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drawing title:

RADFORD PARK
EXISTING INFRASTRUCTURE
AND SURROUNDING
DEVELOPMENTS

location: ELDERSLIE ROAD, RADFORD PARK

council: SINGLETON

dwg ref: 239567-SST-003

client: BELFORD LAND

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239567-SST-001-004-C

RADFORD PARK

PROPOSED WWPS

DRAINAGE RESERVE

BASIN

ELDERSLIE RD

PARKWAY

FIRETRAIL 6 WIDE

ROAD 20 WIDE

(20 WIDE)

CLARET

RADFORD

DRIVE

AVENUE

PISTACIA

ROBINIA

GROVE

PIN OAK CIRCUIT

PYRUS

ELDERSLIE ROAD

FIRETRAIL 10 WIDE

OPEN SPACE (5077m²)

BASIN

DRAINAGE RESERVE

1.2m WIDE WALKING TRACK

3 x 2100(W) x 900(H) RCBC

EASEMENT

ADDITIONAL AREA TO LOT 147

RUSTY LAN

HIGHFIELD WAY

SUTTON GR

NOTTAGE HILL CL

688//1145128
690//1145128
112//850244
111//850244
31//631
52//620139
4//539087
206//1060301
207//1060301
208//1060301
209//1060301
210//1060301
205//1060301
204//1060301
211//1060301
212//1060301
200//1018002
203//1060301
202//1060301
11//1022400
12//1022400
201//1060301
14//1022400
15//1022400
10//1022400
9//1022400
8//1022400
1//880269
7//1022400
6//1022400
5//1022400
4//1022
103//1022399
102//1022399
14//811842
13//811842
15//811842
16//811842
12//811842
17//811842
11//811842
18//811842
10//811842
19//811842
2//618713
9//811842
8//811842
7//811842
3//618713
6//811842
101//1011385
711//1056530
2//1124566
710//1056530
12//864176
21//861508

LEGEND

- PROPOSED EXTENSION TO RADFORD PARK (NORTH)
- PROPOSED EXTENSION TO RADFORD PARK (SOUTH)
- STAGE 1 - CONSTRUCTED
- STAGE 2 - APPROVED SUBDIVISION
- STAGE 3 - APPROVED SUBDIVISION
- STAGE 4 - APPROVED SUBDIVISION
- STAGE 5 - APPROVED SUBDIVISION
- STAGE 6 - APPROVED SUBDIVISION
- STAGE 7 - APPROVED SUBDIVISION
- STAGE 8 - PROPOSED EXTENSION TO RADFORD PARK
- PROPOSED WWPS

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
C	27/08/2018	REVISE GRAVITY AND RISING SEWER ALIGNMENT	SS	CB	DATUM: LPI CONTOUR INTERVAL: 5m	0 60 120 150m SCALE: 1:3000 (FULL)	

drawing title:

RADFORD PARK STAGING PLAN

location: ELDERSLIE ROAD, RADFORD PARK

council: SINGLETON

dwg ref: 239567-SST-003

client: BELFORD LAND

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239567-SST-001-004-C

PROPOSED 1.8M DIA WWPS

DRAINAGE RESERVE

BASIN

PARKWAY

FIRETRAIL 6 WIDE

ROAD 20 WIDE

PROPOSED RISING MAIN
1505m
DN160 PE SDR9

ELDERSLIE RD

RADFORD PARK

RUSTY LAN

CLARET

RADFORD DRIVE (20 WIDE)

ROBINIA (20 WIDE)

PISTACIA (20 WIDE)

GROVE (20 WIDE)

PARKWAY

AVENUE

DRAINAGE RESERVE

BASIN

OPEN SPACE (5077m²)

(20 WIDE)

PIN OAK CIRCUIT

PYRUS AVENUE

EXISTING DN225 GM

EXISTING DN150 GM

ELDERSLIE ROAD

EXISTING 131M LENGTH OF DN150 DICL PN35 CLASS K9 INSTALLED FOR FUTURE CONNECTION

DISCHARGE MH J9132

SUTTON GR

HIGHFIELD WAY

NOTTAGE HILL CL

1.2m WIDE WALKING TRACK

3 x 2100(W) x 900(H) RCBC

DRAINAGE RESERVE

ADDITIONAL AREA TO LOT 147

DN150

DN225

TO EAST BRANXTON 1 WWPS

LEGEND

- EXISTING SEWER - GRAVITY
- EXISTING SEWER - RISING
- SEWER - RISING MAIN Ø100
- SEWER - GRAVITY Ø150
- STAGE 1 - CONSTRUCTED
- PROPOSED EXTENSION TO RADFORD PARK
- CURRENT APPROVED RADFORD PARK
- PROPOSED WWPS

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
C	27/08/2018	REVISE GRAVITY AND RISING SEWER ALIGNMENT	SS	CB	DATUM: LPI CONTOUR INTERVAL: 5m	0 60 120 150m SCALE: 1:3000 (FULL)	

drawing title:
RADFORD PARK PROPOSED SEWER INFRASTRUCTURE

location: ELDERSLIE ROAD, RADFORD PARK

council: SINGLETON

dwg ref: 239567-SST-003

client: BELFORD LAND

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Plotted By: Shane Sandford Plot Date: 27/08/18 3:54:58PM Cad File: N:\239567\DRAWINGS\SEWER STRAT PLAN\239567-SST-001-004-C.DWG

This plan includes coloured information. If you have a black and white copy you do not have all of the information. This note is coloured RED.

Appendix B

SEWAGE DESIGN LOADS

Sewage Design Loads

WWPS Stages	Development Site	Development Classification	Single Residential Lots	ET per unit	ET	ADWF (L/s)	r	PDWF (L/s)	SA (L/s)	PWWF (L/s)	Comments
Proposed WWPS Loads											
Belford Land Stages											
1	Stage 5	Large Lot Residential	27	1	27	0.3					
	Stage 6	Large Lot Residential	22	1	22	0.2					
	Stage 7	Large Lot Residential	19	1	19	0.2					
	Subtotal				**68.0**	**0.7**	**3.5**	**2.6**	**3.9**	**6.5**	
2	Radford Park Extension 1 (Stage 8)	Large Lot Residential	9	1	9	0.1					
	Radford Park Extension 2 (North)	Large Lot Residential	40	1	40	0.4					
	Cumulative Total				**117**	**1.3**	**3.2**	**4.1**	**6.8**	**10.9**	
External Future Developments											
3	External Future Development A (West)	Large Lot Residential	44	1	44	0.5					Lots calculated based on developable area and lot sizes from Belford Land development.
	External Future Development B (East)	Large Lot Residential	70	1	70	0.8					Lots calculated based on developable area and lot sizes from Belford Land development.
	Cumulative Total				**231**	**2.5**	**2.8**	**7.2**	**13.4**	**20.6**	
Total WWPS Load					**231**	**2.5**	**2.8**	**7.2**	**13.4**	**20.6**	

Gravity Flows to Branxton East 1 (Trunk Main sizing)										
Development Site	Development Classification	Single Residential Lots	ET per unit	ET	ADWF (L/s)	r	PDWF (L/s)	SA (L/s)	PWWF (L/s)	Comments
Belford Land Stages										
Stage 1 (Existing)	Large Lot Residential	44	1	44	0.5		1.5	2.6	4.1	
Stage 2	Large Lot Residential	32	1	32	0.4		1.1	1.9	2.9	
Stage 3	Large Lot Residential	22	1	22	0.2		0.7	1.3	2.0	
Stage 4	Large Lot Residential	7	1	7	0.1		0.2	0.4	0.6	
Radford Park Extension 2 (South)	Large Lot Residential	31	1	31	0.3		1.1	1.8	2.9	Extension of Belford Land development
Subtotal				**136**	**1.50**	**3.1**	**4.6**	**7.9**	**12.5**	
External Future Developments										
External Future Development C	Large Lot Residential	24	1	24	0.3		1.0	1.4	2.4	Lot numbers taken from previous Sewer Strategy
External Future Development D	Large Lot Residential	17	1	17	0.2		0.7	1.0	1.7	Lot numbers taken from previous Sewer Strategy
External Future Development E	Large Lot Residential	5	1	5	0.1		0.2	0.3	0.5	
Subtotal				**46**	**0.5**	**3.7**	**1.9**	**2.7**	**4.6**	
Total Gravity Flows Direct to EB1				**182**	**2.0**	**3.0**	**5.9**	**10.6**	**17.1**	

Appendix C

WWPS AND RISING MAIN CALCULATIONS

WWPS Analysis

Project:	Radford Park Rezoning
Client:	BHL
Prepared by:	ADW Johnson
Designer:	NS / CB
Date:	20/08/2018
Description:	**Preliminary pump station and rising main assessment**

	Stage 1	Stage 2	Stage 3
WWPS	East Branxton No. ?	East Branxton No. ?	East Branxton No. ?
Required Capacity	8.6	11.0	20.6
Year required:	2019	2019	beyond 2024
Discharge location:	**J9132**	**J9132**	**J9132**

Sewage Loads

Receiving pump flow (l/s)	0	0.0	0.0
Estimated ADWF for pump flow (l/s) **	0.0	0.0	0.0
Gravity Catchment (ET)	68	117	231
ADWF (l/s)	1.3	1.3	2.5
Diversity factor 'r'	3.5	3.2	2.8
PDWF (l/s)	4.7	4.2	7.2
SA (l/s)	3.9	6.8	13.4
PWWF (l/s)	8.6	11.0	20.6
Design WWPS load (l/s)	**11.0**	**11.0**	**20.6**
4 hours ADWF (gravity) (m3)	19.4	19.3	36.6

WWPS Parameters (10 starts per hour)

Station DN	1800	1800	1800
Design duty flow (l/s)	11.0	11.0	20.6
Surface level (mAHD)	40	40	40
Lowest MH surface level (mAHD)	40	40	40
Local 1:100 flood level (mAHD)	39	39	39
Estimated sewer entry level to well (mAHD)	37	37	37
TWL (mAHD)	36.85	36.85	36.85
MTWL (mAHD)	37	37	37
FAL (mAHD)	37.15	37.15	37.15
Required control volume (m3)	1.0	1.0	1.9
Required control depth (m)	0.40	0.40	0.80
BWL (mAHD)	36.45	36.45	36.05
Min pump submergence (mm)	700	700	700
Floor level (mAHD)	35.75	35.75	35.35
Wet well depth (m)	**4.3**	**4.3**	**4.7**
Emergency storage volume available in wet well (m3)	7.3	7.3	7.3
Is additional ES required?	12.2	12.0	29.3
Station pipework DN	100	100	100
Station pipework velocity (m/s)	1.35	1.35	2.52
Velocity OK?	Check Velocity	Check Velocity	Velocity OK
Station minor loss (assumed K=4.65) (m)	0.43	0.43	1.51

Rising Main

SRM DN	PE100 OD160 SDR9	PE100 OD160 SDR9	PE100 OD160 SDR9
SRM ID (mm)	123	123	123
RM Velocity at duty (m/s)	0.93	0.93	1.73
Min desirable slime velocity (m/s)	0.93	0.93	0.93
Absolute min slime velocity (m/s)	0.53	0.53	0.53
Min slime velocity OK?	Slime OK	Slime OK	Slime OK
Absolute min slime velocity OK?	Slime OK	Slime OK	Slime OK
Solids velocity OK?	Solids OK	Solids OK	Solids OK
SRM Length (m)	1500	1500	1500
IL highpoint (mAHD)	64	64	64
Design discharge (l/s)	11.0	11.0	20.6
Detention Time (hrs)	3.874	3.906	2.1
TWL (mAHD)	36.85	36.85	36.85
Pipe roughness TWL 'k' (mm)	0.000015	0.000015	0.000015
Friction factor 'f'	0.01856	0.01856	0.01672
Minor loss "k"	10	10	10
Minor loss (m)	0.4	0.4	1.5
Friction loss to discharge	10.0	10.0	31.2
Static lift (m)	27.15	27.15	27.15
Duty Head TWL (m)	37.6	37.6	59.9

** Estimated ADWF for pump flow was determined by taking the pump duty flow rate and multiplying this by the estimated number of ADWF pump starts per hour (approx. 4) and a pump run time of 90 seconds. This value is converted to L/s by dividing by 3600.

Appendix D

COST ESTIMATE

ESTIMATING SHEET

PROJECT DESCRIPTION: Development Scenario 1

Item No.	Item Description	Qty	Unit	Rate $/Unit	Amount $	Application of Schedule of Rates
HW0001	All work not included elsewhere in this schedule	Item	Lump Sum	$ 24,956.00	$ 24,956.00	**Payment**: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0002	Site Establishment <Insert Max $>	Item	Lump Sum	$ 30,000.00	$ 30,000.00	**Payment**: 100% after completion.
HW0003	Site Disestablishment <Insert Min $>	Item	Lump Sum	$ 30,000.00	$ 30,000.00	**Payment**: 100% after completion.
HW0004	Preparation and implementation of the Construction EMP	Item	Lump Sum	$ 18,500.00	$ 18,500.00	**Payment**: Maximum of 30% on submission of complying Construction EMP, then 10% per month up to maximum of 80%. Remainder at Practical Completion. **Submit:** Construction EMP.
HW0005	Preparation and implementation of the Safety Management Plan.	Item	Lump Sum	$ 35,500.00	$ 35,500.00	**Payment**: Maximum of 30% on submission of complying plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion. **Submit:** Safety Management Plan.
HW0006	Preparation and implementation of the Traffic Control Plan.	Item	Lump Sum	$ 12,900.00	$ 12,900.00	**Payment**: Maximum of 30% on submission of complying Traffic Control Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.
HW0007	Preparation and Implementation of Quality Management Plan	Item	Lump Sum	$ 13,627.96	$ 13,627.96	**Payment**: Maximum of 30% on submission of complying Quality Management Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.

Sewer Pipeline - Gravity - section will be present if one or more gravity mains are specified

Item	Construction of Sewer Gravity Mains	Qty	Unit	Rate $/Unit	Amount $	Application of Schedule of Rates
HWG001	Service Location	Item	Lump Sum	$ 5,791.68	$ 5,791.68	**Payment**: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HWG02.05	DN150 Valves / Flowmeters	Item	Lump Sum	$ 46,470.00	$ 46,470.00	
HWG03.07	DN150 Fittings	Item	Lump Sum	$ 2,240.00	$ 2,240.00	
HWG03.08	DN150 Fittings	Item	Lump Sum	$ 5,040.00	$ 5,040.00	
HWG004	Supply all pipe materials including detector tape, pipe protection wrapping, rubber rings and lubricant for following pipe sizes:					**Measurement:** Actual metres (effective length) of pipe delivered to site. **Submit:** Relevant Quality Records including Compliance Certificates. *Note: Limits of Accuracy to be inserted for each pipe size.*
00FVSS	Nominal DN150 PVC pipe	6033	m	$ 12.00	$ 72,396.00	
HWG005	Clear, excavate, lay, join, bed, backfill & test pipelines (installation). Up to **1.5 m** depth to invert in OTR.					**Measurement:** Actual metres of pipe installed with design depth of excavation up to and including 1.5m. **Retention:** 10% <or other appropriate percentage> until satisfactory testing. **Submit:** Relevant Quality Records including as constructed lengths, levels and coordinates. **Limits of Accuracy:** <To be inserted>.
00FV03	Nominal DN150 PVC (Trench type 3)	6033	m	$ 85.40	$ 515,218.20	
HWG027	Preparation of line sheets	6033	each	$ 1.16	$ 6,998.28	**Measurement:** Length of pipelines constructed as per design. **Limits of Accuracy:** <To be inserted>.
HWG029	**Miscellaneous**					
HWG000	***Sub Total***				$654,154	

Sewer Pipeline - Rising - section will be present if one or more rising mains are specified

Item	Construction of Sewer Rising Mains	Qty	Unit	Rate $/Unit	Amount $	Application of Schedule of Rates
HWR001	Service Location	Item	Lump Sum	$ 1,488.00	$ 1,488.00	**Payment**: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HWR02.06	DN200 Valves / Flowmeters	Item	Lump Sum	$ 24,840.00	$ 24,840.00	
HWR03.09	DN200 Fittings	Item	Lump Sum	$ 4,480.00	$ 4,480.00	
HWR004	Supply all pipe materials including detector tape, pipe protection wrapping, rubber rings and lubricant for following pipe sizes:					**Measurement:** Actual metres (effective length) of pipe delivered to site. **Submit:** Relevant Quality Records including Compliance Certificates. *Note: Limits of Accuracy to be inserted for each pipe size.*
114ESS	Nominal DN200 PE pipe	1550	m	$ 61.00	$ 94,550.00	
HWR005	Clear, excavate, lay, join, bed, backfill & test pipelines (installation). Up to **1.5 m depth** to invert in OTR.					**Measurement:** Actual metres of pipe installed with design depth of excavation up to and including 1.5m. **Retention:** 10% <or other appropriate percentage> until satisfactory testing. **Submit:** Relevant Quality Records including as constructed lengths, levels and coordinates. **Limits of Accuracy:** <To be inserted>.
1.14E+05	Nominal DN200 PE (Trench type 3)	1550	m	$ 98.40	$ 152,520.00	
HWR027	Preparation of line sheets	1550	m	$ 1.16	$ 1,798.00	**Measurement:** Length of pipelines constructed as per design. **Limits of Accuracy:** <To be inserted>.
HWR029	**Miscellaneous**					
HWR000	***Sub Total***				$279,676	

WWPS 1

Item	*Pump Station - Name*	Qty	Unit	Rate $/Unit	Amount $	Application of Schedule of Rates
HW0401	**WWPS 1 1.8m dia 2 Pump(s)**					
	Clear, excavate & backfill in OTR conditions, construct precast pump station, lid and plugged with 1.5m of plain concrete.	Item	Lump Sum	$ 18,970.45	$ 18,970.45	**Payment**: <Insert appropriate percentages to reflect the value of work at key milestones eg excavation, pump well, metalwork etc>. **Submit:** Relevant Quality Records.
HW0402	**Pumps for Pumping Stations -** Supply and install pumps and associated fittings, connection to pipework, testing and commissioning.	2	Lump Sum	$ 10,537.50	$ 21,075.00	**Payment**: <Insert appropriate percentages for key milestones eg installation, precommissioning, commissioning>. **Submit:** Relevant Quality Records including those for pump test.
HW0403	**Pumping Station Electricals**					
HW0403.01	Pit and Conduit System	Item	Lump Sum	$ 7,300.00	$ 7,300.00	**Payment**: Percentage of work completed. **Submit:** Relevant Quality Records.

HW0403.02	LV Station Power Supply	Item	Lump Sum	$ 10,620.00	$ 10,620.00	**Payment**: Percentage of work completed. **Submit:** Relevant Quality Records.
HW0403.05	Switchboard	Item	Lump Sum	$ 49,375.00	$ 49,375.00	**Payment**: Percentage of work completed. **Submit:** Relevant Quality Records.
HW0403.06	PLC / Telemetry Hardware	Item	Lump Sum	$ 14,437.50	$ 14,437.50	**Payment**: Percentage of work completed. **Submit:** Relevant Quality Records.
HW0403.07	PLC / Telemetry / Scada Engineering and Software Development	Item	Lump Sum	$ 28,450.00	$ 28,450.00	**Payment**: Percentage of work completed. **Submit:** Relevant Quality Records.
HW0403.11	Installation/Cabling (Electrical)	Item	Lump Sum	$ 10,737.50	$ 10,737.50	**Payment**: Percentage of work completed. **Submit:** Relevant Quality Records.
HW0406	**Service Location**	Item	Lump Sum	$ 248.83	$ 248.83	**Payment**: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0415	Acid sulphate soil					
HW0415.01	Initial testing for acid sulphate soils and prepare and submit report	5	per test	$ 121.00	$ 605.00	**Submit:** Result for each test. **Limits of Accuracy:** <To be inserted>
HW0430	Pre commissioning and commissioning	Item	Lump Sum	$ 8,000.00	$ 8,000.00	**Payment**: 50% at completion of satisfactory precommissioning. Remainder at Practical Completion. **Submit:** Relevant Quality Records.
HW0431	Preparation and submission of Work as Constructed Information	Item	Lump Sum	$ 6,000.00	$ 6,000.00	**Payment:** 100% at Practical Completion. **Submit:** Complying Work As Constructed Information.
HW4SP	***Sub Total***				$175,819	

Item No.	Item Description	Qty	Unit		Amount $	Application of Schedule of Rates
HW0012	Preconstruction record					
HW0012.01	Photographic	Item	Lump Sum	$ 5,232.27	$ 5,232.27	**Payment**: 70% on submission of the Photographic record. Remainder at Practical Completion.
HW0013	Work as Constructed Information <Insert Min $>	Item	Lump Sum	$ 60,664.00	$ 60,664.00	**Payment**: 100% at Practical Completion.

A.	**TOTAL ESTIMATED CONTRACT AWARD SUM**	$ 1,341,029.67

B.	**PRE-CONSTRUCTION COST (Table 10)**	
HW0016	Design	$ 160,923.56
HW0017	Project Management of Design	$ 42,184.71
HW0024	Community Consultation	
	Sub Total(B1)	$ 203,108.27
	Pre construction contingency (30% of B1)	$ 60,932.48
	TOTAL PRE-CONSTRUCTION COST (B)	$ 264,040.75

C.	**CONSTRUCTION COST**	
	Total Estimated Contract Award Sum (A)	$ 1,341,029.67
HW0023	Construction Management (Table 11)	$ 174,333.86
	Sub Total (C1)	$ 1,515,363.53
	Construction contingency (Table 12) (30% of C1) Preliminary Estimate	$ 454,609.06
	TOTAL CONSTRUCTION COST (C)	$ 1,969,972.59

TOTAL PRELIMINARY PROJECT ESTIMATE (B+C) (Preliminary Estimate)	$ 2,234,013.34

ESTIMATING SHEET

PROJECT DESCRIPTION: Development Scenario 2

Item No.	Item Description	Qty	Unit	Rate $/Unit	Amount $	Application of Schedule of Rates
HW0001	All work not included elsewhere in this schedule	Item	Lump Sum	$ 7,819.00	$ 7,819.00	**Payment**: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0002	Site Establishment <Insert Max $>	Item	Lump Sum	$ 15,000.00	$ 15,000.00	**Payment**: 100% after completion.
HW0003	Site Disestablishment <Insert Min $>	Item	Lump Sum	$ 15,000.00	$ 15,000.00	**Payment**: 100% after completion.
HW0004	Preparation and implementation of the Construction EMP	Item	Lump Sum	$ 16,000.00	$ 16,000.00	**Payment**: Maximum of 30% on submission of complying Construction EMP, then 10% per month up to maximum of 80%. Remainder at Practical Completion. **Submit:** Construction EMP.
HW0005	Preparation and implementation of the Safety Management Plan.	Item	Lump Sum	$ 36,000.00	$ 36,000.00	**Payment**: Maximum of 30% on submission of complying plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion. **Submit:** Safety Management Plan.
HW0006	Preparation and implementation of the Traffic Control Plan.	Item	Lump Sum	$ 10,000.00	$ 10,000.00	**Payment**: Maximum of 30% on submission of complying Traffic Control Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.
HW0007	Preparation and Implementation of Quality Management Plan	Item	Lump Sum	$ 5,059.68	$ 5,059.68	**Payment**: Maximum of 30% on submission of complying Quality Management Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.

Sewer Pipeline - Gravity - section will be present if one or more gravity mains are specified

Item	Construction of Sewer Gravity Mains	Qty	Unit	Rate $/Unit	Amount $	Application of Schedule of Rates
HWG001	Service Location	Item	Lump Sum	$ 1,366.08	$ 1,366.08	**Payment**: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HWG02.7	DN150 Valves / Flowmeters	Item	Lump Sum	$ 11,460.00	$ 11,460.00	
HWG03.10	DN150 Fittings	Item	Lump Sum	$ 560.00	$ 560.00	
HWG03.11	DN150 Fittings	Item	Lump Sum	$ 560.00	$ 560.00	
HWG03.13	DN150 Fittings	Item	Lump Sum	$ 840.00	$ 840.00	
HWG004	Supply all pipe materials including detector tape, pipe protection wrapping, rubber rings and lubricant for following pipe sizes:					**Measurement:** Actual metres (effective length) of pipe delivered to site. **Submit:** Relevant Quality Records including Compliance Certificates. *Note: Limits of Accuracy to be inserted for each pipe size.*
00FVSS	Nominal DN150 PVC pipe	1423	m	$ 12.00	$ 17,076.00	
HWG005	Clear, excavate, lay, join, bed, backfill & test pipelines (installation). Up to **1.5 m** depth to invert in OTR.					**Measurement:** Actual metres of pipe installed with design depth of excavation up to and including 1.5m. **Retention:** 10% <or other appropriate percentage> until satisfactory testing. **Submit:** Relevant Quality Records including as constructed lengths, levels and coordinates. **Limits of Accuracy:** <To be inserted>.
00FV03	Nominal DN150 PVC (Trench type 3)	1423	m	$ 85.40	$ 121,524.20	
HWG027	Preparation of line sheets	1423	each	$ 1.16	$ 1,650.68	**Measurement:** Length of pipelines constructed as per design. **Limits of Accuracy:** <To be inserted>.
HWG029	**Miscellaneous**					
HWG000	***Sub Total***				$155,037	

Sewer Pipeline - Rising - section will be present if one or more rising mains are specified

Item	Construction of Sewer Rising Mains	Qty	Unit	Rate $/Unit	Amount $	Application of Schedule of Rates
HWR001	Service Location	Item	Lump Sum	$ 1,488.00	$ 1,488.00	**Payment**: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HWR02.8	DN100 Valves / Flowmeters	Item	Lump Sum	$ 21,230.00	$ 21,230.00	
HWR03.12	DN100 Fittings	Item	Lump Sum	$ 1,440.00	$ 1,440.00	
HWR004	Supply all pipe materials including detector tape, pipe protection wrapping, rubber rings and lubricant for following pipe sizes:					**Measurement:** Actual metres (effective length) of pipe delivered to site. **Submit:** Relevant Quality Records including Compliance Certificates. *Note: Limits of Accuracy to be inserted for each pipe size.*
10AVSS	Nominal DN100 PVC pipe	1550	m	$ 15.00	$ 23,250.00	
HWR005	Clear, excavate, lay, join, bed, backfill & test pipelines (installation). Up to **1.5 m depth** to invert in OTR.					**Measurement:** Actual metres of pipe installed with design depth of excavation up to and including 1.5m. **Retention:** 10% <or other appropriate percentage> until satisfactory testing. **Submit:** Relevant Quality Records including as constructed lengths, levels and coordinates. **Limits of Accuracy:** <To be inserted>.
10AV03	Nominal DN100 PVC (Trench type 3)	1550	m	$ 63.80	$ 98,890.00	
HWR027	Preparation of line sheets	1550	m	$ 1.16	$ 1,798.00	**Measurement:** Length of pipelines constructed as per design. **Limits of Accuracy:** <To be inserted>.
HWR029	**Miscellaneous**					
HWR000	***Sub Total***				$148,096	

Item No.	Item Description	Qty	Unit		Amount $	Application of Schedule of Rates
HW0012	Preconstruction record					
HW0012.01	Photographic	Item	Lump Sum	$ 2,051.37	$ 2,051.37	**Payment**: 70% on submission of the Photographic record. Remainder at Practical Completion.
HW0013	Work as Constructed Information <Insert Min $>	Item	Lump Sum	$ 23,784.00	$ 23,784.00	**Payment**: 100% at Practical Completion.

A.	**TOTAL ESTIMATED CONTRACT AWARD SUM**	$ 433,847.01

B.	**PRE-CONSTRUCTION COST (Table 10)**		
HW0016	Design	$	86,769.40
HW0017	Project Management of Design	$	27,353.88
HW0024	Community Consultation		
	Sub Total(B1)	$	114,123.28
	Pre construction contingency (30% of B1)	$	34,236.98
	TOTAL PRE-CONSTRUCTION COST (B)	$	148,360.27

C.	**CONSTRUCTION COST**		
	Total Estimated Contract Award Sum (A)	$	433,847.01
HW0023	Construction Management (Table 11)	$	95,446.34
	Sub Total (C1)	$	529,293.35
	Construction contingency (Table 12) (30% of C1) Preliminary Estimate	$	158,788.01
	TOTAL CONSTRUCTION COST (C)	$	688,081.36

	TOTAL PRELIMINARY PROJECT ESTIMATE (B+C) (Preliminary Estimate)	$	836,441.62

ESTIMATING SHEET

PROJECT DESCRIPTION: Development Scenario 3

Item No.	Item Description	Qty	Unit	Rate $/Unit	Amount $	Application of Schedule of Rates
HW0001	All work not included elsewhere in this schedule	Item	Lump Sum	$ 3,199.00	$ 3,199.00	**Payment**: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0002	Site Establishment <Insert Max $>	Item	Lump Sum	$ 9,000.00	$ 9,000.00	**Payment**: 100% after completion.
HW0003	Site Disestablishment <Insert Min $>	Item	Lump Sum	$ 9,000.00	$ 9,000.00	**Payment**: 100% after completion.
HW0004	Preparation and implementation of the Construction EMP	Item	Lump Sum	$ 10,500.00	$ 10,500.00	**Payment**: Maximum of 30% on submission of complying Construction EMP, then 10% per month up to maximum of 80%. Remainder at Practical Completion. **Submit:** Construction EMP.
HW0005	Preparation and implementation of the Safety Management Plan.	Item	Lump Sum	$ 17,500.00	$ 17,500.00	**Payment**: Maximum of 30% on submission of complying plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion. **Submit:** Safety Management Plan.
HW0006	Preparation and implementation of the Traffic Control Plan.	Item	Lump Sum	$ 7,900.00	$ 7,900.00	**Payment**: Maximum of 30% on submission of complying Traffic Control Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.
HW0007	Preparation and Implementation of Quality Management Plan	Item	Lump Sum	$ 2,749.32	$ 2,749.32	**Payment**: Maximum of 30% on submission of complying Quality Management Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.

WWPS 3 - UPGRADE

Item	*Pump Station - Name*	Qty	Unit	Rate $/Unit	Amount $	Application of Schedule of Rates
HW0102	**Pumps for Pumping Stations -** Supply and install pumps and associated fittings, connection to pipework, testing and commissioning.	2	Lump Sum	$ 15,112.50	$ 30,225.00	**Payment**: <Insert appropriate percentages for key milestones eg installation, precommissioning, commissioning>. **Submit:** Relevant Quality Records including those for pump test.
HW0103	**Pumping Station Electricals**					
HW0103.06	PLC / Telemetry Hardware	Item	Lump Sum	$ 14,437.50	$ 14,437.50	**Payment**: Percentage of work completed. **Submit:** Relevant Quality Records.
HW0103.07	PLC / Telemetry / Scada Engineering and Software Development	Item	Lump Sum	$ 28,450.00	$ 28,450.00	**Payment**: Percentage of work completed. **Submit:** Relevant Quality Records.
HW0106	**Service Location**	Item	Lump Sum	$ 248.83	$ 248.83	**Payment**: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0115	Acid sulphate soil					
HW0115.01	Initial testing for acid sulphate soils and prepare and submit report	5	per test	$ 121.00	$ 605.00	**Submit:** Result for each test. **Limits of Accuracy:** <To be inserted>
HW0130	Pre commissioning and commissioning	Item	Lump Sum	$ 8,000.00	$ 8,000.00	**Payment**: 50% at completion of satisfactory precommissioning. Remainder at Practical Completion. **Submit:** Relevant Quality Records.
HW0131	Preparation and submission of Work as Constructed Information	Item	Lump Sum	$ 6,000.00	$ 6,000.00	**Payment:** 100% at Practical Completion. **Submit:** Complying Work As Constructed Information.
HW1SP	***Sub Total***				$87,966	

Sewer Pipeline - Gravity - section will be present if one or more gravity mains are specified

Item	Construction of Sewer Gravity Mains	Qty	Unit	Rate $/Unit	Amount $	Application of Schedule of Rates
HWG001	Service Location	Item	Lump Sum	$ 252.00	$ 252.00	**Payment**: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HWG004	Supply all pipe materials including detector tape, pipe protection wrapping, rubber rings and lubricant for following pipe sizes:					**Measurement:** Actual metres (effective length) of pipe delivered to site. **Submit:** Relevant Quality Records including Compliance Certificates. *Note: Limits of Accuracy to be inserted for each pipe size.*
016VSS	Nominal DN225 PVC pipe	200	m	$ 35.00	$ 7,000.00	
HWG005	Clear, excavate, lay, join, bed, backfill & test pipelines (installation). Up to **1.5 m** depth to invert in OTR.					**Measurement:** Actual metres of pipe installed with design depth of excavation up to and including 1.5m. **Retention:** 10% <or other appropriate percentage> until satisfactory testing. **Submit:** Relevant Quality Records including as constructed lengths, levels and coordinates. **Limits of Accuracy:** <To be inserted>.
016V03	Nominal DN225 PVC (Trench type 3)	200	m	$ 108.16	$ 21,632.00	
HWG027	Preparation of line sheets	200	each	$ 1.16	$ 232.00	**Measurement:** Length of pipelines constructed as per design. **Limits of Accuracy:** <To be inserted>.
HWG029	**Miscellaneous**					
HWG000	***Sub Total***				$29,116	

Item No.	Item Description	Qty	Unit		Amount $	Application of Schedule of Rates
HW0013	Work as Constructed Information <Insert Min $>	Item	Lump Sum	$ 1,600.00	$ 1,600.00	**Payment**: 100% at Practical Completion.

A.	**TOTAL ESTIMATED CONTRACT AWARD SUM**	$ 178,530.65

B.	**PRE-CONSTRUCTION COST (Table 10)**	
HW0016	Design	$ 35,706.13
HW0017	Project Management of Design	$ 17,141.23
HW0024	Community Consultation	
	Sub Total(B1)	$ 52,847.36
	Pre construction contingency (30% of B1)	$ 15,854.21
	TOTAL PRE-CONSTRUCTION COST (B)	$ 68,701.56

C.	**CONSTRUCTION COST**		
	Total Estimated Contract Award Sum (A)		$ 178,530.65
HW0023	Construction Management (Table 11)		$ 5,000.00
	Sub Total (C1)		$ 183,530.65
	Construction contingency (Table 12) (30% of C1)	Preliminary Estimate	$ 55,059.20
	TOTAL CONSTRUCTION COST (C)		$ 238,589.85

	TOTAL PRELIMINARY PROJECT ESTIMATE (B+C) (Preliminary Estimate)	$ 307,291.41

Summary of options

Option	TOTAL OPTION COST (30yrs 7% Discount)	CAPITAL COST
Potable Water Top-up	$113,076	$6,000
Odour Dosing Unit (Rental)	$181,821	$4,400
Odour Dosing Unit (Purchase)	$227,376	$123,660

ADW Johnson
239567 - NPV Analysis
Odour Dosing Unit (Purchase)

		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048		
Base year		2020																														
Discount Rate		7.0%																														
Year		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Period		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
CAPITAL COSTS																																
Preliminary Estimate																																
Odour Dosing Unit Design & Installation		$ 4,000.00																														
Odour Dosing Unit Purchase		$ 119,660.00																														
TOTAL CAPITAL COST		**$123,660**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
O&M																																
Odour dosing chemical supply/servicing	$/ML of sewer $ 141.56	$ 23,640.52	$ 23,640.52	$ 23,640.52	$ 23,640.52	$ 23,640.52																										
TOTAL O&M COST		$23,641	$23,641	$23,641	$23,641	$23,641	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TOTAL COSTS (Capital)		$123,660	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TOTAL COSTS (O&M)		$23,641	$23,641	$23,641	$23,641	$23,641	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
PV of costs (Capital)		$123,660	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
PV of costs (O&M)		$23,641	$22,094	$20,649	$19,298	$18,035	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Cumulative Present Value		$147,301	$169,394	$190,043	$209,341	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376	$227,376
Year		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

NET PRESENT VALUE OF TOTAL COSTS	Discount Rate 4%	7%	10%
	$233,113	**$227,376**	$222,238

ADW Johnson
239567 - NPV Analysis
Odour Dosing Unit (Rental)

			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048		
Base year			2020																														
Discount Rate			7.0%																														
Year			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Period			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
CAPITAL COSTS																																	
Preliminary Estimate																																	
Odour Dosing Unit Design & Installation			$ 4,400.00																														
TOTAL CAPITAL COST			**$4,400**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
O&M																																	
Unit Rental	$/month	$ 1,400.00	$ 16,800.00	$ 16,800.00	$ 16,800.00	$ 16,800.00	$ 16,800.00																										
Odour dosing chemical supply/servicing	$/ML of sewer	$ 141.56	$ 23,640.52	$ 23,640.52	$ 23,640.52	$ 23,640.52	$ 23,640.52																										
TOTAL O&M COST			$40,441	$40,441	$40,441	$40,441	$40,441	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TOTAL COSTS (Capital)			$4,400	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TOTAL COSTS (O&M)			$40,441	$40,441	$40,441	$40,441	$40,441	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
PV of costs (Capital)			$4,400	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
PV of costs (O&M)			$40,441	$37,795	$35,322	$33,012	$30,852	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Cumulative Present Value			$44,841	$82,635	$117,958	$150,969	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821	$181,821
Year			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

	Discount Rate		
	4%	7%	10%
NET PRESENT VALUE OF TOTAL COSTS	$191,635	**$181,821**	$173,032

ADW Johnson
239567 - NPV Analysis
Potable Water Top-up

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048			
Base year	2020																															
Discount Rate	7.0%																															
Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	
Period	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
CAPITAL COSTS																																
Preliminary Estimate																																
Budget cost estimate																																
RPZD	$ 3,500.00																															
Separate line to Valve Pit and tap outlet	$ 2,500.00																															
TOTAL CAPITAL COST	**$6,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	
O&M																																
Potable Water Usage (kL/yr) L/s kL/year																																
2020 0.56 17672	$41,560.10																															
2021 0.54 17041		$40,176.00																														
2022 0.28 8836			$20,884.08																													
2023 0.15 4734				$11,215.87																												
2024 0.01 316					$749.59																											
TOTAL O&M COST	$41,560	$40,176	$20,884	$11,216	$750	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
TOTAL COSTS (Capital)	$6,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
TOTAL COSTS (O&M)	$41,560	$40,176	$20,884	$11,216	$750	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
PV of costs (Capital)	$6,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
PV of costs (O&M)	$41,560	$37,548	$18,241	$9,155	$572	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
Cumulative Present Value	$47,560	$85,108	$103,349	$112,504	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	$113,076	
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	

Discount Rate	4%	7%	10%
NET PRESENT VALUE OF TOTAL COSTS	$116,111	**$113,076**	$110,282

Appendix E

HUNTER WATER INFORMATION

HUNTER WATER AUSTRALIA

Asset Mapping Services

Index	Index	Papers No	Contract No	Suburb	Fin Year	Work Description
67062	S	2009-1553	S09-1553	Branxton	13/14	Sewermain

Proposed Work	☐ No	Work Commenced	Work Completed	Sent to Survey	☑ Yes
Prop Work Rec		17/01/2013	6/08/2013	Date to Survey	6/08/2013

Description: Construct 2679m sewermain Reticulation - Stage 1 Elderslie Rd

Find Record | Add Record | Save Record | Undo Record | Delete Record

Survey Consulting

Job Number: 1915-5689

Received By	Received Date	All Data Available	☐	Design Company
MJC	7-8-13	Design Internal (Yes	☐	RPS

Prepared By	Due Date	Survey Method	Completed By	Survey Completed
MJC	4-9-13	GPS	MJC	13-9-13.

Forward to SWIMS By: MJC | Date to SWIMS: | Approx Days: 0

Levels (OK) ☑

Locations (OK) ☑

Exceptions ☐

Comments: REMAIN ONLY LOCATES FROM SURFACE PAINT MARKS.

Sewer/Water Information Management System

WO Received	WO Captured	WO Captured By	To Scanning	From Scanning	Completed	Checked By
13/9/13	13.9.13	DAP.	26/9/13	24/10/13	24/10/13	KB

Static File:

WO Steel River ☐ No | WO Date to Steel River: | WO Date returned Steel River:

Approx Days SWIMS: 0 | Comments:

Print Record | Close Form

N 27472 to N 27476

HUNTER WATER AUSTRALIA

Asset Mapping Services

Index	Index	Papers No	Contract No	Suburb	Fin Year	Work Description
67062	S	2009-1553	S09-1553	Branxton	13/14	Sewermain

Proposed Work	☐	No	Work Commenced	Work Completed	Sent to Survey	☑	Yes
Prop Work Rec			17/01/2013	6/08/2013	Date to Survey		6/08/2013

Description	Construct 2679m sewermain Reticulation - Stage 1 Elderslie Rd

Find Record | Add Record | Save Record | Undo Record | Delete Record

Survey Consulting

Job Number 1915-5689

Received By	Received Date	All Data Available	☐	Design Company
MJC	7/08/2013	Design Internal (Yes	☐	RPS Australia East

Prepared By	Due Date	Survey Method	Completed By	Survey Completed
MJC	4/09/2013	GPS	MJC	13/09/2013

Forward to SWIMS By MJC | Date to SWIMS 13/09/2013 | Approx Days 26

Levels (OK) ☑

Locations (OK) ☑

Exceptions ☐

Comments

Sewer/Water Information Management System

WO Received	WO Captured	WO Captured By	To Scanning	From Scanning	Completed	Checked By
		DAP	26/09/2013	24/10/2013	24/10/2013	SB
13/09/2013	13/09/2013	Static File				

WO Steel River ☑ Yes | WO Date to Steel River 13/09/2013 | WO Date returned Steel River 26/09/2013

Approx Days SWIMS 0 | Comments

Print Record | Close Form

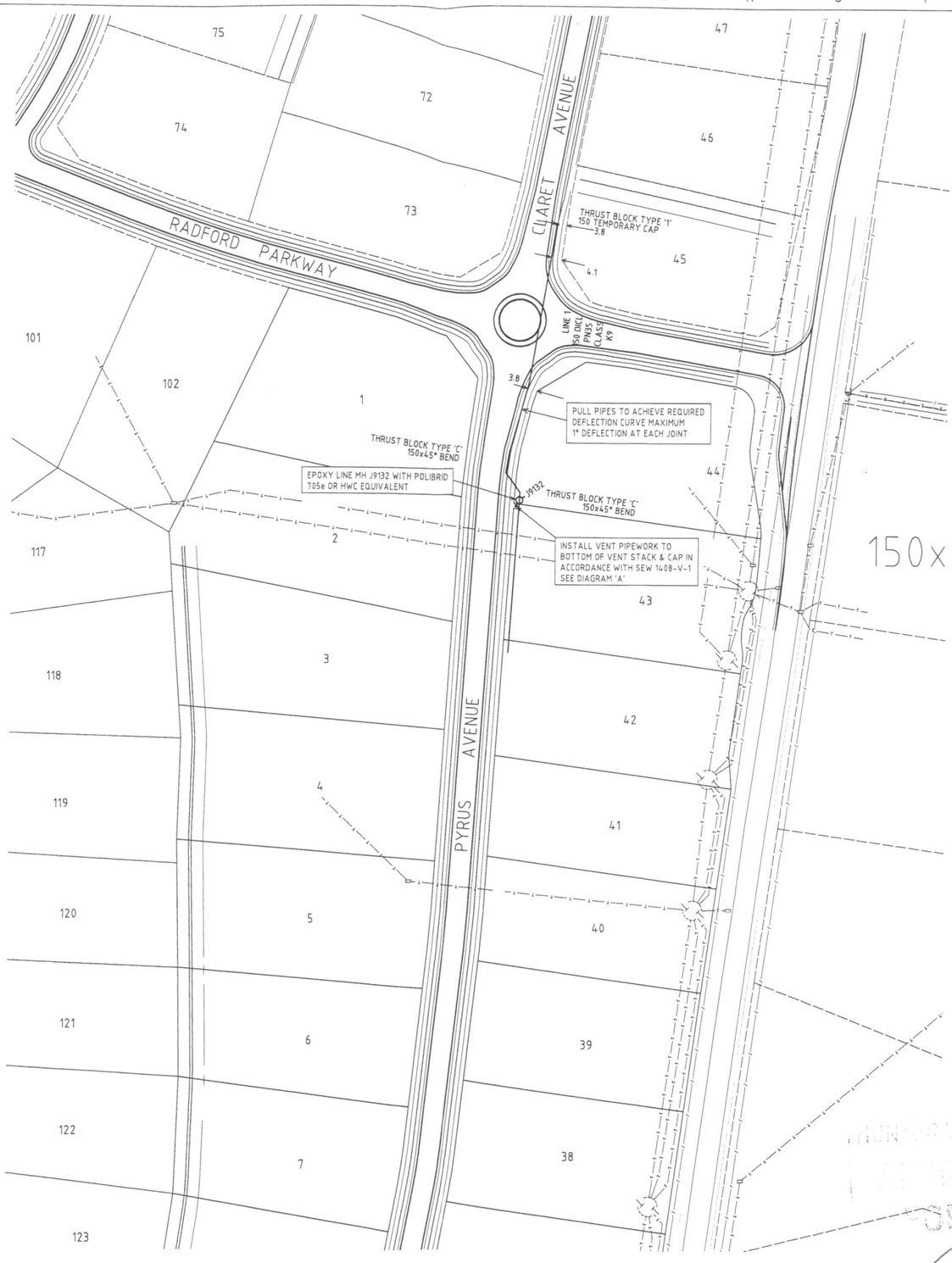
DIAL 1100 BEFORE YOU DIG

A1 1:1000 ON ORIGINAL 0 10 20 30 40 50m

M.G.A. (GND) COORDINATES

ORIGIN: PM 21418 ZONE: 56
E: 345935.544
N: 6385641.961 C.S.F: 0.99999

LINE	MH/MS	EASTING	NORTHING
1	J9132 (EX.)	346030.66	6387484.26
1	150 x 45 BEND	346030.85	6387487.25
1	150 x 45 BEND	346025.44	6387494.79
1	TEMPORARY CAP	346044.19	6387589.86



Works WSA 109 Strategy

NOTES:

1. WORKS MUST BE CONSTRUCTED IN ACCORDANCE WITH THE DESIGN DRAWINGS, CONSTRUCTION NOTES, WSA 02 HWC EDITION PART 3 - CONSTRUCTION AND WSA 02 HWC EDITION STANDARDS DRAWINGS.
2. THE CONSTRUCTOR IS TO VERIFY THE POSITIONS AND LEVELS OF ALL EXISTING AND PROPOSED BOUNDARIES, SERVICES, PIPES, CABLES AND CONDUITS.
3. CLEARANCES SHOWN TO OTHER PIPES HAVE BEEN CALCULATED FROM THE COLLAR.
4. KERB LEVEL SHOWN ON THE SECTION IS ADJACENT TO THE ROUTE OF THE PROPOSED SEWER.
5. ALL PRODUCTS AND MATERIALS TO BE SELECTED FROM THE HWC APPROVED PRODUCTS AND MATERIALS REGISTER.
6. ALL PROPERTY CONNECTIONS TO BE LOCATED 1.0M FROM THE DOWNSTREAM BOUNDARY UNLESS OTHERWISE INDICATED. ALL CONNECTIONS TO BE BURIED INTERFACE METHOD IN ACCORDANCE WITH SEW-1105 AND SEW-1107-V WITH:
   - VERTICAL RISER WHERE SEWER DEPTH >1.5M
   - MARKER TAPE (NON-DETECTABLE) LAID RAISED TO THE SURFACE AT EACH JUNCTION
7. LAY PIPE IN ACCORDANCE WITH SUPPORT TYPE AS SHOWN ON LONG SECTION AND SEW-1251-H STANDARD TRENCH DETAILS.
8. CONSTRUCT ALL MAINTENANCE HOLES IN ACCORDANCE WITH:
   - LONG SECTION LEVELS
   - SEW-1300-V TYPE P1 OR TYPE P2 AS SHOWN IN LONG SECTION
   - ALL COMPONENT JOINTS TO BE SEALED AS PER SEW-1300-V NOTE 11
   - SEW-1302-V PIPE CONNECTIONS
   - SEW-1303-V CHANNEL LEVELS
   - SEW 1304-V / SEW-1305-V CHANNEL ARRANGEMENTS
   - SEW-1308-V COVER ARRANGEMENTS
9. FILL IN THE VICINITY OF THE PROPOSED SEWERMAIN IS TO BE PLACED PRIOR TO PIPELAYING AND IS TO BE PLACED IN LAYERS NOT EXCEEDING 200mm THICKNESS AND COMPACT EACH LAYER TO NOT LESS THAN 95% OF IT'S STANDARD MAXIMUM DRY DENSITY

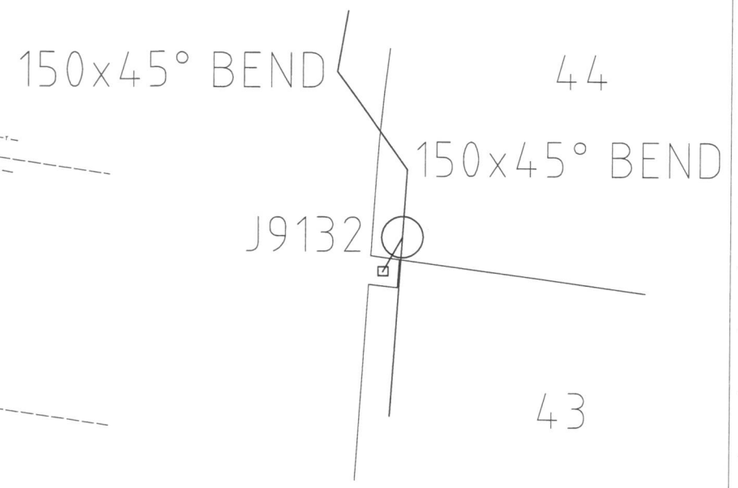


DIAGRAM 'A'

ORIGIN OF LEVELS
PM/SSM/BM No. 21418 RL 28.87 AHD
SCALE
PLAN 1:1000

CONSTRUCTION ISSUE

HUNTER WATER CORPORATION LIMITED
APPROVED IN CONNECTION
FOR CONSTRUCTION
19-4-13
MANAGER, PLANNING & URBAN DEVELOPMENT
16/4/2013

No.	REVISION DETAILS	DWN	DATE
04	RISING MAIN ROUTE AMENDED	IM	15.4.2013
3	CONSTRUCTION ISSUE	R.P.	09.04.13
2	ADD 45° BENDS NEAR J9132 - ABANDON J9133	R.P.	09.04.13
1	AMEND 90° BEND RADFORD PARKWAY TO 2 x 45° BENDS	R.P.	02.04.13
0	CONSTRUCTION ISSUE (AMENDED)	IM	25.2.2013
A	ORIGINAL ISSUE	IM	18.1.13

CONSULTANT DETAILS:
RPS Australia East Pty Ltd
ABN 44 140 292 762
Newcastle Office
Ground Floor, 241 Denison Street
Broadmeadow, NSW Australia 2292
PO Box 428, Hamilton, NSW Australia 2303
T +61 2 4940 4200 F +61 2 4961 6794
E newcastle@rpsgroup.com.au W rpsgroup.com.au

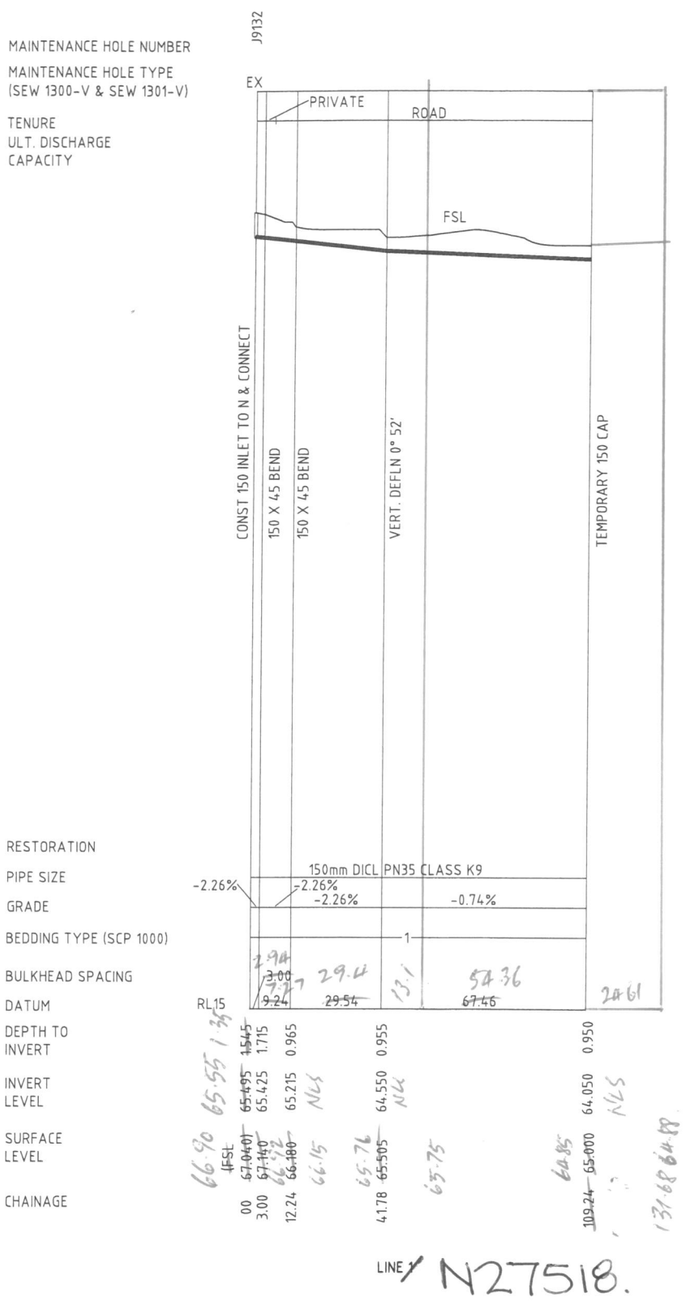
CONSULTANT REFERENCE No.
113229-4C-RISING MAIN

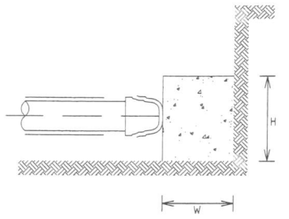
DESIGNED: IM	DATE: 18.1.2013	COMPANY: RPS	
DRAWN: IM	DATE: 18.1.13	COMPANY: RPS	
CHECKED: RP	DATE: 18.1.13	COMPANY: RPS	
APPROVED: RP	DATE: 21.1.13	COMPANY: RPS	

TITLE: S09-1553

PROPOSED STAGE 1 SEWER RISING MAIN
ELDERSLIE ROAD BRANXTON

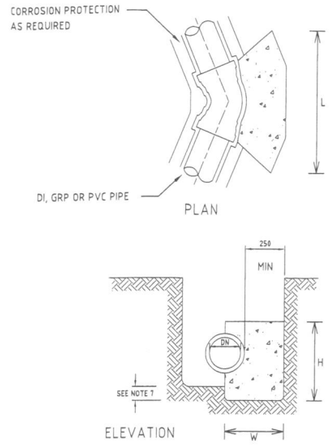
SIZE	SCALE	INDEX No.	DRAWING No.	SHEET	REV No.
A1	1:1000	67062		008	04





THRUST BLOCK FOR CAP (1)

ELEVATION



HUNTER WATER CORPORATION LIMITED
APPROVED IN CONCEPT FOR CONSTRUCTION
19-4-13
ENGINEERING MANAGER, BUSINESS & URBAN DEVELOPMENT

DIAL 1100 BEFORE YOU DIG

A1 1:1000 ON ORIGINAL 0 10 20 30 40 50m

A1 1:200 ON ORIGINAL 0 2 4 6 8 10m

THRUST BLOCK FOR BENDS
(FOR HORIZONTAL THRUST)

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.
2. CAST THE THRUST AREA OF ALL THRUST BLOCKS AGAINST A CLEAN FACE OF UNDISTURBED NATURAL SOIL. THRUST BLOCKS NOT TO INTERFERE WITH OTHER SERVICES.
3. SOIL CLASSIFICATIONS USED ON THIS DRAWING ARE EXPLAINED IN WAT-1200.
4. DO NOT USE STANDARD THRUST BLOCKS AS SPECIFIED IN THIS DRAWING IN:
   - VERY SOFT, SOFT OR FIRM CLAY.
   - LOOSE CLEAN SAND.
   - UNCOMPACTED FILL OR REFUSE.

   A GEOTECHNICAL ASSESSMENT AND INDIVIDUAL DESIGN IS REQUIRED FOR THESE SOILS.
5. THE NOMINAL THRUST AREA 'N' TO BE ACHIEVED BY POURING CONCRETE THE FULL LENGTH OF THE FITTING AND EXTENDING FROM THE FLOOR OF THE TRENCH TO ABOVE THE FITTING (SEE ALSO NOTE 7).
6. DESIGN PRESSURES OTHER THAN 1000 kPa REDUCE OR INCREASE THE MINIMUM THRUST AREA BY THE RATIO OF THE DESIGN PRESSURES EXCEPT WHERE:
   - MIN THRUST AREA IS <0.1 m^2, AND
   - 'N' APPEARS IN THE TABLE AND DESIGN PRESSURE IS ABOVE 1000 kPa

   CALCULATE THE AREA.
7. FINISH THRUST BLOCKS APPROXIMATELY 100 ABOVE THE TOP OF THE FITTING OR BEARING PAD AND EXTEND TO THE FLOOR OF THE TRENCH OR DEEPER IF NECESSARY TO ACHIEVE THE REQUIRED THRUST AREA. MAXIMUM ENCASEMENT TO BE 180°.
8. THE MINIMUM THRUST AREA FOR TAPER THRUST BLOCKS TO BE EQUAL TO THE DIFFERENCE BETWEEN THE THRUST AREAS FOR DEAD ENDS OF EQUIVALENT DIAMETER TO THOSE EACH SIDE OF TAPER.
9. FOR DOWNWARD VERTICAL THRUST, THE ALLOWABLE BEARING PRESSURES FOR VARIOUS SOILS MAY BE TAKEN AS TWICE THAT FOR HORIZONTAL THRUST SHOWN.
10. WHEN POURING CONCRETE AGAINST FITTINGS PLACE A MEMBRANE OF POLYETHYLENE, PVC OR FELT BETWEEN THE FITTING AND CONCRETE TO PREVENT DAMAGE TO THE FITTING. JOINTS TO BE CLEAR OF CONCRETE.
11. CONCRETE THRUST BLOCKS AND ANCHORS FOR VALVES TO BE AS DETAILED IN WAT-1207.

THRUST BLOCK DETAILS

TYPE	FITTING	DESIGN AHBP (mPa)	DESIGN STP (kPa)	TA (m^2)	L (m)	H (m)	W (m)
C	150x45° BEND	50	1000	0.38	1.0	0.38	xN
1	150 CAP	50	1000	0.50	0.71	0.71	xN

xN – NOMINAL TRENCH WIDTH

NOTES:

1. WORKS MUST BE CONSTRUCTED IN ACCORDANCE WITH THE DESIGN DRAWINGS, CONSTRUCTION NOTES, WSA 02 HWC EDITION PART 3 – CONSTRUCTION AND WSA 02 HWC EDITION STANDARDS DRAWINGS.
2. THE CONSTRUCTOR IS TO VERIFY THE POSITIONS AND LEVELS OF ALL EXISTING AND PROPOSED BOUNDARIES, SERVICES, PIPES, CABLES AND CONDUITS.
3. CLEARANCES SHOWN TO OTHER PIPES HAVE BEEN CALCULATED FROM THE COLLAR.
4. KERB LEVEL SHOWN ON THE SECTION IS ADJACENT TO THE ROUTE OF THE PROPOSED SEWER.
5. ALL PRODUCTS AND MATERIALS TO BE SELECTED FROM THE HWC APPROVED PRODUCTS AND MATERIALS REGISTER.
6. ALL PROPERTY CONNECTIONS TO BE LOCATED 1.0M FROM THE DOWNSTREAM BOUNDARY UNLESS OTHERWISE INDICATED. ALL CONNECTIONS TO BE BURIED INTERFACE METHOD IN ACCORDANCE WITH SEW-1105 AND SEW-1107-V WITH:
   - VERTICAL RISER WHERE SEWER DEPTH >1.5M
   - MARKER TAPE (NON-DETECTABLE) LAID RAISED TO THE SURFACE AT EACH JUNCTION
7. LAY PIPE IN ACCORDANCE WITH SUPPORT TYPE AS SHOWN ON LONG SECTION AND SEW-1251-H STANDARD TRENCH DETAILS.
8. CONSTRUCT ALL MAINTENANCE HOLES IN ACCORDANCE WITH:
   - LONG SECTION LEVELS
   - SEW-1300-V TYPE P1 OR TYPE P2 AS SHOWN IN LONG SECTION
   - ALL COMPONENT JOINTS TO BE SEALED AS PER SEW-1300-V NOTE 11
   - SEW-1302-V PIPE CONNECTIONS
   - SEW-1303-V CHANNEL LEVELS
   - SEW 1304-V / SEW-1305-V CHANNEL ARRANGEMENTS
   - SEW-1308-V COVER ARRANGEMENTS
9. FILL IN THE VICINITY OF THE PROPOSED SEWERMAIN IS TO BE PLACED PRIOR TO PIPELAYING AND IS TO BE PLACED IN LAYERS NOT EXCEEDING 200mm THICKNESS AND COMPACT EACH LAYER TO NOT LESS THAN 95% OF IT'S STANDARD MAXIMUM DRY DENSITY

ORIGIN OF LEVELS

PM/~~SSM/BM No.~~ 21418 RL 28.87 AHD

SCALE
HORIZONTAL 1:1000
VERTICAL 1:200

CONSTRUCTION ISSUE

WAE TAKEN FROM PAINT MARKS ON GROUND BY BARACOM. - M.J.C.

No.	REVISION DETAILS	DWN	DATE
04	RISING MAIN ROUTE AMENDED	IM	15.4.2013
3	CONSTRUCTION ISSUE	R.P.	09.04.13
2	ADD 45° BENDS NEAR J9132 - ABANDON J9133	R.P.	09.04.13
1	AMEND 90° BEND RADFORD PARKWAY TO 2 x 45° BENDS	R.P.	02.04.13
0	CONSTRUCTION ISSUE (AMENDED)	IM	25.2.2013
A	ORIGINAL ISSUE	IM	18.1.13

CONSULTANT DETAILS:
RPS Australia East Pty Ltd
ABN 44 140 292 762
Newcastle Office
Ground Floor, 241 Denison Street
Broadmeadow, NSW Australia 2292
PO Box 428, Hamilton, NSW Australia 2303
T +61 2 4940 4200 F +61 2 4961 6794
E newcastle@rpsgroup.com.au W rpsgroup.com.au

CONSULTANT REFERENCE No.
113229-5Csrm

DESIGNED: IM	DATE: 18.1.13	COMPANY: RPS	
DRAWN: IM	DATE: 18.1.13	COMPANY: RPS	
CHECKED: RP	DATE: 18.1.13	COMPANY: RPS	
APPROVED: RP	DATE: 21.1.13	COMPANY: RPS	

TITLE: S09-1553

PROPOSED SEWER RISING MAIN
ELDERSLIE ROAD BRANXTON

I. Murphy 16/4/2013

SIZE	SCALE	INDEX No.	DRAWING No.	SHEET	REV No.
A1	1:1000/1:200	67062		009	04

Murray Melmeth

From: Malcolm Withers
Sent: Friday, 19 April 2013 2:06 PM
To: 'Ian Murphy'; Daniel Golenia (Daniel@hvSurveyors.com)
Cc: Murray Melmeth
Subject: FW: BRANXTON RISING MAIN PLANS - Approval and easement requirements
Attachments: 113229-5D-srm.15.04.pdf; 113229.SRM.STG1.15.04.pdf

Good morning Daniel / Ian,

I have approved the latest design and passed on to our contracts Group. Could you ensure that an easement is established over the section of rising main in private property please?

Regards

Malcolm Withers
Senior Developer Services Engineer| Hunter Water Corporation
36 Honeysuckle Drive Newcastle NSW 2300 | PO Box 5171 HRMC NSW 2310
T 02 4979 9545 | **F** 02 4979 9311 | **M** 0429 372 449
malcolm.withers@hunterwater.com.au
Please consider the environment before printing this email

From: Ian Murphy [mailto:Ian.Murphy@rpsgroup.com.au]
Sent: Tuesday, 16 April 2013 11:41 AM
To: Malcolm Withers
Cc: Murray Melmeth; Chris Hall
Subject: BRANXTON RISING MAIN PLANS

Mal

Rising main plans showing amended route as discussed. Will drop signed plans in later today.

Thanks for your help on this one

Cheers

ian

RPS

Ian Murphy
Principal / Water & Sewer Strategist
RPS Australia Asia Pacific
PO Box 428, Hamilton, NSW, Australia, 2303
241 Denison St, Broadmeadow, NSW, 2292

Tel: +61 2 4940 4200
Fax: +61 2 4961 6794
Mobile: +61 409 301 219

Sheet No. A 23651

STREET: ELDERSLIE ROAD

WORK ORDER No.:

SUBURB: BRANXTON

LINE No.: 1

PIPE SIZE: 225

INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8

CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)		Lot No.	Depth Junct
		UPSTREAM M.H. No. J9125		
		DEPTH OF M.H.		
1.0m				
1.0m	3			
1.0m				
	Type of Bedding			
		DOWNSTREAM M.H. No. J9124		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

"NO JUNCTIONS IN LINE"

GANGER: B Bowman

DATE: 25/2/13

Sheet No. A 23652

STREET: ELDERSLIE ROAD WORK ORDER No.:

SUBURB: BRANXTON LINE No.: 1

PIPE SIZE: 225 INDEX No.: 67062

TYPE OF PIPE: UPVC - SN8 CONTRACT No.: 509 1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)	UPSTREAM M.H. No.	J9126	Lot No.	Depth of Junction
		DEPTH OF M.H.			
1.0m					
1.0m	W				
1.0m					
	Type of Bedding	DOWNSTREAM M.H. No.	J9125		
		DEPTH OF M.H.			
		DIST. BETWEEN M.H. METRES			

"W" JD JUNCTIONS IN LINE"

GANGER: [signature]

DATE: 25/2/13

Sheet No. A 23653

STREET: ELDERSLIE ROAD WORK ORDER No.:

SUBURB: BRANXTON LINE No.: 1

PIPE SIZE: 225 INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8 CONTRACT No.: 509 1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)		Lot No.	Depth of Junction
		UPSTREAM M.H. No. J9127		
		DEPTH OF M.H.		
1.0m				
		RJ ON BACK AT 2.1.0m		
		VERTICAL RISER		
1.0m	3	RJ FOR BRANCH 9.8m		
		Y/J FOR AT 1.5m TOWARDS		
			24	1.5m
1.0m	Type of Bedding			
		DOWNSTREAM M.H. No. J9126		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

GANGER: BPassmore

DATE: 25/2/13

Sheet No. A 23654

STREET: ELDERSLIE ROAD | WORK ORDER No.:

SUBURB: BRANXTON | LINE No.: 1

PIPE SIZE: 225 | INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8 | CONTRACT No.: 509 1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)		Lot No.	Depth of Junction
		UPSTREAM M.H. No. J9128		
		DEPTH OF M.H.		
NL		RISING MAIN AT 90.6m		
		VERTICAL RISER		
		RISING MAIN 9.3m		
		Y JUNCTION AT 1.5m INV.	23	1.5m
2.0m	3			
1.0m				
	Type of Bedding	DOWNSTREAM M.H. No. J9127		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

GANGER: BP

DATE: 25/2/13

Sheet No. A 23655

STREET: ELDERSLIE ROAD

WORK ORDER No.:

SUBURB: BRANXTON

LINE No.: 1

PIPE SIZE: 225

INDEX No.: 67062

TYPE OF PIPE: UPVC - SN8

CONTRACT No.: 509 1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)		Lot No.	Depth of Junction
		UPSTREAM M.H. No. MS 750		
		DEPTH OF M.H.		
		RJ TO RJ 50.3m	25	1.7m
		1.7m TO INV.		
NIL	3			
	Type of Bedding	DOWNSTREAM M.H. No. J9128		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

GANGER: RP

DATE: 25/2/13

Sheet No. A 23656

STREET: ELDERSLIE ROAD WORK ORDER No.:

SUBURB: BRANXTON LINE No.: 1

PIPE SIZE: 225 INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8 CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)	UPSTREAM M.H. No. ○ MS751	Lot No.	Depth of Junction
		DEPTH OF M.H.		
		✓ YJ TO RAT 67.0m		
		1.1m TO INV.	28	1.1m
NIL				
	3			
		✓ YJ TO RAT 39.0m		
		1.1m TO INV.	27	1.1m
		✓ YJ TO RAT 2.4m		
		1.5m INV.	26	1.5m
	Type of Bedding			
		DOWNSTREAM M.H. No. MS750		
		DEPTH OF M.H. ○		
		DIST. BETWEEN M.H. METRES		

GANGER: B Passmore

DATE: 25/2/13

Sheet No. A 23657

STREET: ELDERSLIE ROAD WORK ORDER No.:

SUBURB: BRANXTON LINE No.: 1

PIPE SIZE: 225 INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8 CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)		Lot No.	Depth Junctio
		UPSTREAM M.H. No. MS752		
		DEPTH OF M.H.		
		✓ YJ TO RAT 54.4m		
		1.4m TO INV.	31	1.4m
NIL	3			
		✓ YJ TO RAT 26.2m		
		1.5m TO INV.	30	1.5.
		✓ YJ TO RAT 4.6m		
		1.2M TO INV.	29	1.2m
	Type of Bedding	DOWNSTREAM M.H. No. MS751		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

GANGER: [signature]

DATE: 25/2/13

Sheet No. A 23658

STREET: ELDERSLIE ROAD

WORK ORDER No.:

SUBURB: BRANXTON

LINE No.: 1

PIPE SIZE: 225

INDEX No.: 67062

TYPE OF PIPE: UPVC - SN8

CONTRACT No.: SC9 1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)		Lot No.	Depth of Junction
		UPSTREAM M.H. No. J9129		
		DEPTH OF M.H.		
NIL	3			
		YJ TO R AT 3.4m		
		1.4m TO INV.	32	1.4m
	Type of Bedding	DOWNSTREAM M.H. No. MS 752		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

GANGER: [signature]

DATE: 28/2/13

Sheet No. A 23659

STREET: ELDERSLIE ROAD | WORK ORDER No.:

SUBURB: BRANXTON | LINE No.: 1

PIPE SIZE: 225 | INDEX No.: 67062

TYPE OF PIPE: UPVC - SN8 | CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)			Lot No.	Depth Junctio
		UPSTREAM M.H. No.	MS753		
		DEPTH OF M.H.			
			YJ TO RAF 39.5m		
			1.1m TO INV.	34	1.1m
NIL	3				
			YJ TO RAF 2.0m		
			1.2m TO INV.	33	1.2m
	Type of Bedding	DOWNSTREAM M.H. No.	JP129		
		DEPTH OF M.H.			
		DIST. BETWEEN M.H. METRES			

GANGER: [signature]

DATE: 25/2/13

Sheet No. A 23660

STREET: ELDERSLIE ROAD WORK ORDER No.:

SUBURB: BRANXTON LINE No.: 1

PIPE SIZE: 225 INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8 CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)		Lot No.	Depth Junctio
		UPSTREAM M.H. No. MS 754		
		DEPTH OF M.H.		
		Y JTO RAD 41.5m		
NIL	3	1.3m TO INV.	36	1.3m
		Y JTO RAD 4.0m		
		1.2m TO INV.	35	1.2m
	Type of Bedding	DOWNSTREAM M.H. No. MS 753		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

GANGER: [signature]

DATE: 25/2/13

Sheet No. A 23661

STREET: ELDERSLIE ROAD WORK ORDER No.:

SUBURB: BRANXTON LINE No.: 1

PIPE SIZE: 225 INDEX No.: 67062

TYPE OF PIPE: UPVC - SN8 CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)		Lot No.	Depth of Junction
		UPSTREAM M.H. No. J9130		
		DEPTH OF M.H.		
		Y to Rock 38.1m		
NIL	3	.8m to INV.	38	.8m
		Y to Rock 2.4m		
		1.1m to INV.	37	1.1m
	Type of Bedding	DOWNSTREAM M.H. No. MS 754		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

GANGER: [signature]

DATE: 25/2/13

Sheet No. A 23662

STREET: ELDERSLIE ROAD WORK ORDER No.:

SUBURB: BRANXTON LINE No.: 1

PIPE SIZE: 225 INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8 CONTRACT No.: 509 1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)		Lot No.	Depth Junctio
		UPSTREAM M.H. No. MS755		
		DEPTH OF M.H.		
		RJ ON BACK AT 49.3m		
		VERTICAL RISER		
	3	RJ TO R AT 1.5m RW.	40	1.5m
NIL				
		Y JTO R AT 3.0m		
		1.1m TO RW.	39	1.1m
	Type of Bedding	DOWNSTREAM M.H. No. J9130		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

GANGER: B Passmore

DATE: 25/2/13

Sheet No. A 23663

STREET: ELDERSLIE ROAD WORK ORDER No.:

SUBURB: BRANXTON LINE No.: 1

PIPE SIZE: 225 INDEX No.: 67062

TYPE OF PIPE: UPVC - SN8 CONTRACT No.: 509 - 1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)		Lot No.	Depth of Junction
		UPSTREAM M.H. No. J9131		
		DEPTH OF M.H.		
1.7m				
	3	RJ ON BACK AT 38.3m VERTICAL RISER		
1.7m		RJ FOR Ø 1.5m INV.	42	1.5m
		RJ ON BACK AT 2.4m VERTICAL RISER		
	Type of Bedding	RJ FOR Ø 1.4m INV	41	1.4m
NIL				
		DOWNSTREAM M.H. No. MS755		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

GANGER: [signature]

DATE: 25/2/13

Sheet No. A 23664

STREET: ELDERSLIE ROAD WORK ORDER No.:

SUBURB: BRANXTON LINE No.: 1

PIPE SIZE: 225 INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8 CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram) / Type of Bedding		Lot No.	Depth of Junction
		UPSTREAM M.H. No. J9132		
		DEPTH OF M.H.		
1.2		Y/S TO RAT 59.2m		
		1.5m TO INV.	44	1.5m
		150 DICL STUB FOR FUTURE RISING MAIN		
	3			
1.7				
		RJ ON PACKER 5.9m		
		VERTICAL RISER		
		RJ TO RAT 1.4m INV.	43	1.4m
1.7				
		DOWNSTREAM M.H. No. J9131		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

GANGER: BP

DATE: 25/2/13

Sheet No. A 23666

STREET: ELDERSLIE ROAD | WORK ORDER No.:

SUBURB: BRANXTON | LINE No.: 2

PIPE SIZE: 150 | INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8 | CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	($how encasement on diagram)	UPSTREAM M.H. No.	MS756	Lot No.	Depth of Junction
		DEPTH OF M.H.	MH		
NIL					
	3		#NO JUNCTIONS IN LINE		
	Type of Bedding				
		DOWNSTREAM M.H. No.	J9128		
		DEPTH OF M.H.			
		DIST. BETWEEN M.H. METRES			

GANGER: [signature]

DATE: 25/2/13

Sheet No. A 23667

STREET: ELDERSLIE ROAD WORK ORDER No.:

SUBURB: BRANXTON LINE No.: 2

PIPE SIZE: 150 INDEX No.: 67062

TYPE OF PIPE: UPVC - SN8 CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)		
		UPSTREAM M.H. No. MS 757	Lot No. / Depth Junctic
		DEPTH OF M.H. M/H	
NIL	3		
		RJ ON BACK AT 4.0m	
		VERTICAL RISER	
		RJ TO B AT 1.7m RN	22 / 1.7m
	Type of Bedding	DOWNSTREAM M.H. No. MS 756	
		DEPTH OF M.H.	
		DIST. BETWEEN M.H. METRES	

GANGER: B Passmore

DATE: 25/2/13

Sheet No. A 23668

STREET: ELDERSLIE ROAD WORK ORDER No.:

SUBURB: BRANXTON LINE No.: 2

PIPE SIZE: 150 INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8 CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)	UPSTREAM M.H. No. J9134	Lot No.	Depth of Junction
		DEPTH OF M.H.		
		RJ ON BACK AT 82.3m		
		VERTICAL RISER		
		RJ FOR AT 1.5m INV.	19	1.5m
N/C				
	B	RJ ON BACK AT 55.3m		
		VERTICAL RISER		
		RJ FOR AT 1.3m INV	20	1.3m
		Y/J FOR AT 25.7m		
		1.7m TO INV.	21	1.7m
		M/H		
	Type of Bedding	DOWNSTREAM M.H. No. MS 757		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

GANGER: B Passmore

DATE: 25/2/13

Sheet No. A 23669

STREET: ELDERSLIE ROAD WORK ORDER No.:

SUBURB: BRANXTON LINE No.: 2

PIPE SIZE: 150 INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8 CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)		Lot No.	Depth of Junction
		UPSTREAM M.H. No. J9135		
		DEPTH OF M.H.		
NIL	3			
		↓ YJ TO RAT 17.0m		
		1.1m TO 2nd	18	1.1m
		EXTERNAL DROP		
		DOWNSTREAM M.H. No. J9134		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

Type of Bedding

GANGER: B Pearson

DATE: 25/2/13

Sheet No. A 23670

STREET: ELDERSLIE ROAD | WORK ORDER No.:

SUBURB: BRANXTON | LINE No.: 2

PIPE SIZE: 150 | INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8 | CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)		Lot No.	Depth of Junction
		UPSTREAM M.H. No. J9136		
		DEPTH OF M.H.		
		BRANCH LINE	13	1.0m
		YJ TO RAS 7.0m		
		1.0m TO RNL		
NIL	3			
		YJ TO RAT 2.5m		
		1.3m TO RAV	15	1.3m
	Type of Bedding	DOWNSTREAM M.H. No. J9135		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

GANGER: [signature]

DATE: 25/2/13

Sheet No. A 23671

STREET: ELDERSLIE ROAD WORK ORDER No.:

SUBURB: BRANXTON LINE No.: 1

PIPE SIZE: 150 INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8 CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)	UPSTREAM M.H. No.	MS758	Lot No.	Depth c Junctio
		DEPTH OF M.H.	M/H		
1.7m					
	3				
1.7m					
			Y/J TO RAP 2.5m		
			1.8m TO RAP.	12	1.8m
NIL					
	Type of Bedding	DOWNSTREAM M.H. No.	J9136		
		DEPTH OF M.H.			
		DIST. BETWEEN M.H. METRES			

GANGER: [signature]

DATE: 25/2/13

Sheet No. A 23672

STREET: ELDERSLIE ROAD | WORK ORDER No.:

SUBURB: BRANXTON | LINE No.: 2

PIPE SIZE: 150 | INDEX No.: 67062

TYPE OF PIPE: UPVC - SN8 | CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)		Lot No.	Depth of Junction
		UPSTREAM M.H. No. MS759		
		DEPTH OF M.H. M/H.		
1.7m				
1.7m	3			
		RJ ON BACKFALL 2.5m		
		VERTICAL RISER		
		RJ TO RAP 1.0m	10	1.0m
1.7m		M/H		
	Type of Bedding	DOWNSTREAM M.H. No. MS758		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

GANGER: [signature]

DATE: 25/2/13

Sheet No. A 23673

STREET: ELDERSLIE ROAD WORK ORDER No.:

SUBURB: BRANXTON LINE No.: 2

PIPE SIZE: 150 INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8 CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)	UPSTREAM M.H. No.	MS 780	Lot No.	Depth Junctio
		DEPTH OF M.H.			
NIL			YJTSRAT 89.9m		
			1.6m TO INV	7	1.6r
	3		YJTSRAT 59.7m		
			1.2m TO INV.	8	1.2.
NIL					
			YJTSRAT 30.2m		
			1.2m TO INV.	9	1.2r
1.7m			N/H		
		DOWNSTREAM M.H. No.	MS 759		
		DEPTH OF M.H.			
		DIST. BETWEEN M.H. METRES			

Type of Bedding

GANGER: [signature]

DATE: 25/2/13

Sheet No. A 23674

STREET: ELDERSLIE ROAD | WORK ORDER No.:

SUBURB: BRANXTON | LINE No.: 2

PIPE SIZE: 150 | INDEX No.: 67062

TYPE OF PIPE: UPVC - SN8 | CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)		Lot No.	Depth of Junction
		UPSTREAM M.H. No. J9137		
		DEPTH OF M.H.		
NIL				
NIL	3			
		RJ ON BANK 33.8m		
		VERTICAL RISER		
		RJ FOR AT 1.5m INV.	6	1.5m
NIL				
	Type of Bedding	DOWNSTREAM M.H. No. MS760		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

GANGER: [signature]

DATE: 25/2/13

Sheet No. A 23675

STREET: ELDERSLIE ROAD WORK ORDER No.:

SUBURB: BRANXTON LINE No.: 2

PIPE SIZE: 150 INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8 CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)	UPSTREAM M.H. No.	MS761	Lot No.	Depth of Junction
		DEPTH OF M.H.			
			Y/J TO R/W 53.0m		
			1.7m TO R/W	4	1.7m
	3				
N/C					
			Y/J TO R/W 4.2m		
			1.6m TO R/W.	5	1.6m
Type of Bedding		DOWNSTREAM M.H. No.	J9137		
		DEPTH OF M.H.			
		DIST. BETWEEN M.H. METRES			

GANGER: B Bosmans

DATE: 25/2/13

Sheet No. A 23681

STREET: ELDERSLIE ROAD WORK ORDER No.:

SUBURB: BRANXTON LINE No.: 5

PIPE SIZE: 150 INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8 CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)		Lot No.	Depth of Junction
		~~UPSTREAM M.H. No.~~		
		~~DEPTH OF M.H.-~~		
		10.1m TO CAPPED PERPETUAL		
		RT ON BACK AT 9.8m VERTICAL RISER		
NIL	3	RT TO RAT 1.2m FROM	14	1.2m
	Type of Bedding	DOWNSTREAM M.H. No.		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES TO CAP = 10.1m		

GANGER: [signature]

DATE: 25/2/13

Sheet No. A 23676

STREET: ELDERSLIE ROAD | WORK ORDER No.:

SUBURB: BRANXTON | LINE No.: 2

PIPE SIZE: 150 | INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8 | CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement or diagram)		Lot No.	Depth of Junction
		UPSTREAM M.H. No. J9138		
		DEPTH OF M.H.		
		150 BRANCH		
		Y/J TO RAT 7.0m		
		1.8m TO INV. Y/J TO RAT 55.1m		
		1.6m TO INV.	2	1.6m
NIL	3			
		Y/J TO RAT 2.4m		
		1.6m TO INV.	3	1.6m
	Type of Bedding	DOWNSTREAM M.H. No. MS 761		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

GANGER: [signature]

DATE: 25/2/13

Sheet No. A 23677

STREET: ELDERSLIE ROAD WORK ORDER No.:

SUBURB: BRANXTON LINE No.: 2

PIPE SIZE: 150 INDEX No.: 67062

TYPE OF PIPE: UPVC - SN8 CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)	~~UPSTREAM M.H. No.~~	Lot No.	Depth of Junction
		~~DEPTH OF M.H.~~		
		DE2=37.1m		
		Y/J to R at 36.8m		
		1.7m to INV.	1	1.7m
	3			
NIL				
	Type of Bedding			
		DOWNSTREAM M.H. No. J9138		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES TO DE 2 = 37.1m		

GANGER: [signature]

DATE: 25/2/13

Sheet No. A 23678

STREET: ELDERSLIE ROAD | WORK ORDER No.:

SUBURB: BRANXTON | LINE No.: 3

PIPE SIZE: 150 | INDEX No.: 67062

TYPE OF PIPE: UPVC-SN4 | CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)	UPSTREAM M.H. No. J9139	Lot No.	Depth of Junction
		DEPTH OF M.H.		
NIL	3			
	Type of Bedding	DOWNSTREAM M.H. No. J9135		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES		

2 No JUNCTIONS IN LINE

GANGER: [signature]

DATE: 25/2/13

Sheet No. A 23679

STREET: ELDERSLIE ROAD | WORK ORDER No.:

SUBURB: BRANXTON | LINE No.: 3

PIPE SIZE: 150 | INDEX No.: 67062

TYPE OF PIPE: UPVC-SN8 | CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	(Show encasement on diagram)	~~UPSTREAM M.H. No.~~ / ~~DEPTH OF M.H.~~	Lot No.	Depth of Junction
		DE3 = 38.8m		
		YJ to RAT 38.5m 1.1m to INV.	16	1.1m
NIL	3			
		YJ to RAT 2.5m .8m to INV.	17	.8m
	Type of Bedding	DOWNSTREAM M.H. No. J9139		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES to DE3 =		

GANGER: [signature]

DATE: 25/2/13

Sheet No. A 23680

STREET: ELDERSLIE ROAD

WORK ORDER No.:

SUBURB: BRANXTON

LINE No.: 4

PIPE SIZE: 150

INDEX No.: 67062

TYPE OF PIPE: UPVC - SN8

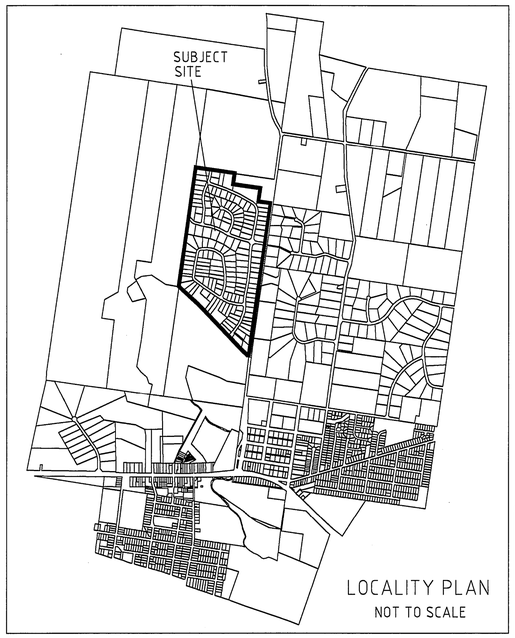
CONTRACT No.: 509-1553

Show Average Depth from surface to rock at points indicated.

Rock	Type of Bedding ($how encasement on diagram)		Lot No.	Depth of Junction
		UPSTREAM M.H. No.		
		DEPTH OF M.H.		
		DE4 = 30.5m		
		Y JTN AT 30.2m		
		.8m RNV.	11	.8m
	3			
NIL				
		DOWNSTREAM M.H. No. J9136		
		DEPTH OF M.H.		
		DIST. BETWEEN M.H. METRES TO DE4 = 30.5m		

GANGER: [signature]

DATE: 25/2/13



DIAL1100 BEFORE YOU DIG

A1 1:1000 ON ORIGINAL 0 10 20 30 40 50m

M.G.A. (GND) COORDINATES

ORIGIN: PM 214.18 ZONE: 56
E: 345935.544 C.S.F: 0.99999
N: 6385641.961

LINE	MH/MS	EASTING	NORTHING
1	J9125	346002.580	6386629.113
1	J9126	345955.035	6386671.111
1	J9127	345897.631	6386730.497
1	J9128	345859.804	6386769.631
1	MS750	345892.958	6386815.182
1	MS751	345946.811	6386889.171
1	MS752	345979.453	6386981.541
1	J9129	345984.462	6387023.555
1	MS753	345984.796	6387097.838
1	MS754	346000.149	6387176.895
1	J9130	346015.792	6387257.440
1	MS755	346021.937	6387348.007
1	J9131	346026.792	6387425.365
1	J9132	346030.660	6387484.259
1	J9133	346027.462	6387484.725
2	MS756	345842.030	6386788.018
2	MS757	345778.059	6386859.908
2	J9133	345834.570	6386930.230
2	J9134	345853.204	6386972.927
2	J9136	345890.540	6387058.475
2	MS758	345904.034	6387125.043
2	MS759	345894.325	6387127.435
2	MS760	345907.743	6387228.187
2	J9137	345908.152	6387299.644
2	MS761	345909.894	6387405.038
2	J9138	345903.282	6387472.881
3	J9139	345885.451	6386960.977

NOTES

1. # CONSTRUCT CONNECTION TO A MAXIMUM DEPTH OF 1.5 METRES TO SURFACE IN ACCORDANCE WITH STANDARD DRAWINGS SEW-1107-V AND SEW-1109
2. × LAY PROPERTY CONNECTION SEWER AT 1.2%
3. MAINTENANCE SHAFTS AND TERMINAL MAINTENANCE SHAFT TO BE CONSTRUCTED IN ACCORDANCE WITH STANDARD DRAWINGS SEW-1315, SEW-1317, SEW-1314-V & SEW1316-V
4. CONTRACTOR TO RECORD DETAILS OF MAINTENANCE SHAFT BEND LOCATIONS AND ANGLES ON WORK AS CONSTRUCTED DRAWINGS.
5. ▨ UNDRAINABLE AREA - CONNECTION IN THESE AREAS MAY REQUIRE THE PLACEMENT OF FILL OR INSTALLATION OF PRIVATE PUMP TO SEWER SYSTEMS.

HUNTER WATER CORPORATION LIMITED
APPROVED IN CONCEPT FOR CONSTRUCTION
27/11/12
for ENGINEERING MANAGER, BUSINESS & URBAN DEVELOPMENT

NOTES:

1. WORKS MUST BE CONSTRUCTED IN ACCORDANCE WITH THE DESIGN DRAWINGS, CONSTRUCTION NOTES, WSA 02 HWC EDITION PART 3 - CONSTRUCTION AND WSA 02 HWC EDITION STANDARDS DRAWINGS.
2. THE CONSTRUCTOR IS TO VERIFY THE POSITIONS AND LEVELS OF ALL EXISTING AND PROPOSED BOUNDARIES, SERVICES, PIPES, CABLES AND CONDUITS.
3. CLEARANCES SHOWN TO OTHER PIPES HAVE BEEN CALCULATED FROM THE COLLAR.
4. KERB LEVEL SHOWN ON THE SECTION IS ADJACENT TO THE ROUTE OF THE PROPOSED SEWER.
5. ALL PRODUCTS AND MATERIALS TO BE SELECTED FROM THE HWC APPROVED PRODUCTS AND MATERIALS REGISTER.
6. ALL PROPERTY CONNECTIONS TO BE LOCATED 1.0M FROM THE DOWNSTREAM BOUNDARY UNLESS OTHERWISE INDICATED. ALL CONNECTIONS TO BE BURIED INTERFACE METHOD IN ACCORDANCE WITH SEW-1105 AND SEW-1107-V WITH:
   - VERTICAL RISER WHERE SEWER DEPTH >1.5M
   - MARKER TAPE (NON-DETECTABLE) LAID RAISED TO THE SURFACE AT EACH JUNCTION
7. LAY PIPE IN ACCORDANCE WITH SUPPORT TYPE AS SHOWN ON LONG SECTION AND SEW-1251-H STANDARD TRENCH DETAILS.
8. CONSTRUCT ALL MAINTENANCE HOLES IN ACCORDANCE WITH:
   - LONG SECTION LEVELS
   - SEW-1300-V TYPE P1 OR TYPE P2 AS SHOWN IN LONG SECTION
   - ALL COMPONENT JOINTS TO BE SEALED AS PER SEW-1300-V NOTE 11
   - SEW-1302-V PIPE CONNECTIONS
   - SEW-1303-V CHANNEL LEVELS
   - SEW 1304-V / SEW-1305-V CHANNEL ARRANGEMENTS
   - SEW-1308-V COVER ARRANGEMENTS
9. FILL IN THE VICINITY OF THE PROPOSED SEWERMAIN IS TO BE PLACED PRIOR TO PIPELAYING AND IS TO BE PLACED IN LAYERS NOT EXCEEDING 200mm THICKNESS AND COMPACT EACH LAYER TO NOT LESS THAN 95% OF IT'S STANDARD MAXIMUM DRY DENSITY

SEWER PIPE DATA

PIPE SIZE (mm)	PIPE TYPE	LENGTH (m)	NO. MAINTENANCE STRUCTURES
225	UPVC-SN8	1725.0	15
150	UPVC-SN8	928.57	12
	BRANCHES	25.35	
	TOTAL	2678.92	27

MAINTENANCE SHAFTS

MAINTENANCE SHAFT NO.	LINE NO.	INLET GRADE	OUTLET GRADE	HORIZONTAL BEND
MS750	1	7.91%	5.42%	180°
MS751	1	4.59%	7.91%	163°
MS752	1	4.25%	4.59%	167°
MS753	1	4.72%	2.96%	191°
MS754	1	6.09%	4.72%	180°
MS755	1	1.00%	6.24%	180°
MS756	2	0.60%	0.61%	183°
MS757	2	0.60%	0.60%	260°
MS758	2	1.35%	1.32%	90°
MS759	2	8.70%	1.35%	264°
MS760	2	7.91%	8.70%	174°
MS761	2	1.49%	1.17%	173°

CONTRACTOR TO USE SMARTSTREAM THROUGH VINIDEX OR SIMILAR PRODUCT
ALL ANGLES ARE MEASURED CLOCKWISE FROM DS OUTLET

ORIGIN OF LEVELS

PM/SSM/BM No. 214.18 RL 28.87 AHD
SCALE PLAN 1:1000

CONSTRUCTION ISSUE

No.	REVISION DETAILS	DWN	DATE
0	CONSTRUCTION ISSUE	EC	26.10.12
A	ORIGINAL ISSUE	EC	7.8.12

CONSULTANT DETAILS:
RPS Australia East Pty Ltd
ABN 44 140 292 762
Newcastle Office
Ground Floor, 241 Denison Street
Broadmeadow, NSW Australia 2292
PO Box 428, Hamilton, NSW Australia 2303
T +61 2 4940 4200 F +61 2 4961 6794
E newcastle@rpsgroup.com.au W rpsgroup.com.au

CONSULTANT REFERENCE No. 113229-4B-3

DESIGNED: IM	DATE: 7.8.12	COMPANY: RPS	
DRAWN: EC	DATE: 9.8.12	COMPANY: RPS	
CHECKED: RP	DATE: 14.9.12	COMPANY: RPS	
APPROVED: IM	DATE: 26.10.12	COMPANY: RPS	

TITLE: S09-1553

PROPOSED STAGE 1 RETICULATION SEWERMAINS
ELDERSLIE ROAD BRANXTON

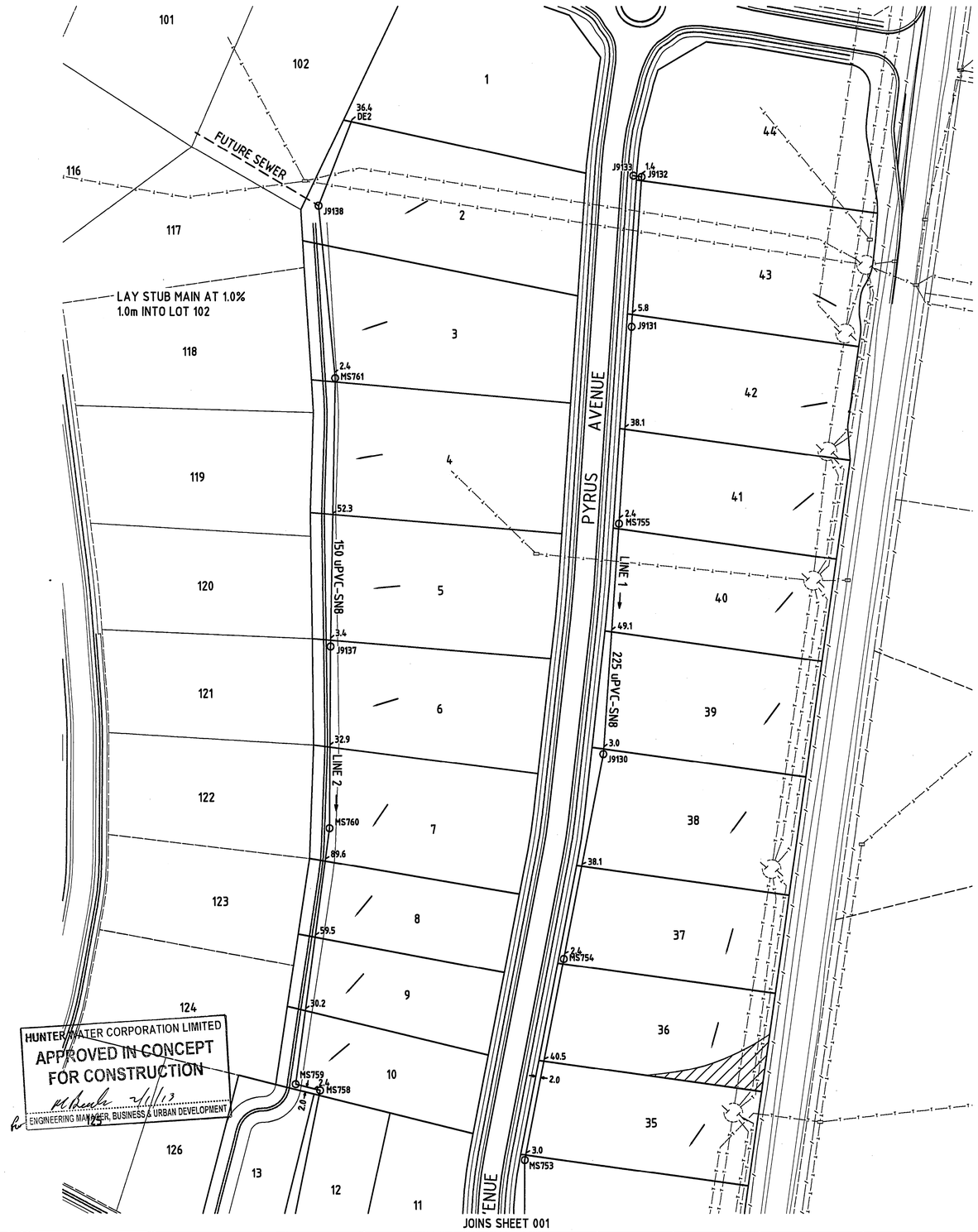
I. Murphy 27/11/2012

SIZE	SCALE	INDEX No.	DRAWING No.	SHEET	REV No.
A1	1:1000	67062		001	0

DIAL 1100 BEFORE YOU DIG

A1 1:1000 ON ORIGINAL 0 10 20 30 40 50m

LOT	SURFACE LEVEL	PROPERTY CONNECTION IL	SEWERMAIN LEVEL	RISER HEIGHT
24	36.34	34.840	31.780	3.060
23	34.75	33.250	32.270	0.980
25	37.00	35.500	35.165	0.335
26	37.25	37.250	36.010	0.000
27	39.40	38.520	38.520	0.000
28	41.45	40.715	40.715	0.000
29	44.10	42.840	42.840	0.000
30	45.15	43.880	43.880	0.000
31	46.35	45.150	45.150	0.000
32	48.45	47.325	47.325	0.000
33	50.25	49.085	49.085	0.000
34	51.20	50.180	50.180	0.000
35	52.20	51.365	51.365	0.000
36	54.35	53.135	53.135	0.000
37	56.40	55.175	55.175	0.000
38	58.30	57.425	57.425	0.000
39	61.50	60.250	60.250	0.000
40	65.00	63.500	63.130	0.370
41	67.80	66.300	65.695	0.605
42	68.45	66.950	66.050	0.900
43	68.00	66.445	65.085	1.415
44	66.790	65.620	65.620	0.000
22	34.50	33.120	33.120	0.000
21	35.40	33.900	33.375	0.525
20	36.30	34.800	33.555	1.245
19	37.14	35.640	33.715	1.925
18	38.30	37.020	37.020	0.000
17	41.49	40.340	40.340	0.000
16	43.07	41.990	41.990	0.000
15	39.77	38.395	38.395	0.000
11	47.25	46.480	46.480	0.000
13	45.100	43.650	43.650	0.000
12	46.00	44.500	43.575	0.925
10	46.97	45.470	44.525	0.945
9	47.90	47.525	47.525	0.000
8	50.70	50.220	50.220	0.000
7	53.80	52.990	52.990	0.000
6	58.35	56.850	56.320	0.530
5	60.20	58.945	58.945	0.000
4	61.00	59.520	59.520	0.000
3	61.50	60.285	60.285	0.000
2	61.980	61.000	61.000	0.000
1	65.330	65.620	65.620	0.000



HUNTER WATER CORPORATION LIMITED
APPROVED IN CONCEPT FOR CONSTRUCTION
ENGINEERING MANAGER, BUSINESS & URBAN DEVELOPMENT

NOTES:

1. WORKS MUST BE CONSTRUCTED IN ACCORDANCE WITH THE DESIGN DRAWINGS, CONSTRUCTION NOTES, WSA 02 HWC EDITION PART 3 - CONSTRUCTION AND WSA 02 HWC EDITION STANDARDS DRAWINGS.
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   - SEW-1308-V COVER ARRANGEMENTS
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ORIGIN OF LEVELS
PM/~~SSM/BM No.~~ 214.18 RL 28.87 AHD
SCALE
PLAN 1:1000

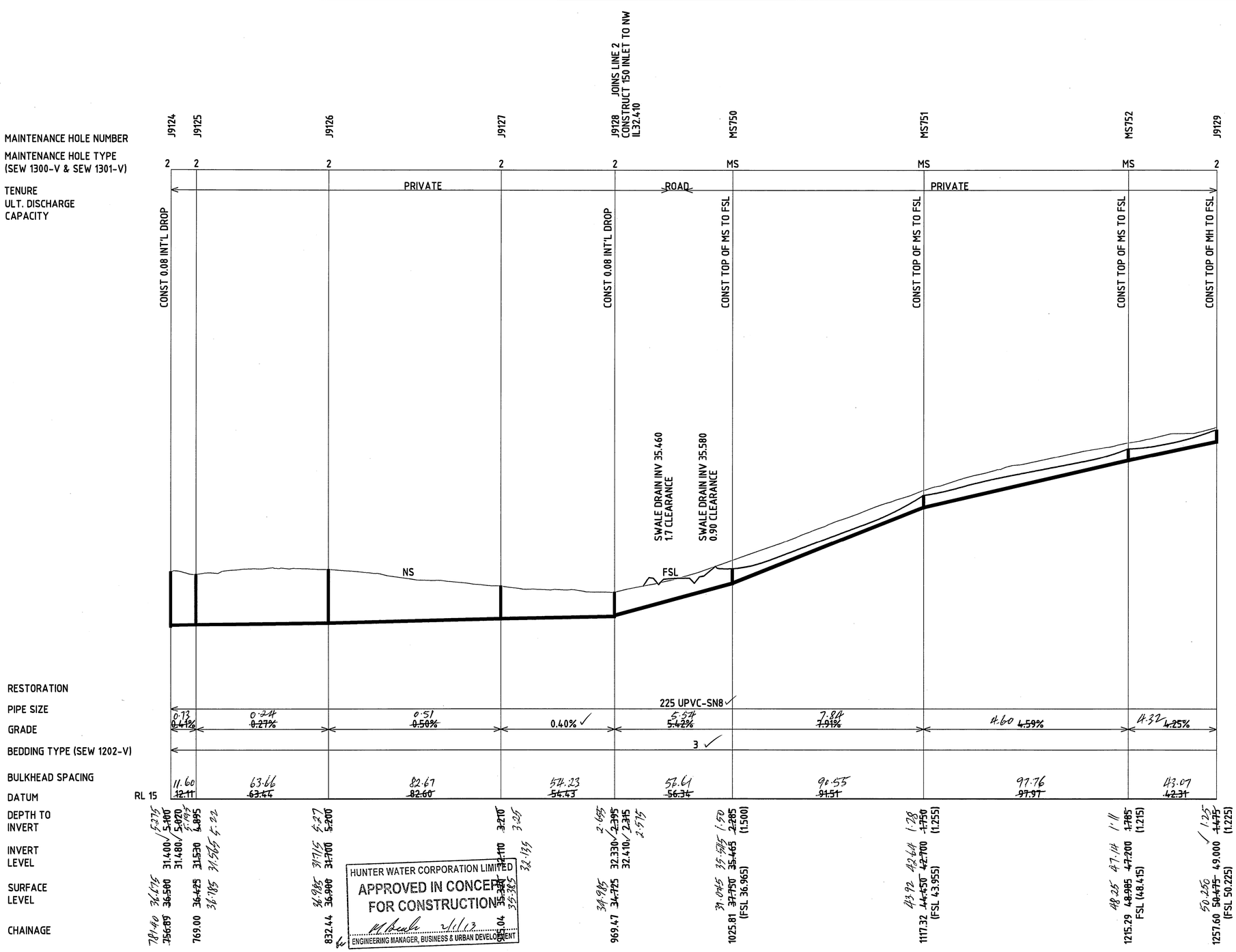
CONSTRUCTION ISSUE

No.	REVISION DETAILS	DWN	DATE
0	CONSTRUCTION ISSUE	EC	26.10.12
A	ORIGINAL ISSUE	EC	7.8.12

CONSULTANT DETAILS:
RPS Australia East Pty Ltd
ABN 44 140 292 762
Newcastle Office
Ground Floor, 241 Denison Street
Broadmeadow, NSW Australia 2292
PO Box 428, Hamilton, NSW Australia 2303
T +61 2 4940 4200 F +61 2 4961 6794
E newcastle@rpsgroup.com.au W rpsgroup.com.au
CONSULTANT REFERENCE No. 113229-4B-4

DESIGNED: IM	DATE: 7.8.12	COMPANY: RPS	TITLE: S09-1553	
DRAWN: EC	DATE: 9.7.12	COMPANY: RPS	PROPOSED STAGE 1 RETICULATION SEWERMAINS ELDERSLIE ROAD BRANXTON	
CHECKED: RP	DATE: 14.9.12	COMPANY: RPS		
APPROVED: IM	DATE: 26.10.12	COMPANY: RPS	SIZE: A1 / SCALE: 1:1000 / INDEX No. 67062 / DRAWING No. / SHEET 002 / REV No. 0	

27/11/2012



DIAL 1100 BEFORE YOU DIG

A1 1:1000 ON ORIGINAL 0 10 20 30 40 50m

A1 1:200 ON ORIGINAL 0 2 4 6 8 10m

NOTES:

1. WORKS MUST BE CONSTRUCTED IN ACCORDANCE WITH THE DESIGN DRAWINGS, CONSTRUCTION NOTES, WSA 02 HWC EDITION PART 3 - CONSTRUCTION AND WSA 02 HWC EDITION STANDARDS DRAWINGS.
2. THE CONSTRUCTOR IS TO VERIFY THE POSITIONS AND LEVELS OF ALL EXISTING AND PROPOSED BOUNDARIES, SERVICES, PIPES, CABLES AND CONDUITS.
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   - VERTICAL RISER WHERE SEWER DEPTH >1.5M
   - MARKER TAPE (NON-DETECTABLE) LAID RAISED TO THE SURFACE AT EACH JUNCTION
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   - SEW-1300-V TYPE P1 OR TYPE P2 AS SHOWN IN LONG SECTION
   - ALL COMPONENT JOINTS TO BE SEALED AS PER SEW-1300-V NOTE 11
   - SEW-1302-V PIPE CONNECTIONS
   - SEW-1303-V CHANNEL LEVELS
   - SEW 1304-V / SEW-1305-V CHANNEL ARRANGEMENTS
   - SEW-1308-V COVER ARRANGEMENTS
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ORIGIN OF LEVELS

PM/SSM/BM No. 21418 RL 28.87 AHD

SCALE
HORIZONTAL 1:1000
VERTICAL 1:200

CONSTRUCTION ISSUE

HUNTER WATER CORPORATION LIMITED
APPROVED IN CONCEPT FOR CONSTRUCTION
for ENGINEERING MANAGER, BUSINESS & URBAN DEVELOPMENT

LINE X N27472

Total Survey 1891.08m
Branches 33.1m

No.	REVISION DETAILS	DWN	DATE
0	CONSTRUCTION ISSUE	EC	26.10.12
A	ORIGINAL ISSUE	EC	08.08.12

CONSULTANT DETAILS:
RPS Australia East Pty Ltd
ABN 44 140 292 762
Newcastle Office
Ground Floor, 241 Denison Street
Broadmeadow, NSW Australia 2292
PO Box 428, Hamilton, NSW Australia 2303
T +61 2 4940 4200 F +61 2 4961 6794
E newcastle@rpsgroup.com.au W rpsgroup.com.au

CONSULTANT REFERENCE No. 113229-5B

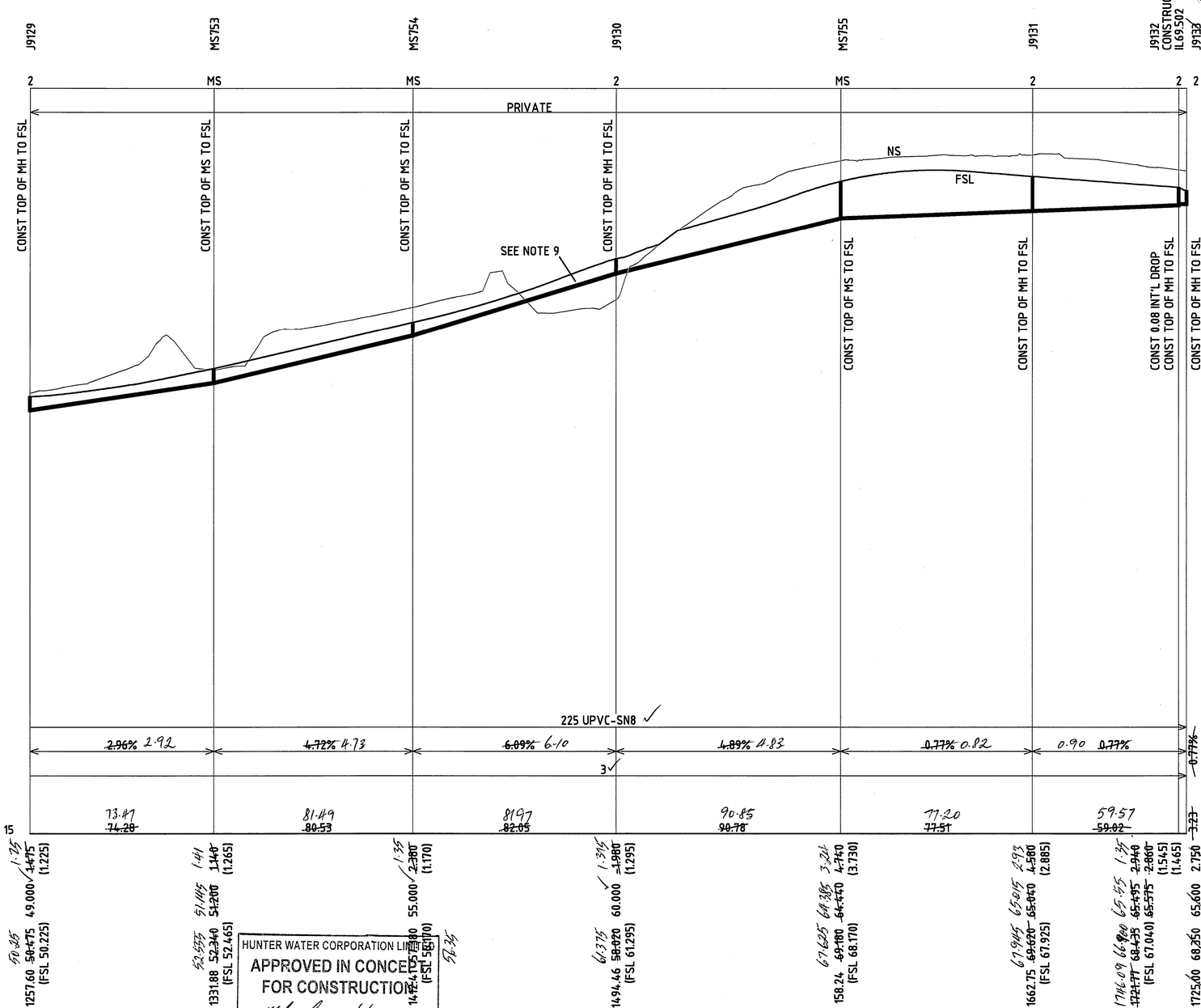
DESIGNED: IM	DATE: 10.8.12	COMPANY: RPS	
DRAWN: EC	DATE: 13.8.12	COMPANY: RPS	
CHECKED: RP	DATE: 14.9.12	COMPANY: RPS	
APPROVED: IM	DATE:	COMPANY: RPS	

TITLE: S09-1553

PROPOSED STAGE 1 RETICULATION SEWERMAINS
ELDERSLIE ROAD BRANXTON

I. Murphy 27/11/2012

SIZE	SCALE	INDEX No.	DRAWING No.	SHEET	REV No.
A1	1:1000/1:200	67062		003	0



LINE N27472

DIAL 1100 BEFORE YOU DIG

A1 1:1000 ON ORIGINAL 0 10 20 30 40 50m

A1 1:200 ON ORIGINAL 0 2 4 6 8 10m

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ORIGIN OF LEVELS
PM/SSM/BM No. 21618 RL 28.87 AHD
SCALE
HORIZONTAL 1:1000
VERTICAL 1:200

CONSTRUCTION ISSUE

No.	REVISION DETAILS	DWN	DATE
0	CONSTRUCTION ISSUE	EC	26.10.12
A	ORIGINAL ISSUE	EC	08.08.12

CONSULTANT DETAILS:
RPS Australia East Pty Ltd
ABN 44 140 292 762
Newcastle Office
Ground Floor, 241 Denison Street
Broadmeadow, NSW Australia 2292
PO Box 428, Hamilton, NSW Australia 2303
T +61 2 4940 4200 F +61 2 4961 6794
E newcastle@rpsgroup.com.au W rpsgroup.com.au

CONSULTANT REFERENCE No. 113229-5B

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	IM	10.8.12	RPS
	DRAWN: EC	DATE: 13.8.12	COMPANY: RPS
	CHECKED: RP	DATE: 14.9.12	COMPANY: RPS
	APPROVED: IM	DATE: 26.10.12	COMPANY: RPS

TITLE: S09-1553

PROPOSED STAGE 1 RETICULATION SEWERMAINS
ELDERSLIE ROAD BRANXTON

I. Murphy 27/11/2012

SIZE:	SCALE:	INDEX No.	DRAWING No.	SHEET	REV No.
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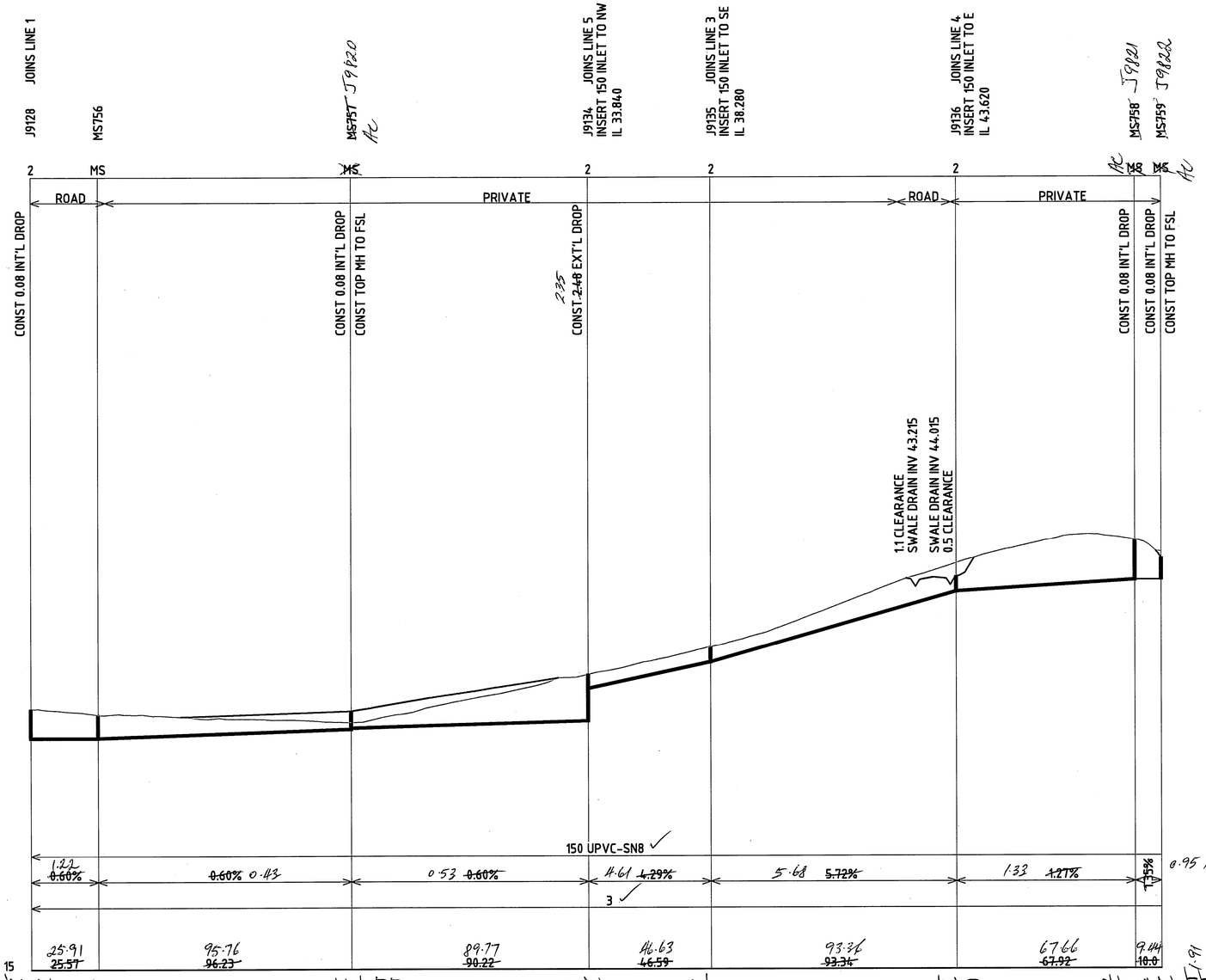

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M.Banks 5/11/13
for ENGINEERING MANAGER, BUSINESS & URBAN DEVELOPMENT

LINE 8 N27473

DIAL 1100 BEFORE YOU DIG

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A1 1:200 ON ORIGINAL 0 2 4 6 8 10m

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PROPOSED STAGE 1 RETICULATION SEWERMAINS
ELDERSLIE ROAD BRANXTON

I. Murphy 27/11/2012

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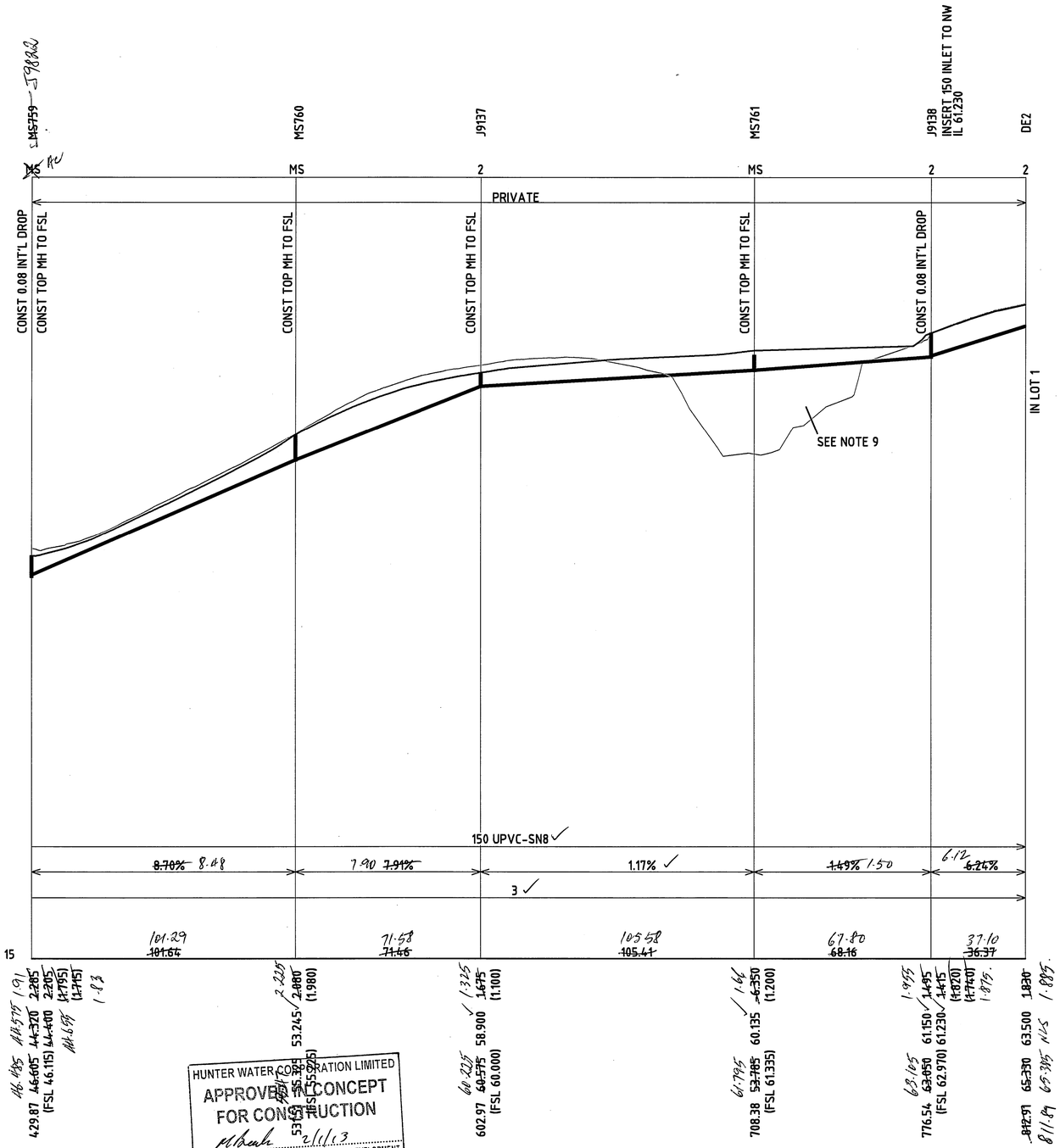

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PROPOSED STAGE 1 RETICULATION SEWERMAINS
RADFORD PARK ELDERSLIE ROAD BRANXTON

I. Mufty 27/11/2012

SIZE	SCALE	INDEX No.	DRAWING No.	SHEET	REV No.
A1	1:1000/1:200	67062		006	0

	LINE 3	LINE 4	LINE 5
	JOINS LINE 2	JOINS LINE 2	JOINS LINE 2
MAINTENANCE HOLE NUMBER	J9134 / J9138 / DE3	J9135 / DE4	J9133 / DE5
MAINTENANCE HOLE TYPE (SEW 1300-V & SEW 1301-V)	EX 2 2	EX 2	EX 2
TENURE	PRIVATE	PRIVATE	PRIVATE
ULT. DISCHARGE CAPACITY	CONST 0.08 INT'L DROP	CONST TOP MH TO FSL	CONST 0.08 INT'L DROP
RESTORATION			
PIPE SIZE	150 UPVC-SN8 ✓	150 UPVC-SN8 ✓	150 UPVC-SN8 ✓
GRADE	5.85 ~~5.21%~~ / 4.31 ~~4.45%~~	9.52 ~~10.02%~~	~~0.79%~~ 0.54
BEDDING TYPE (SEW 1202-V)	3 ✓	3 ✓	3 ✓
BULKHEAD SPACING	34.19 ~~38.39~~ / 39.72 ~~38.45~~	38.50 ~~29.33~~	9.49 ~~9.49~~ 10.10
DATUM	RL 15	RL 15	RL 15
DEPTH TO INVERT	1.37 ~~1.360~~ / 1.11 ~~1.170~~ / 1.03 ~~1.090~~ / 1.150 ~~1.185~~	1.45 ~~2.420~~ (1.400) / 1.275 (0.750) / 0.685	3.77 / 3.69 ~~3.745~~ / 3.665 / 3.415
INVERT LEVEL	38.200 ✓ ~~38.190~~ / 40.200 ✓ ~~40.280~~ / 41.990 NLS	~~43.595~~ 43.545 (FSL 44.940) / 46.410 NLS	33.70 / 33.78 ~~33.680~~ / ~~33.760~~ / 33.835 NLS
SURFACE LEVEL	39.57 ~~39.560~~ / 41.31 ~~41.370~~ / ~~43.175~~ ~~43.140~~	~~47.095~~ 47.085 (FSL 47.160)	37.47 ~~37.425~~ / 37.250 NLS
CHAINAGE	0.00 / 38.39 / ~~73.72~~ ~~76.85~~	0.00 / 29.33	0.00 / 9.49

LINE 3 N27474

LINE 4 N27475

LINE 5 N27476.

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PROPOSED STAGE 1 RETICULATION SEWERMAINS
ELDERSLIE ROAD BRANXTON

I. M 27/11/2012

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Cameron Black

From: Barry Calderwood <barry.calderwood@hunterwater.com.au>
Sent: Tuesday, 13 March 2018 9:38 AM
To: Cameron Black
Subject: 2009-1553 Radford Park Meeting Minutes
Attachments: 2009-1553 8 Consultant Report - Elderslie Road Sewer Servicing Strategy April 2012.pdf; SKM_C25818022217340.pdf

Hi Cameron

Wes has provided advice on Branxton 2 WWPS.
Let me know if you need more

Regards

Barry Calderwood
Account Manager Major Development | Hunter Water Corporation
36 Honeysuckle Drive Newcastle NSW 2300 | PO BOX 5171 HRMC NSW 2310
T 02 4979 9721 | **F** 02 4979 9711 | Twitter: @hunterwater
barry.calderwood@hunterwater.com.au | hunterwater.com.au

From: Wesley Jones
Sent: Monday, 12 March 2018 2:00 PM
To: Barry Calderwood <barry.calderwood@hunterwater.com.au>
Subject: FW: 2009-1533 Radford Park Meeting Minutes

Hi Barry,

East Branxton 1 (formerly Branxton 2) WWPS has a pump capacity of 55 L/s and currently receives 53.7 L/s of gravity flow. As identified in the previous strategy, upgrades of this station are to be investigated for connection of future stages.

Catchment	WWPS		
Please Select a Catchment	*Please Select a WWPS*		2017 Connection ET
BRANXTON	EAST BRANXTON 1 (PREVIOUSLY BRANXTON 2)		Gravity Catchment ADWF (L/s)
Pumping Capacity			Cumulative Upstream ADWF (L/s)
SS-EBR-001-PS1 (Previously SSBRA186)	Capacity (L/s)	Head (m)	Gravity Catchment PWWF (L/s)
Single Duty Pump Capacity	55.0	32.0	Total Upstream Pumped Flow (L/s)
Duty + Assist	N/A	N/A	Design PWWF (L/s)
Flip-flop from PLC - pumps can run together			Upstream WWPS
			Downstream Station

Regards,

Wesley Jones
Development Services Engineer | Hunter Water Corporation

36 Honeysuckle Drive Newcastle NSW 2300 | PO BOX 5171 HRMC NSW 2310
T 02 4979 9676 | Twitter: @hunterwater
wesley.jones@hunterwater.com.au | hunterwater.com.au

From: cameronb@adwjohnson.com.au [mailto:cameronb@adwjohnson.com.au]
Sent: Monday, 12 March 2018 10:20 AM
To: Wesley Jones <wesley.jones@hunterwater.com.au>; Barry Calderwood <barry.calderwood@hunterwater.com.au>
Cc: Andrew Williams <awilliams@adwjohnson.com.au>; Nick Andrews <nicka@adwjohnson.com.au>
Subject: 2009-1533 Radford Park Meeting Minutes

Barry,

Thank you for meeting with me last week regarding possible amendments to the current wastewater strategy guiding development of the Radford park estate in Branxton.
For your reference I have attached the current approved wastewater strategy and a sketch indicating the inclusion of the land to the west and the relocation of the proposed WWPS.

My records from the meeting with regard to the discussions are below for your records.

1. Developer owns the land immediately to the west of the current development site and will be applying to have the adjacent land rezoned for large lot residential.
2. Developer has held preliminary meetings with Council regarding the rezoning and Council are on board and have provided their "in principal" approval to proceed with the rezoning application.
3. The neighbouring land has an area that is lower in elevation than the current approved development area.
4. Rather than construct the WWPS in the location as approved within the attached strategy, the proponent is seeking to construct the required WWPS at the lowest point of the neighbouring land to maximise the WWPS future catchment area.
5. To facilitate the relocation of the WWPS to the neighbouring land HWC will require an update to the current wastewater strategy.
6. The updated strategy should:
    a. Account for any other potential land rezoings and future residential development within the new WWPS catchment area
    b. Cater for the larger catchment area when sizing the new WWPS and rising main
    c. Consider the impacts downstream of the increased catchment area
    d. Consider how the WWPS will be staged to cater for gradual growth in its catchment
7. HWC would advise current capacity of downstream sewerage system including Branxton 2 WWPS capacity.

ACTIONS:

a. HWC Advise capacity of Branxton 2 WWPS
b. ADW Johnson to submit updated wastewater strategy accounting for the proposed new WWPS location and larger catchment area for approval by HWC.

Regards,

Cameron Black
SENIOR ENGINEER
Hunter Office
02 4978 5143
0412 552 835
Email : cameronb@adwjohnson.com.au
Website: www.adwjohnson.com.au

ADW Johnson Pty Limited

SYDNEY	Level 35 One International Towers, 100 Barangaroo Avenue, Sydney NSW 2000	**Ph.** 02 8046 7411
CENTRAL COAST	5 Pioneer Avenue, Tuggerah NSW 2259	**Ph.** 02 4305 4300
HUNTER	7/335 Hillsborough Road, Warners Bay NSW 2282	**Ph.** 02 4978 5100

Cameron Black

From: Chris Barker <chris.barker@hunterwater.com.au>
Sent: Friday, 16 March 2018 10:31 AM
To: Cameron Black
Cc: Barry Calderwood; Wesley Jones
Subject: Radford Park

Hi Cameron,

I've reviewed Huntlee strategy and the required first stage of works has been completed between Greta up to the Huntlee site. Following this stage it appears that adequate capacity has been allowed for in the Branxton area prior to the next upgrade being required, so these upgrades shouldn't restrict the development of Branxton. If development occurs faster than forecast in the strategy then there is the ability to bring forward future stages of the works.

We have also assessed East Maitland 1 WWPS (formerly Branxton 2 WWPS). Hunter Water will be undertaking regional upgrades of this station to support growth in this area of the network as it's required.

If you have any question or need further clarification then please let me know.

Chris Barker
Team Leader Development Planning and Relations | Hunter Water Corporation
36 Honeysuckle Drive Newcastle NSW 2300 | PO BOX 5171 HRMC NSW 2310
T 02 4979 9564 | Twitter: @hunterwater
chris.barker@hunterwater.com.au | hunterwater.com.au

EAST BRANXTON 1 (BRNXTN 2)
(SS-EBR-001-PS1)

BRANXTON 1
(SS-BRA-001-PS1)

Appendix F

HYDER STRATEGY

BELFORD LAND CORPORATION

ELDERSLIE ROAD

SEWERAGE INFRASTRUCTURE

SERVICING STRATEGY

Hyder Consulting Pty Ltd
ABN 76 104 485 289
Level 16, 31 Queen Street
Melbourne VIC 3000
Australia
Tel: +61 3 8623 4000
Fax: +61 3 8623 4111
www.hyderconsulting.com

BELFORD LAND CORPORATION

ELDERSLIE ROAD

SEWERAGE INFRASTRUCTURE

SERVICING STRATEGY

Author	Simon Engelsen	
Checker	Muhammad Amjad	
Approver	Simon Engelsen	

Report No F0002-AA004390-AAR-03

Date 18 April 2012

EXECUTIVE SUMMARY

DEVELOPMENT BACKGROUND

The existing site is located at Elderslie Road, Branxton and is currently used as rural residential. The site covers approximately 74 hectares with the site bordered by Elderslie Road to the East, Lot 1 DP1124566 and Lot 21 DP861508 to the South, Lot 120 DP628166 and Lot 111 DP850244 to the North, and Lot 1 DP1124566 to the west as shown in Exhibit A. The existing site is planned for 166 developable lots.

The Branxton Area contains 10 adjoining areas that include 449 lots of potential developable land. This includes land south of the proposed development with 5 lots, 18 lots on the Eastern side of Elderslie Road, 56 lots to the North of the development and 100 lots to the East of the development.

The proposed development is proposed to be undertaken in six stages with construction commencing in 2012 and finalising in 2016.

The development and demand that will be established by the proposed six stages is as per the following table:

Stage	Number of Lots	Average Dry Weather Flow (ADWF)	Peak Dry Weather Flow (PDWF)	Peak Wet Weather Flow (PWWF)
Grey (2012)	40	0.44 L/s	1.68 L/s	4.00 L/s
Cyan (2013)	69	0.76 L/s	2.63 L/s	6.64 L/s
Yellow (2014)	99	1.09 L/s	3.55 L/s	9.30 L/s
Purple (2015)	112	1.42 L/s	3.94 L/s	10.43 L/s
Green (2015)	140	2.54 L/s	4.75 L/s	12.87 L/s
Blue (2016)	166	1.83 L/s	5.65 L/s	15.10 L/s

Table 1 Proposed Development Staging and Timing

RECOMMENDED SERVICING OPTION

The sewer water strategy for the Elderslie Road, Branxton development identified three possible options to service the development. The three options with recommendations are described below:

Option Description	Cost Effective Analysis	Pros	Cons	Risks	Option Recommendation
1. Transfer Main and Reticulation main.	$2.19M PV	Minimal maintenance. Lower cost.	Sewerage discharge for full land development cannot be achieved.	Northern areas of land development not being able to discharge to Branxton 2 WWPS.	Option discarded.
2. Transfer Main, Reticulation main, pump station and rising main.	$3.11M PV	Services whole development and adjacent developments. Sewerage discharge to Branxton 2 WWPS is achieved to service developments.	Higher present value cost. Operation and maintenance of PS required.	Availability of capacity at Branxton 2 WWPS.	Recommended Option
3. Transfer Main, Reticulation main, pump station and rising main.	$2.24M PV	Lower cost.	Sewerage discharge for adjacent developments to North (56 lots) and West (100 Lots) are not serviced. Operation and maintenance of PS required.	Availability of capacity at Branxton 2 WWPS.	Option discarded

Table 2 Option Summary

PROPOSED WORKS

The Elderslie Road, Branxton development will require the following infrastructure for the corresponding thresholds:

Stage	Threshold (ET's)	Peak Dry Weather Flow (PDWF)	Required Infrastructure
1) Grey (2012)	40	4.00 L/s	• 760m of 300mm Transfer Main • 1,417m of 150mm Reticulation Main • 348m of 300 mm Reticulation Main • 69m of 100mm Rising Main
2) Cyan (2013)	69	6.64 L/s	• 1,145m of 150 mm Reticulation Main • Pump Station (10m Head) • 788m of 100 mm Rising Main
3) Yellow (2014)	99	9.30 L/s	• 1,105m of 150mm Reticulation Main
Purple (2015)	112	10.43 L/s	• 543m of 150 mm Reticulation Main
Green (2015)	140	12.87 L/s	• 1,325m of 150mm Reticulation Main • 179m of 300mm Transfer Main
Blue (2016)	166	15.10 L/s	• 272m m of 225 mm Reticulation Main • 813m of 150mm Reticulation Main

Table 3 Infrastructure Staging

CONTENTS

1 BACKGROUND

1.1 Development Description

The site is currently used as rural residential and covers approximately 74 hectares. The proposed development consists of the subdivision of the site into residential lots with an average area of 4000m^2.

The site area is comprised of the following lots:

- Lot 13 DP595347
- Lot 22 DP861508
- Lot 140 DP619407
- Lot 121 DP628116

The site is bordered by Elderslie Road to the East, Lot 1 DP1124566 and Lot 21 DP861508 to the South, Lot 120 DP628166 and Lot 111 DP850244 to the North, and Lot 1 DP1124566 to the West as shown in Figure 1 below.

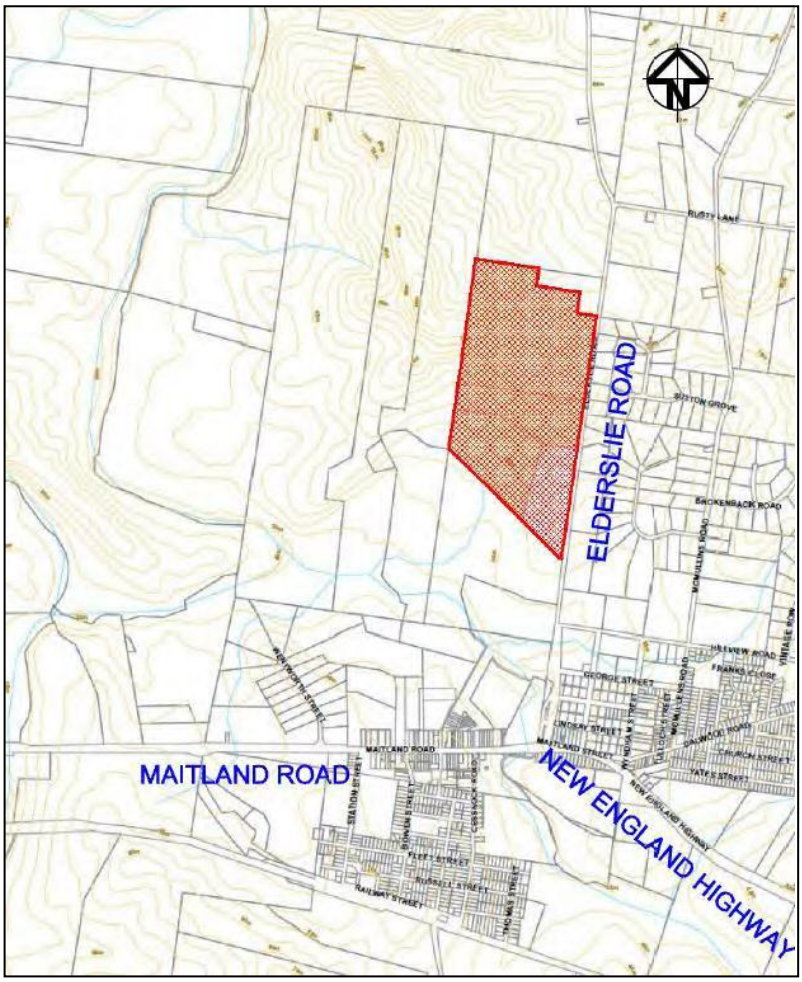


Figure 1 - Site Location

Staging and timing for the development will ultimately be determined by market conditions. It is anticipated that the development would progress based on the table below.

Stage	Threshold (ET's)	Peak Dry Weather Flow (PDWF)	Required Infrastructure
Grey (2012)	40	4.00 L/s	• 760m of 300mm Transfer Main • 1,417m of 150mm Reticulation Main • 348m of 300 mm Reticulation Main • 69m of 100mm Rising Main
Cyan (2013)	69	6.64 L/s	• 1,145m of 150 mm Reticulation Main • Pump Station (10m Head) • 788m of 100 mm Rising Main
Yellow (2014)	99	9.30 L/s	• 1,105m of 150mm Reticulation Main
Purple (2015)	112	10.43 L/s	• 543m of 150 mm Reticulation Main
Green (2015)	140	12.87 L/s	• 1,325m of 150mm Reticulation Main • 179m of 300mm Transfer Main
Blue (2016)	166	15.10 L/s	• 272m m of 225 mm Reticulation Main • 813m of 150mm Reticulation Main

Table 4 Proposed Development Staging and Timing

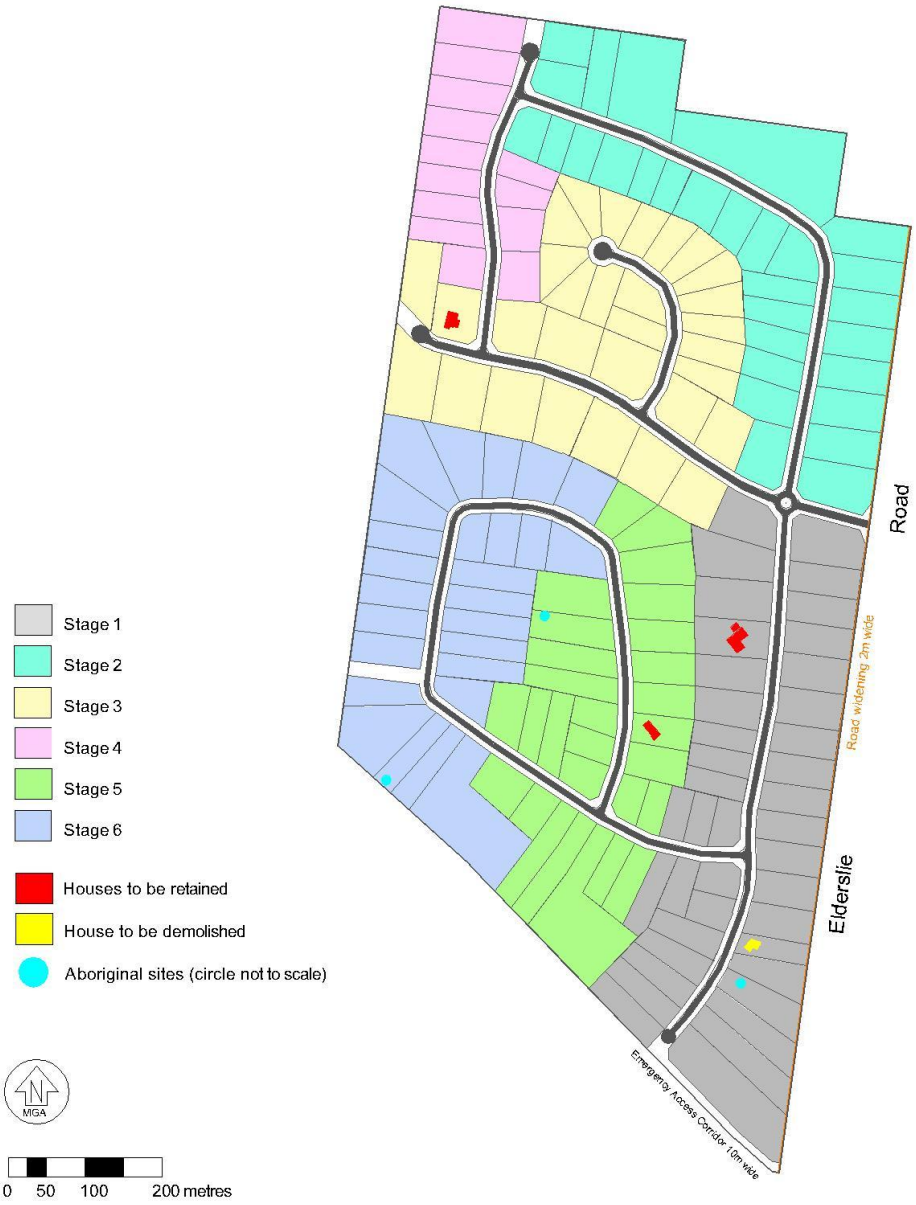


Figure 2 - Indicative Staging Plan

1.2 Planning Context

Current Planning

Planning for development within the area is described in the following documents:

1. Lower Hunter Regional Strategy (October 2006) prepared by the NSW Department of Planning.

2. Singleton Rural Residential Development Strategy (December 2004) prepared by ERM Australia for Singleton Council;

3. Singleton Land Use Strategy (April 2008) prepared by Planning Workshop Australia for Singleton Council;

The Lower Hunter Regional Strategy (LHRS) identifies future development areas, principal land use types, settlement patterns and conservation outcomes. The portion of Branxton located within the Cessnock LGA is within the boundaries of the strategy; however the subject site is located within the Singleton LGA and is not a part of the Strategy. The LHRS was adopted by the State Government and informed Council's planning direction in Branxton contained in the Land Use Strategy.

The Singleton Rural Residential Development Strategy (SRRDS) prepared for Council provides much of the basis for the rural residential component within the Singleton Land Use Strategy. It identified several candidate areas within Branxton that are suitable for rural residential development within the Singleton LGA. The Singleton Land Use Strategy (SLUS) builds upon this and establishes land supply requirements within the Singleton Council LGA for residential and rural residential development.

Local Planning Strategies

The Singleton Land Use Strategy has identified the subject site and a number adjacent to it as candidate sites for future rural residential development (refer Exhibit C).

The SLUS indicates that the following development may occur in the nominated candidate areas:

Branxton North West – Total area of 88 Ha in 7 existing lots (6 of which form the proposed development site). Maximum potential of approximately 189 'large lot residential' lots. Land adjoining to the South may have potential for rezoning to 'environmental living' to provide transition to agricultural lands (not included in Figure 4. Refer SKC008 on Appendix B).

Branxton North East – Total area of 41 Ha in 5 existing lots. Proposed zoning as 'large lot residential' with a maximum potential of 87 lots.

Branxton South West – Total area 8 Ha in 8 existing lots. Proposed zoning of 'large lot residential', with maximum potential for 17 lots.

Negotiations with Council

In addition to the lots identified above, input from Singleton Council was sought to identify any other additional lots that are currently subject to rezoning applications or may have potential to be developed in the next five to ten years. Advice received from Mr Gary Pearson, Singleton Council's Strategic Land Use Planner is included in Appendix A. This advice confirmed that the lots highlighted in Exhibit C (as identified in the SLUS) are a conservative assessment of potential future development within the area.

Future Lots under Consideration

In addition to the lots identified in the local planning strategies, adjacent lots are also under consideration for future development by the developer. The following lots are under consideration for development:

10 Acres: Lot 120 DP628116 to the North West -Total area of 4 Ha with development potential of 6 Lots.

Patton: Lot 11 DP850244 to the North West -Total area of 39 Ha with development potential of 50 Lots.

Stonehenge: Lot 1 DP1124566 to the West -Total area of 42 Ha with development potential of 50 Lots.

Vella: Lot 711 DP1066530 to the West -Total area of 59 Ha with development potential of 50 Lots.

1.3 Development Assumptions

Based on the current planning from council and the Singleton Land Use Strategy, the development will be located within the Branxton North West candidate area. This area includes for 189 “large lot” residential areas of which 166 are in the Elderslie Road, Branxton development.

A preliminary estimate of demand for lots is around 30 lots per year, but will be dictated by the market. Preliminary discussions with Hunter Water Corporation have indicated that access to water infrastructure should become available by 2014 once infrastructure upgrades in the area have been completed. This and market forces will dictate the release of land to the market.

The development is proposed in six stages as per the following table:

Stage	Number of Lots	Total Lots
Grey (2012)	40	40
Cyan (2013)	29	69
Yellow (2014)	30	99
Purple (2015)	13	112
Green (2015)	28	140
Blue (2016)	26	166

Table 5 Proposed Development Staging

1.4 Study Area

Study area

The proposed development in Branxton is shown in the figure below. The township of Branxton itself is located 18km north-west of Maitland and 22km south-east of Singleton and is within the Singleton Local Council area. Figure 1 shows the location of the study area.

Location in relation to Hunter Water's area of operations

The site is included in the Hunter Water Corporation's proposed service area extension as shown in the figure below. It is noted that the extension of the area does not necessarily guarantee that the land will be serviced by Hunter Water.

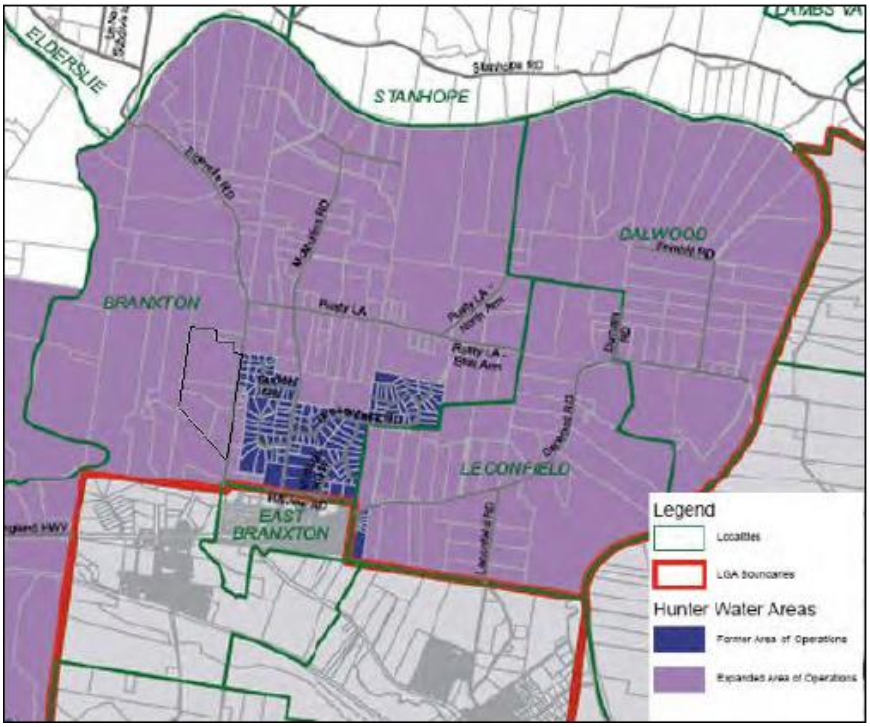


Figure 3 - Hunter Water Corporation Area of Operations

Significant natural features the development may impact or be impacted

The existing 74 ha site is currently used as a rural residential (hobby farm). The new development will be more urbanized and will therefore change the existing site conditions of the site including the removal of existing storage dams and the development of new stormwater detention basins.

Topographical considerations

The existing site contains seven major drainage catchments with contributing area of 0.91 ha from the Eastern side of Elderslie Road. The existing topographical catchments direct stormwater to existing farm dams.

The development of the site will comprise of minor reshaping for roads, stormwater detention basins and housing developments. This re-development will not alter the major topographical features of the site with stormwater flows continuing on their existing flow paths.

Significant infrastructure features that may impact or be impacted

The existing site does not contain any existing infrastructure that will be affected by the development of the 166 lot subdivision.

The development of the subdivision will comprise of sewerage reticulation services, a pump station and connection to the existing Branxton No. 2 Wastewater pumping station by a transfer main along Elderslie Road. In addition, the development will consist of potable water and drainage reticulation services.

Hunter Water has advised that there is available capacity in the Branxton No. 2 Wastewater pumping station.

Existing and past land use

The site is currently used as rural residential (hobby farm) and covers approximately 74 Ha. The site area is comprised of the following lots:

1. Lot 13 DP595347
2. Lot 22 DP861508
3. Lot 140 DP619407
4. Lot 121 DP628116

The site is bordered by Elderslie Road to the east, Lot 1 DP1124566, Lot 21 DP861508 to the south, Lot 120 DP628116 and Lot 111 DP850244 to the north, and Lot 1 DP1124566 to the west. Exhibit A shows the location of the subject site.

Current local population

In the 2006 Census there were 5,084 persons usually resident in the Branxton postal area (post code: 2335): 50.5% were males and 49.5% were females. Of the total population in the Branxton postal area 2.1% were Indigenous persons, compared with 2.3% Indigenous persons in Australia (http://www.censusdata.abs.gov.au/). At the time of the 2006 census, 1,926 private dwellings were located within the postal area: 1,675 were separate houses, 6 were semi-detached houses, 40 were flats or units and 24 were other dwellings. The local government area of Singleton has been growing 1.4% per annum between 2005 and 2010, with growth reaching 1.6% between 2009 and 2010 (ABS, 2011).

In the 2006 Census, the most common industries of employment for persons aged 15 years and over usually resident in the Branxton postal area were: Coal Mining 12.9%; School Education 3.2%; Cafes, Restaurants and Takeaway Food Services 3.1%; Accommodation 2.9% and Road Freight Transport 2.9%. 4.3% of the population responded that they were unemployed.

Social and environmental constraints associated with the Elderslie development site are discussed in sections 4.6 and 4.7, below.

Development area and average lot size

The proposed development covers approximately 74 Ha with average lot size of 4000 m^2.

1.5 Projected Development in the Study Area

The Singleton Land Use Strategy (SLUS) has identified the subject site and a number adjacent to it as candidate sites for future residential development. The SLUS indicates that the following development may occur in the nominated candidate areas listed in the table below and shown in Exhibit C.

Development Area	Development Description	Impact on the strategy	Mitigation Strategy Proposed
B & C	Branxton North West	Developments will increase demand on proposed transfer main connecting into Hunter Water's sewerage network.	Assessment of sewerage network to consider all areas that will require connection to the Branxton No. 2 WWPS. Hydraulic assessment of transfer main required to service the Branxton North West developments.
D	Branxton South West	No Impact	Not Applicable
E	Branxton North East	No Impact.	Not Applicable.
F	Branxton North West (10 Acres)	Development will increase demand on proposed transfer main connecting into Hunter Water's sewerage network.	Hydraulic assessment of transfer main required to service the 10 Acres development.
G	Patton	Development will increase demand on proposed transfer main connecting into Hunter Water's sewerage network.	Hydraulic assessment of transfer main required to service the Patton development..
H	Stonehenge	Development will increase demand on proposed transfer main connecting into Hunter Water's sewerage network.	Hydraulic assessment of transfer main required to service the Stonehenge development.
I	Vella	Development will increase demand on proposed transfer main connecting into Hunter Water's sewerage network.	Hydraulic assessment of transfer main required to service the Vella development.

Table 6 - Rural Residential Candidate Areas in Branxton

1.6 Liaison with Hunter Water

Hyder has held discussions with Hunter Water throughout the development of the preliminary strategy documentation and this current strategy document. Correspondence between Hyder and Hunter Water is attached in Appendix A.

1.7 Exhibits

The following exhibits are presented in Appendix B:

Exhibit A – Regional plan

Exhibit B – Local plan

Exhibit C – Zoning plan

Exhibit D – Environmental plan

Exhibit E – Sewerage servicing staging plan

Exhibit F – Sewerage infrastructure overlay on environmental features

Exhibit G – Sewerage infrastructure overlay on other infrastructure

2 OPTIONS DEVELOPMENT

2.1 Inception Meeting

Discussions were held with Hunter Water on the 4th of May 2011 for the Preliminary Sewerage Servicing strategy. The meeting discussed the following:

- Roles of the participants.
- Structure of the servicing strategy.
- Requirement for option analysis and hydraulic modelling.
- Connection points for the potable water and sewerage systems at the New England Highway.
- The existing options of a pumping station and connection to Branxton No. 2 WWPS.

2.2 Points of Connection and Available Capacity

Discussions with Hunter Water have indicated that the nominal connection point for the proposed development is the existing Branxton 2 Wastewater Pumping Station (WWPS) located at the junction of Elderslie Road with Lindsay Street.

Design for the sewer connection main from the site to the existing Branxton 2 WWPS in Elderslie Road would need to take into account the capacity required to service all developments that have the potential to be serviced from the same connection. A review of the relevant strategic planning documentation, combined with advice from Council's planners, indicates there are a number of potential developments that may utilise the same external connection main proposed for the subject development.

Development sites A (this development), B,C, F, G, H & I (Table 6) have the potential to connect to the same transfer sewerage main. Through hydraulic modelling (Refer to table 9, section 4.2.8 and Appendix G), the construction of a new 300mm distribution main will be sufficient to supply development within and the adjacent proposed development sites.

2.3 Existing and Planned Hunter Water Assets

The proposed development is located within the Branxton wastewater treatment works (WWTW) system. This system can be divided into four major sub-systems:

1. Greta sub-system
2. Branxton 1 Wastewater Pump System (WWPS) sub-system
3. Branxton 2 WWPS sub-system
4. Branxton 3 WWPS sub-system

The Greta sub-system is composed of a sewer gravity main that covers the suburb of Greta (east of Branxton WWTW) and the south-eastern portion of East Branxton. The gravity main discharges to Branxton 3 WWPS located adjacent of Branxton WWTW. Branxton 2 WWPS receives flow from a separate catchment that includes the Branxton 2 CEP system.

Branxton 1, 2 and 3 WWPS's discharge to the inlet works of Branxton Wastewater Treatment Plant via separate rising mains.

Advice from Hunter Water indicates that Branxton 2 WWPS has a duty capacity of 55L/s and 15.1L/s from the Branxton 2 CEP and gravity flows from some 294 ET. We have been advised that there is currently limited spare capacity at Branxton 2 WWPS, and considering other developments in the area, it is likely that an upgrade of Branxton 2 WWPS will be required to service the whole of the development. Hunter Water has identified that the need for a future upgrade of Branxton 2 WWPS to 87.5L/s. No expenditure has been allocated for this upgrade within the current Hunter Water price path.

2.4 Design Sewerage Loading

Based on the lots that have been identified with potential for future development, an estimate of the likely future increase demand has been produced.

A summary of the potential future increase in load rates at the proposed connection is given in Table 7.

Average Dry Weather Flow (ADWF)	Peak Dry Weather Flow (PDWF)	Peak Wet Weather Flow (PWWF)
3.81 L/s	13.02 L/s	33.00 L/s

Table 7 - Estimate of Future Increase Sewer Demands at Singleton Shire Council Area

Table 8 summarises a potential staged load increase for the proposed development.

Stage	Number of Lots	Average Dry Weather Flow (ADWF)	Peak Dry Weather Flow (PDWF)	Peak Wet Weather Flow (PWWF)
Grey (2012)	40	0.44 L/s	1.68 L/s	4.00 L/s
Cyan (2013)	69	0.76 L/s	2.63 L/s	6.64 L/s
Yellow (2014)	99	1.09 L/s	3.55 L/s	9.30 L/s
Purple (2015)	112	1.42 L/s	3.94 L/s	10.43 L/s
Green (2015)	140	2.54 L/s	4.75 L/s	12.87 L/s
Blue (2016)	166	1.83 L/s	5.65 L/s	15.10 L/s

Table 8 - Estimate of Development Future Sewer Demands

In addition to the subject site there are a number of other potential development sites adjacent to the proposed development. The number of potential new lots for these adjacent sites has been sourced from the Singleton Land Use Strategy (SLUS) and/or proportioned based on the estimates in the SLUS.

A summary of potential sewerage load rates is given in Table 9 below.

Development Site	Number of Lots	Average Dry Weather Flow (L/s)	Peak Dry Weather Flow (L/s)	Peak Wet Weather Flow (L/s)
A	166	1.83	5.65	15.10
B	18	0.20	0.79	1.84
C	5	0.06	0.22	0.51
D	18	0.19	0.75	1.73
E	87	0.96	3.19	8.24
F	6	0.07	0.26	0.61
G	50	0.55	2.02	4.92
H	50	0.55	2.02	4.92
I	50	0.55	2.02	4.92
A-I	449	4.96	16.92	42.97
A, B, C, F, G, H & I	345	3.81	13.02	32.82

Table 9 - Estimate of Development Future Water Demands

2.5 Option Assumptions

In the assessment of options, we have assumed the following:

- Development sites A (this development), B, C, F, G, H & I (Table 6) have the potential to connect to the same transfer sewerage main.
- Connection point to Hunter Water's network is Branxton 2 Wastewater Pumping Station (WWPS) located at the junction of Elderslie Road with Lindsay Street.
- Available capacity in the Branxton 2 Wastewater Pumping Station will be available at the time of development for the developments of 10 Acres, Patton, Stonehenge and Vella.
- Capital costs are based on Hunter Water's estimating spreadsheet.
- Energy prices are based on the Hunter Water document "Operating and Maintenance Cost Estimating Guideline".
- Greenhouse gas abatement emission factors and Maintenance/Operating Costs are based on the Hunter Water document "Operating and Maintenance Cost Estimating Guideline".

2.6 Progress Meeting 1

Following the inception meeting, it was agreed that progress meeting number 1 was not required.

3 SERVICING OPTIONS

3.1 Options Review

Hyder has considered the options for the servicing the sewerage network within the Elderslie Road development. The options to provide sewerage to the development are as follows:

- Option 1 - All developments connecting to the existing system at Branxton 2 WWPS (gravity only).
- Option 2 - All developments connecting to the existing system at Branxton 2 WWPS (internal pump station and rising main).
- Option 3 - Elderslie Road development connecting to the existing system at Branxton 2 WWPS (internal pump station and rising main). Remaining developments not provided with connection.

3.2 Option Constraints

3.2.1 Technical Constraints

The options identified will service the development with alternatives that include the provision of reticulation, a sewerage pumping station and an external transfer main. Technical constraints identified below are for the internal reticulation and the external transfer main.

Internal Reticulation

Existing surface levels on the site range between 34m and 83m. Hunter Water requires that the sewerage network be drained by gravity. In cases that the sewerage network is not able to drain by gravity, a sewerage pumping station and rising main will be required. The Hunter Water Sewer and Design Manual also states the minimum grades for the pipe system:

Diameter (mm)	Minimum Grade (%)
150	0.5
225	0.33
300	0.25

Table 10 Design Requirements

The catchment analysis based on the contours of the site has determined that the northern areas of the site will require a pump station to discharge to the proposed sewerage network (refer to section 4.8). The pump station is based at the lowpoint of the site to allow all areas of the site to be drained to the external transfer main.

The design of the reticulation network and pump station will progress in further detail in detailed design. The design will be in accordance with the Hunter Water Design Manual.

External Sewerage Connection

The nominal connection point for the proposed development is the Branxton 2 Wastewater Pumping Station (WWPS) located at the junction of Elderslie Road with Lindsay Street.

The design for the sewerage transfer main for the site to the existing pump station has taken into account the capacity required to service all developments. Based on the review of relevant strategic planning documentation, combined with advice received from Council's planners, indicates that there are a number of potential developments that may utilise the same external connection main proposed for the proposed development. It is proposed that a 300mm diameter pipe would be sufficient to discharge the sewerage flows for this development and the adjacent developments.

The adjacent Northern and Western developments of 10 Acres, Patton and approximate 40% of Stonehenge and Vella will require an additional pumping station to connect to the transfer main. The remaining component of Stonehenge and Vella will connect to the internal 225 mm distribution main. These developments will connect into the transfer main in addition to the Elderslie Road, Branxton development.

The design of the transfer main and pump station will progress in further detail in detailed design. The design will be in accordance with the Hunter Water Design Manual.

Options for Consideration

Option 1

Option 1 would include internal reticulation and the transfer main to the Branxton 2 WWPS. This option will provide service to the majority of the development. However, the internal reticulation will not provide discharge to the network for the northern part of the development. These areas will not be in accordance with the sewerage discharge requirements from Hunter Water.

Option 2

Option 2 will include internal reticulation, a pump station, rising main and the transfer main. This option will provide service to the whole development and the adjacent developments of "B", "C", "F", "G", "H" and "I". The inclusion of the pump station together with the internal reticulation will provide the required infrastructure for all areas within the development. These areas will be in accordance with the pipe grade requirements from the Hunter Water – Water and Sewer design manual.

Option 3

Option 3 will include internal reticulation, a pump station, rising main and the transfer main. This option will provide service to the whole development. However, it will not provide for the servicing of developments "F", "G", "H" and "I". The inclusion of the pump station together with the internal reticulation will provide the required infrastructure for all areas within the development. These areas will be in accordance with the pipe grade requirements from the Hunter Water – Water and Sewer design manual.

Options for further Progression

All options that have been considered are able to service the development. A desktop options review has been completed and is attached is Appendix C. The review process found that only option 2 was the only option able to provide a collection system to all areas of this and the adjacent development.

3.2.2 Option 2 has been considered further for community, environmental, social, financial and technical constraints. Community/Stakeholder Constraints

The following sections provide a summary of the existing social context of the Elderslie development site and summarises those issues that potentially represent social constraints on the options.

Social impacts associated with construction and operation of the strategy are discussed in Section 3.6.

Native title

A search of the Native Title Tribunal's application and determination areas map of 30 June 2011, showed that there are no Native Title applications or determinations applicable to the Elderslie development site (http://www.nntt.gov.au/Publications-And-Research/Maps-and-Spatial-Reports/Documents/Quarterly%20Maps/NSW_ACT_JBT_NTDA_Schedule.PDF). Notification of traditional owners of the land regarding the proposed development will not therefore be subject to the requirements of the Native Title (New South Wales) Act 1994.

Notification of registered Aboriginal parties for the proposed development should be undertaken in accordance with the Aboriginal Cultural Heritage Community Consultation Requirements for Proponents (2010). Cultural heritage of the site is discussed in Section 3.2.3.

Noise

The Elderslie development site is sparsely populated, with approximately six residences currently on the site. The site is currently largely used for grazing, which is unlikely to generate significant noise levels. The Singleton Local Environment Plan maps the surrounding land uses as rural and rural small holdings and would similarly not generate significant noise levels.

Visual amenity

The proposed water mains will be buried at a depth of approximately 2 metres and will therefore not be visible once installed. During construction there would be a moderate impact to the visual amenity of the site; however this impact would be short term and there are currently few residents with views of the development site.

When the pipes are operational, it will be necessary to maintain cleared access to their buried location to allow for maintenance and repairs as required. As the pipes will be installed along planned future road reserves that will require similar maintenance it is not anticipated that their operation will have an impact on visual amenity.

3.2.3 Environmental Constraints

The most significant difference between the options is the construction footprint required. The estimated construction footprints for each of the options are shown in Appendix C.

The following sections outline the existing environment at the Elderslie development site and summarise those issues that potentially represent environmental constraints to the options. Environmental impacts associated with construction and operation of the proposed strategy are discussed in Section 3.7.

Geology and soils

Geology of the Elderslie site is mapped as of the Dalwood group and consists:

- Pmb – mudstone, sandstone and conglomerate.
- Pmms – sandstone and conglomerate.
- Pmm – siltstone and sandstone.

The soils of the Elderslie development site are mapped as the Rothbury soil landscape (Kovak and Laurie (1991). Soils of the Rothbury soil landscape are characterised by red and yellow podzolic soils on upper slopes, yellow solodic or brown soloths on the lower slopes and prairie soils in the drainage lines. Table 11 contains a description of the topsoil and subsoil for each soil type occurring on the site and its erodibility potential.

Soil description	Topsoil	Subsoil	Erodibility
Red podzolic	Dark brown sandy loam or loam with weak structure. Overlies brown, fine sandy loam to clay loam A2 horizon, weak structure or massive. Depth to 30 cm.	Clear change to reddish brown medium clay with strung structure; faint brown mottles. Gradual change to a bright brown or reddish brown medium clay; strongly structured; red, yellow or grey mottling.	Topsoil: Low Subsoil: Moderate
Yellow podzolic	Dark brown sandy loam; single grained. Clear change to bleached dull brown sandy loam; loose at the top becoming massive with depth. Depth to 20 cm.	Clear change to bright reddish brown medium clay with strong structure. Becomes light clay with depth.	Topsoil: Low Subsoil: Moderate
Yellow solodic	Dull yellowish brown loamy sand; single grained. Clear change to dull yellowish brown light sandy clay loam; apedal; depth to 15 cm.	Clear change to dull yellow orange medium clay with strong structure;; smooth faced peds. Gradual change to a yellowish grey medium clay with strong structure.	Topsoil: High Subsoil: Moderate
Brown soloths	Brown sandy loam; single grained. Sharp change to bleached dull brown sandy loam; massive. Depth to 25 cm.	Sharp change to brown medium clay with strong structure.	Topsoil: Moderate Subsoil: High
Prarie soils	Dark brown silt loam with weak structure. Depth to 20 cm. With depth, grades into brownish black silty clay loam with moderate structure. Depth to 70 cm.	Gradual change to dark brown light clay with weak structure; rough faced peds. Depth to 150 cm. Gradual change to dull yellowish brown light medium clay with moderate structure.	Topsoil: Moderate Subsoil: Moderate

Table 11 - Soil types of the Elderslie development site

The Australian Soil Resource Information System shows the site as having an extremely low probability of acid sulphate soil, with no known occurrence in the area and is therefore not considered as risk to the project.

A search of the Office of Environment and Heritage's Contaminated Land Management Register identified two sites within Singleton Shire Council's LGA. Table 12

Site name & Lot on Plan(s)	Contaminants of concern	Distance from Elderslie development site
Putty Road Saw Mill Lot 18 DP 1037851	▪ Petroleum hydrocarbons ▪ Monocyclic aromatic hydrocarbons, including toluene, ethyl benzene and xylenes ▪ Polycyclic aromatic hydrocarbons ▪ Volatile chlorinated hydrocarbons ▪ Styrene ▪ Copper ▪ Zinc	75 km
Singleton Gas Works Lot 1 DP 81369 Lot 1 DP90228 SP48532	▪ Coal tar ▪ Petroleum hydrocarbons ▪ Benzene, toluene, ethylbenzene, xylene (BTEX) ▪ Polycyclic aromatic hydrocarbons (PAHs) ▪ Phenol ▪ Cyanide ▪ Ammonia	20 km

Table 12 - Sites on the Contaminated Lands Register

The distance of the Elderslie development site from the listed contaminated sites means that contamination from those sites would not have migrated to the Elderslie development site. The site is currently predominantly used for grazing. Key risks for site contamination associated with the operation of grazing properties include:

- The broad acre application of pesticides, for which contaminants of concern include arsenic and organochlorine pesticides (OCPs).
- The operation of a plunge dip, for which contaminants of concern include arsenic and OCPs.
- Underground fuel storage tanks, for which contaminants of concern include lead, petroleum hydrocarbons and monocyclic aromatic hydrocarbon.
- The presence of old buildings and sheds with asbestos containing material.

Flora and fauna

A search of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Protected Matters Search Tool (http://www.environment.gov.au/epbc/pmst/index.html) identified 13 threatened species, one threatened ecological community and fourteen migratory species as likely to occur within the site.

The threatened ecological community that may occur in the area is the White Box-yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, which is listed under the EPBC Act as critically endangered. More than 400 native plant species have been recorded within the community, the majority of which are grasses and herbs; hence the community can occur in the absence of trees. Ground layer species of the community include grasses, sedges, pea plants, daisies and lillies (DEH, 2006).

Vegetation mapping undertaken by the Hunter Catchment Management Authority (CMA) identifies the patches of vegetation along the eastern boundary for the site as Lower Hunter Spotted Gum – Ironbark Forest, and the small section of vegetation at the top of the drainage line as Central Hunter Ironbark – Spotted Gum – Grey Box Forest. A description of each community and their status under the Threatened Species Conservation Act 2003 is presented in Table 13. A calculation of the approximate clearing requirements has been included, based on the assumption that a 6 metre construction corridor would be required for installation of the water mains.

Community	Description	Status	Approximate clearing requirements (m2)
Lower Hunter Spotted Gum – Ironbark Forest	The community is dominated by *Corymbia maculata* and *Eucalyptus fibrosa*, with *E. punctata* and *E. crebra* occurring occasionally. A number of other eucalypt species occur at low frequency, but may be locally common in the community. One of these species, *E. canaliculata*, intergrades extensively in the area with *E. punctata*. The understorey is marked by the *Acacia parvipinnula*, and by the prickly shrubs, *Daviesia ulicifolia*, *Bursaria spinosa*, *Melaleuca nodosa* and *Lissanthe strigosa*. The ground layer is diverse; frequent species include *Cheilanthes sieberi*, *Cymbopogon refractus*, *Dianella revoluta*, *Entolasia stricta*, *Glycine clandestina*, *Lepidosperma laterale*, *Lomandra multiflora, Microlaena stipoides, Pomax umbellata, Pratia purpurascens, Themeda australis* and Phyllanthus hirtellus. In an undisturbed condition the structure of the community is typically open forest. If thinning has occurred, it may take the form of woodland or a dense thicket of saplings, depending on post-disturbance regeneration. Lower Hunter Spotted Gum - Ironbark Forest belongs to the Hunter - Macleay Dry Sclerophyll Forests vegetation class of Keith (2004).	Endangered ecological community	5,260
Central Hunter Ironbark – Spotted Gum – Grey Box Forest	The community is dominated by *Corymbia maculata* and *Eucalyptus fibrosa*, while *E. punctata* and *E. crebra* occur occasionally. A number of other eucalypt species occur at low frequency, but may be locally common in the community. The understorey is marked by *Acacia parvipinnula*, and *Daviesia ulicifolia*, *Bursaria*	Endangered ecological community	430

	spinosa, Melaleuca nodosa and *Lissanthe strigosa*. Other shrubs include *Persoonia linearis, Maytenus silvestri*s and *Breynia oblongifolia*. The ground layer is diverse; frequent species include *Cheilanthes sieberi, Cymbopogon refractus, Dianella revoluta, Entolasia stricta, Glycine clandestina, Lepidosperma laterale, Lomandra multiflora, Microlaena stipoides, Pomax umbellata, Pratia purpurascens, Themeda australis* and *Phyllanthus hirtellus*. In an undisturbed condition the structure of the community is typically open forest. If thinning has occurred, it may take the form of woodland or a dense thicket of saplings, depending on post-disturbance regeneration. Lower Hunter Spotted Gum - Ironbark Forest belongs to the Hunter - Macleay Dry Sclerophyll Forests vegetation class of Keith (2004).

Table 13 - Protected vegetation communities in the project site It is estimated that the

Lower Hunter Spotted Gum – Ironbark Forest and Central Hunter Ironbark – Spotted Gum – Grey Box Forest cover areas that are only 10% and 30% of the pre-European distribution respectively. Figure 5 shows the location of the mapped vegetation communities at the Elderslie development site.

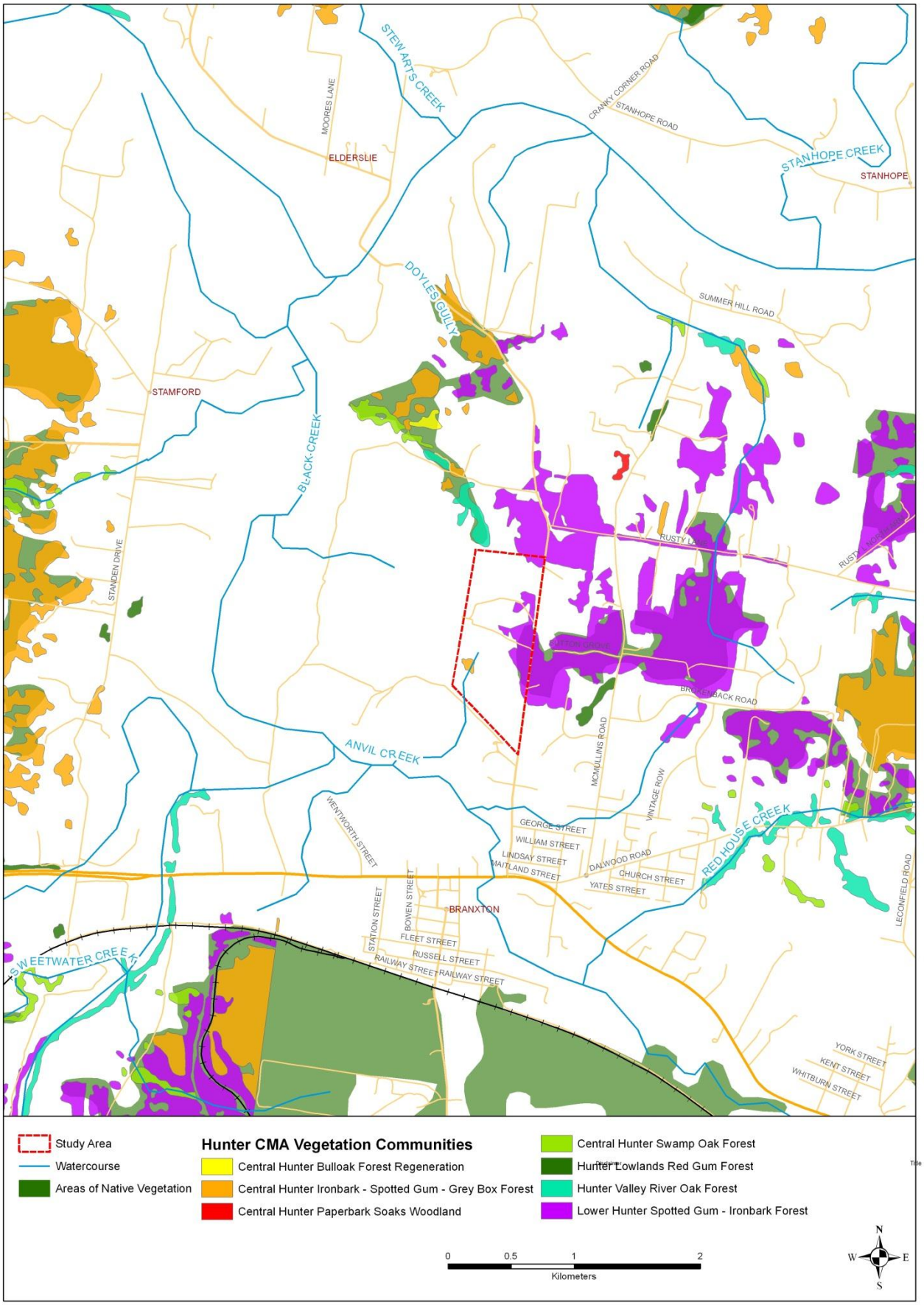


Figure 4 - Hunter Catchment Management Authority: Mapped vegetation communities at the Elderslie development site

Hydrology

The Elderslie development site is located within the catchment of the Hunter River. There is a small, mapped tributary of Anvil Creek located in the south-west corner of the site. The tributary drains from north to south into Anvil Creek, which then drains in a north-westerly direction to the Hunter River. The EPBC Act Protected Matters Search Tool identified the Hunter Estuary Wetlands as occurring within the vicinity of the Elderslie development site. The wetlands are located approximately 50 kilometres from the site, at the mouth of the Hunter River.

A number of small water storages are located at low points across the site, five of which will be traversed by the proposed mains. The tributary of Anvil Creek will also be traversed by the mains.

Cultural heritage

An extensive search of the Aboriginal Heritage Information Management System (AHIMS) for the site revealed that three Aboriginal heritage artefacts have been identified within the Elderslie development site. All artefacts were identified at open sites and no permits have been issued under the National Parks and Wildlife Act 1974 to allow their disturbance or removal. Figure 5 shows the location of these artefacts.

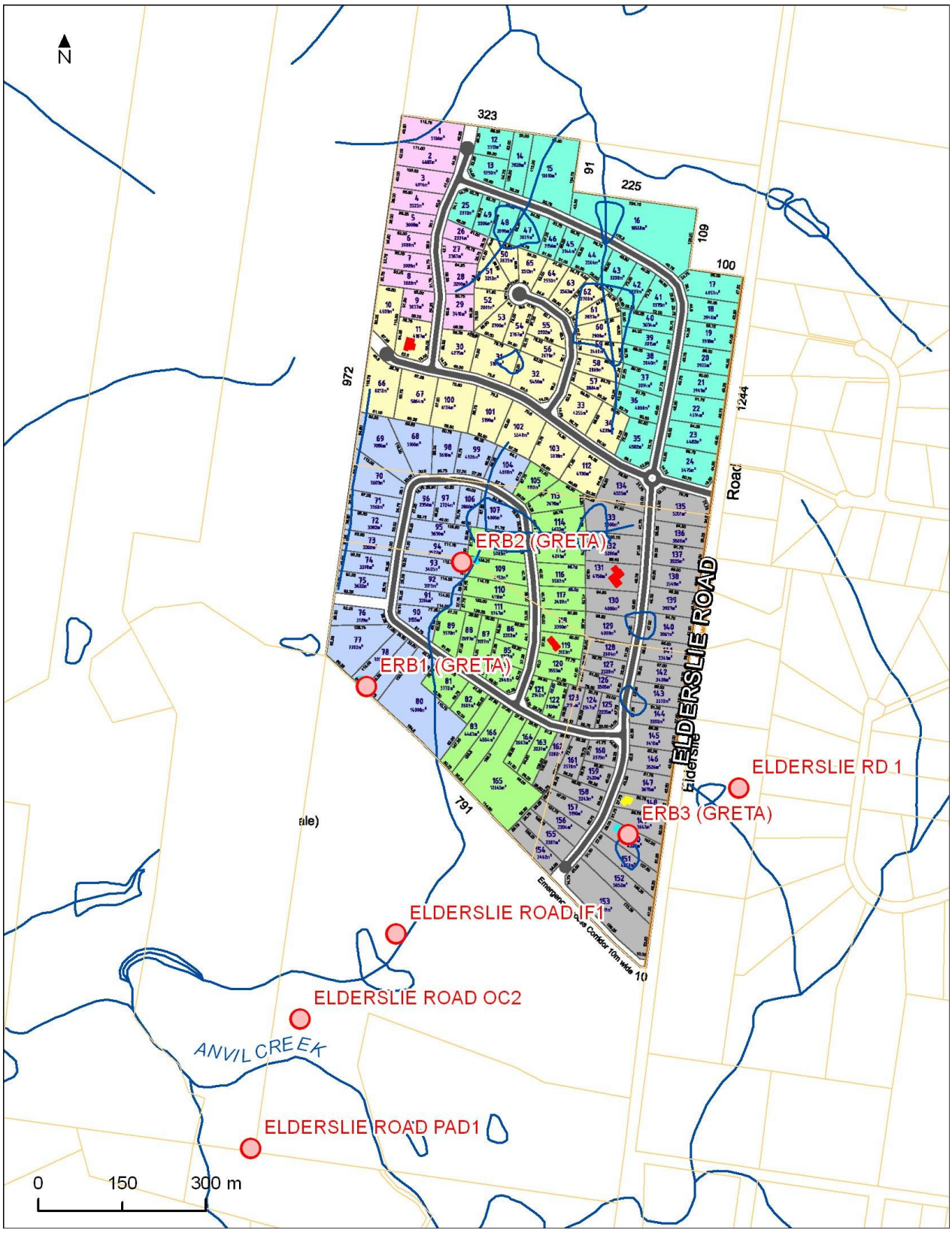


Figure 5 - Location of cultural heritage artefacts

Non-indigenous heritage

A search of the State Heritage Register for the suburb of Branxton revealed three sites listed under the Heritage Act 1971 within the suburb. The site, a brief description and distance from the proposed development are summarised in Table 14.

Item name	Statement of significance	Distance from site (km)	Impact likely (Y/N)
Branxton Railway Station Group	Branxton station features some of the earliest buildings on the northern line. The substantial nature of the buildings reflects the importance once attached to the town and its station. The original station incorporated a rare example of a residence (1 of 5 similar structures in the State). The group exhibits the effects of duplication and the addition of structures from later periods including several additions to the 1862 building during the 1880's and again in 1914 to make a substantial main line railway group. The group is one of the most interesting and important sites surviving in the State.	2.0	N
Branxton Railway Group – moveable relics	Railway machinery and objects	2.0	N
Dalwood House and surrounds of Wyndham Estate	Dalwood House is significant because it reflects the history of one of the most important pioneering families in the Hunter Valley. The house is a rare survival of one of the earliest Greek Revival buildings in New South Wales and the earliest known example of the style in the Hunter Valley. It is significant for its association with the development of viticulture and the development of the Hunter Valley wine industry. The fabric reveals the constructional evolution of the house and notably an innovative attempt at flat roof construction.	5.29	N

Table 14 - State heritage items at Branxton

Nine heritage items listed under the Hunter Regional Plan 1989 (Heritage), which is now deemed as State Environmental Planning Policy, are located within the town of Branxton and surrounds. These sites are located approximately 1 kilometre from the Elderslie development site and no impacts on them are predicted as a result of the proposed strategy.

No World Heritage or National Heritage places were identified within the vicinity of the site on the EPBC Act Protected Matters search.

3.3 Sewerage Loading Assessment

The sewerage loading assessment of the development is identified in the below table:

Stage	Number of Lots	Average Dry Weather Flow (ADWF)	Peak Dry Weather Flow (PDWF)	Peak Wet Weather Flow (PWWF)
Grey (2012)	40	0.44 L/s	1.68 L/s	4.00 L/s
Cyan (2013)	69	0.76 L/s	2.63 L/s	6.64 L/s
Yellow (2014)	99	1.09 L/s	3.55 L/s	9.30 L/s
Purple (2015)	112	1.42 L/s	3.94 L/s	10.43 L/s
Green (2015)	140	2.54 L/s	4.75 L/s	12.87 L/s
Blue (2016)	166	1.83 L/s	5.65 L/s	15.10 L/s

Table 15 - Estimate of Development Future Sewer Loading

The sewerage loading assessment for the associated developments that will require servicing from the transfer main are identified in the below table:

Development Site	Number of Lots	Average Dry Weather Flow (L/s)	Peak Dry Weather Flow (L/s)	Peak Wet Weather Flow (L/s)
A	166	1.83	5.65	15.10
B	18	0.20	0.79	1.84
C	5	0.06	0.22	0.51
F	6	0.07	0.26	0.61
G	50	0.55	2.02	4.92
H	50	0.55	2.02	4.92
I	50	0.55	2.02	4.92
A, B, C, F, G, H & I	345	3.81	13.02	32.82

Table 16 – Sewer Loading for Surrounding Areas

3.4 Infrastructure Description

Internal Reticulation

An internal reticulation layout has been developed using Infoworks CS to illustrate how reticulated sewerage would be discharged from the proposed development (refer to Drawing SKC009 in Appendix F). The reticulation network has also considered adjacent developments that would also utilise the network.

The proposed reticulation network size is identified below:

Pipe Size	Length (m)
150 mm	6,348
225 mm	272
300 mm	527

Table 17 – Internal Reticulation

External Sewerage Connection

The external sewer connection has been developed using Infoworks CS and has been assessed against the sewerage loading assessment and topography of the site. The sizing of the transfer main has also considered adjacent developments that would utilise the transfer main.

Pipe Size	Length (m)
300 mm	760

Table 18 – External Transfer Main

Pump Station & Rising Main

The pump station size and pump flow rate has been developed using Infoworks CS in conjunction with the Hunter Water Design Manual – Wastewater Pump Station. Refer to Appendix H for the calculation of the pump station volume.

The pump station will consist of a switchboard and hard standing area to enable site access. The booster connection will occupy an area of 30m x 30m and have will include the following:

Item	Size/Capacity
Duty & Standby Pumps	7 L/s
Control Volume (Section 4.5.3 – HW Design Manual)	630 L
Emergency Storage (Section 4.2.11 – HW Design Manual)	10,300 L
Detention Time (Section 4.3.5 – HW Design Manual)	2.87 Hrs
Rising Main Diameter	100 mm
Rising Main Length	860 m

Table 19 – Pump Station and Transfer Main

The pump station will be designed further in detailed design in accordance with the Hunter Water – Water and Sewer Design Manual (Section 5 Water Pumping stations).

3.5 Financial Criteria

3.5.1 Capital and Replacement Costs

Based on Hunter Water's "Pipeline and Pump Station Estimating guidelines" and the Hunter Water PVA template, an estimate has been completed of the construction and replacement costs. Refer to Appendix D for the output from the PVA template.

The capital and replacement costs over the life of the project are:

- Construction Cost: $2,833,546
- Replacement cost: $34,094.

3.5.2 Operating Cost

Based on the Hunter Water Document "HW operating and maintenance cost guidelines", the operation costs over the life of the project are as follows:

- Electricity and Monitoring of Assets: $129,989

3.5.3 Maintenance Cost

Based on Table 1 and Table 2 in the Hunter Water Document "HW operating and maintenance cost guidelines", the maintenance costs over the life of the project are as follows:

- Pipeline and Pump Station maintenance: $108,866

3.5.4 Cost Effectiveness Analysis

Based on the Hunter Water "Water and Sewer Design Manual" and the PVA template, a cost effective analysis has been completed. Refer to Appendix E for the full breakdown.

Key parameters of the analysis are as follows:

- Developer to fund internal reticulation, pump station and transfer mainDiscount Rate – 7%
- Analysis Period – 30yrs

The total present value of the proposed option is $3,106,496.

3.6 Social Impact

The following sections identify potential social impacts that may result from the proposed development. Recommendations for further investigation and impact mitigation strategies are provided.

Disruption to existing services

Installation of the proposed mains has the potential to cause disruption to existing services during the cut-in process.

Recommendations and mitigation measures

All works associated with the cut-ins to existing water and sewage services to residents should be undertaken in accordance with Hunter Water's requirements and policies. Measures to mitigate potential impacts on residents resulting from disruption to water and sewage services include:

- Provision of alternative water supply for the duration of the cut-in.
- Prior notification of and liaison with residents regarding the proposed shut down of water supply and identification of times of least demand.

Noise

Noise from operation of construction machinery such as excavators, mobile cranes and backhoes, has the potential to cause nuisance to residents of the Elderslie Road development site and those adjacent to the section of Elderslie Road where the mains will be installed.

Additionally, noise from operation of the proposed pumping stations (for both sewage and potable water) has the potential to cause disruption to adjacent residents, particularly as the pump stations will be operational for 24 hours a day.

Recommendations and mitigation measures

The pump stations should be designed to minimise noise, with the pumping 'machinery' housed within acoustically controlled structures. Additional controls, such as landscaping, should also be considered. The principles of the Water Services Association of Australia's Sewage Pumping Station Code of Australia regarding noise control should be taken into account during design of the pump stations.

Work for the installation of the mains should be undertaken in accordance with the Interim Construction Noise Guideline (DECC, 2009). The following mitigation measures are also recommended to minimise nuisance to residents resulting from construction noise:

- Prior to commencement of construction, residences in the vicinity of the construction footprint should be provided with notification of the proposed works, their location and proposed construction schedule.
- Alternatives to diesel and petrol engines and pneumatic units, such as hydraulic or electric-controlled units, should be used where feasible and reasonable.
- Where different types of machines are available that perform the same function the machinery that generates the least noise should be selected (e.g. rubber wheeled tractors can be less noisy than steel tracked tractors).
- Machinery should be turned off when not in use.
- Work should be scheduled to occur during standard work hours.

Odour

There is the potential for the wet well associated with the proposed sewage pump station to release odorous gases and cause nuisance to adjacent residents.

Recommendations and mitigation measures

The principles of the Water Services Association of Australia's Sewage Pumping Station Code of Australia and Section 4 of Hunter Water's Water and Sewer Design Manual (2008), regarding odour control should be taken into account during design of the pump stations.

Traffic

Construction of the mains will be largely undertaken within the Elderslie development site and is predicted to have minimal impact to traffic in the area.

It is likely that installation of the mains along Elderslie Road will require closure of one lane of traffic to achieve the clearance requirements specified in Traffic Control at Worksites (RTA, 2010). This has the potential to cause nuisance to road users seeking to use Elderslie Road.

Recommendations and mitigation measures

The following mitigation measures are recommended to minimise nuisance to road users:

- Notification of residents through a notice in the local paper, letter box drops etc. of the likely work schedule, potential for delays and alternative routes to avoid the construction site, such as McMullins Road.
- Worksites should be selected so that the minimum length and width of a road is closed at each stage to ensure minimum disruption to traffic and inconvenience to road users while maintaining working efficiency.
- Work should be staged to ensure minimum disruption to traffic, especially at peak times, nights, weekends, holiday periods and during special events.

Traffic on either side of the worksite should be monitored and action taken if excessive lengths of queues or delays occur.

3.7 Environmental Impact

This section assesses the environment impacts of the construction and operation of the proposed infrastructure. Where appropriate, further studies or special construction methods and maintenance procedures to minimise environmental harm have been recommended.

Geology and soils

Soils on the site are susceptible to minor sheet erosion on slopes, with moderate sheet and gully erosion on lower slopes. Clearing and excavation for installation of the mains has the potential to cause erosion through exposure of soil to raindrop impact, surface water flows and wind. Eroded material entering watercourses has the potential to deposit, smothering native flora and fauna, altering the stream profile and causing an afflux during subsequent storm events.

Construction activities also have the potential to cause contamination of soils through spillage of fuels or hydraulic fluids from machinery or sewage during connection to the existing system.

Recommendations and mitigation measures

An Erosion and Sediment Control Plan (ESCP) should be developed in accordance with *The Blue Book - Managing Urban Stormwater (MUS): Soils and Construction* (Landcom, 2004). The following principles should be incorporated in to the ESCP:

- The extent of clearing should be minimise and clearly delineated and clearing should be undertaken in accordance with an established clearing schedule.
- The extent and duration of soil exposure should be minimised.
- Clean stormwater should be diverted from areas of disturbance, and, if required, drainage structures should be installed early in the construction phase.

- All erosion and sediment control measures should be installed as early in the construction phase as practicable.
- Exposed soil surfaces should be protected from erosion through the application of controls such as geofabric or seeding where a site will be left exposed for a period of two weeks or more.
- Rainfall impact and potential rilling should be minimise by covering stockpiles and slopes
- Every attempt should be made to capture sediment on site through the use of silt fences on the down-slope perimeter of the site.
- The construction footprint should be progressively stabilised and revegetated as installation of the mains is completed.
- Surface water flow velocities across the construction footprint should be minimised with velocity dissipating controls

Potential for contamination resulting from construction activities and potential sewage spills from cut in activities can be mitigated through the inclusion of the following measures in the construction environmental management plan:

- Where practicable, fuel and oil should not be stored on site. If on site storage is required, fuel should be stored in a covered, bunded container and handled in accordance with Australian Standard AS 1940 *The storage and handling of flammable and combustible liquids*.
- Spill kits with sufficient capacity for the volumes of fuel and oil contained in construction machinery and any stored should be kept on site at all times. Spill kits should be inspected annually and any material used should be replaced as soon as possible.
- A process for live sewage cut overs should be developed in accordance with Hunter Water's requirements. Any spills should be cleaned up immediately and the soil treated with an environmentally benign bactericidal cleaner.

Flora and fauna

Construction of the mains would require clearing of approximately 5,700 m^2 of native vegetation. Mapping shows the presence of two endangered ecological communities on the site; the Lower Hunter Spotted Gum – Ironbark Forest and the Central Hunter Ironbark – Spotted Gum – Grey Box Forest. Clearing of these communities is regulated under the *Threatened Species Conservation Act* 1995. Key threatening processes for both these communities include:

- Clearing and associated habitat fragmentation for residential development, cropping and mines.
- Weed invasion, particularly lantana, wild tobacco and giant Paramatta grass.
- Inappropriate fire regimes such as frequent burning.

Installation of the mains has the potential to spread invasive species.

Recommendations and mitigation measures

Further assessment, likely involving more detailed desktop research, database interrogation and targeted field survey, will be required to:

- Identify the presence, or likely presence, of threatened species, populations and ecological communities known to occur in the locality.

- Identify the presence of invasive species on the site and map their extent.
- Assess potential impacts of the proposal, including direct, indirect and cumulative impacts.
- Describe measures to be implemented to avoid or mitigate potential impacts.

This information would be used to support an Assessment of Significance if required under the *Threatened Species Conservation Act* 1995.

Where possible, the mains should be located to avoid endangered ecological communities. Where this is not possible construction methodologies should be reviewed to minimise the area of disturbance. The following mitigation measures are recommended to minimise impacts on endangered ecological communities:

- All staff are to be made aware of their responsibilities under the *Threatened Species Conservation Act* 1995 and the potential occurrence native flora and fauna on site.
- Selective clearing of native species to be used in preference to clear felling. If practicable, trees should be trimmed and allowed to coppice, rather than their roots removed.
- Clearing not to occur for construction site camps or stockpiles. Site compounds, access tracks, laydowns and stockpiles must be located 5 m from the drip line of native vegetation that is to be retained.
- Limits of clearing are to be clearly marked with flagging tape with vegetation to remain marked on site plan.
- Construction traffic to be restricted to formed access tracks and no clearing of native vegetation permitted for access purposes.
- Use of a backhoe or two-tonne excavator in preference to large excavator to minimise footprint of disturbance and clearing requirements.
- Weeds within the construction footprint to be identified and their extent delineated prior to ground disturbance. Construction footprint should be cleared of weeds and treated with appropriate herbicides prior to ground disturbance in the area.
- All machinery entering the site to have undergone washdown at a suitable facility and visually inspected for the presence of invasive species by a competent person prior to mobilisation onsite.
- All imported soil material to be certified as weed free and stored away from areas of the site that have been identified as containing invasive species.
- Where invasive species have been identified ongoing weed management and control to be implemented post construction within the construction footprint.
- Lighting of fires on site to be strictly prohibited and means for safe disposal of cigarette butts made available to smokers.
- Where appropriate, hot works associated with construction should be timed to avoid times when fire danger is mapped as high or above on the rural fire service Total Fire Ban and Current Fire Danger Map (http://www.rfs.nsw.gov.au/dsp_content.cfm?cat_id=1109). Where this is not practicable an area should be cleared of flammable debris and fire fighting equipment should be present on site during the works.
- Trees to be cleared must be inspected for the presence of native fauna and nesting material prior to removal. Where necessary a trained spotter/catcher should relocate breeding fauna.

- Existing hollow timber logs present on the ground and large tree logs felled during construction shall be retained and reallocated to areas clear of construction activities.
- Where possible, construction should occur outside the main breeding season of fauna known to occur on the site.
- Excavations for the installation of the mains shall be closed or covered at the end of each day to prevent fauna entering the trench.

Hydrology

Installation of the mains has the potential to impact on water quality through:

- The introduction of sediment to waterways as a result of erosion within the construction footprint, which has to potential to smother aquatic biota, alter the flow path of the watercourse and cause an afflux and flooding during subsequent rain events.
- Introduction of fuels, oils or chemicals required for construction to waterways, which may poison aquatic biota and harm fauna drinking from the watercourses.

Installation of the mains will result in removal of the water storages currently on the site, altering the hydrology of the site. Removal of the storage areas would result in an increase in surface water flows leaving the site.

Recommendations and mitigation measures

The following mitigation measures are recommended for the protection of water quality and hydrological features of the Elderslie development site:

- All staff are to be made aware of the following:
    - Their general environmental duty and duty to notify under the *Protection of the Environment Operations Act 1995*.
    - Conditions of environmental licences, permits and approvals for installation of the mains.
    - Identified site specific areas, such as watercourses, approved discharge points and receiving aquatic environments.
- Refuelling of construction machinery should be restricted to areas a minimum of 50 m from known drainage lines and hydrological features.
- Spill kits suitable for land and water should be kept on site at all times.
- The site should be maintained in a tidy fashion and spills to soil and water must be recovered immediately.
- Chemicals required for construction and weed control should be stored in bunded area 100 m from watercourses.
- Construction methodology should seek to minimise impacts on hydrological features. Use of trenchless technology for the installation of the mains may be appropriate for installation of the mains beneath some hydrological features, particularly the tributary to Anvil Creek.

The following should be considered when selecting pipe location and construction methodology:

- Minimise or avoid disturbance to channel bed and banks.
- Minimise or avoid rehabilitation, maintenance and on-going costs after construction.

- Ensure depth does not result in exposure of assets if channel experiences bed or bank degradation.
- Place infrastructure below calculated bankfull flow scour depths and allow a safety margin.
- Avoid concrete caps and casings at shallow depths which may become exposed by bed lowering.
- Address the recovery and removal of construction plant and materials, including drilling mud.
- If using trenchless technology, minimise risks associated with cave-ins, bed collapse or frac-outs during boring.
- If using trenchless technology, locate bore entry and exit points outside designated riparian corridors and existing vegetation.
- If trenching, locate (lay) pipes and cables across the watercourse on the downstream side of channel bedrock outcrops.
- If trenching, avoid outside bends and choose a straight section of the watercourse to cross.
- If trenching, ensure backfilling restores the channel shape and bed level to preconstruction condition and ensure trench is open for minimal length of time and minimise the time involved in stopping or intercepting flows.
- If trenching, address additional disturbances from temporary coffer dams or diversion of flows around work site, vehicle and machinery access and crossings, material stockpiles, etc.

Cultural heritage

The presence of two known Aboriginal cultural heritage artefacts within the vicinity of the Elderslie development site indicate a potential for more items of Aboriginal cultural heritage to be present within the site.

The *National Parks and Wildlife Act 1974* lists a number of criminal offences relating to the damage or disturbance of items of Aboriginal cultural heritage. The offence is a strict liability offence and is applicable whether the harm to the object was done knowingly or not.

Recommendations and mitigation measures

It is recommended that an Aboriginal Cultural Heritage Assessment of the proposed construction footprint be undertaken in accordance with the requirements of the *Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW* (DECCW, 2010) and the *Aboriginal Cultural Heritage Community Consultation Requirements for Proponents* (DECCW, 2010). The Aboriginal Cultural Heritage Assessment should be undertaken to satisfy due diligence requirements, with the purpose to:

- Identify whether or not Aboriginal objects are present or likely to be present in the construction footprint.
- Consider whether or not construction activities are likely to harm Aboriginal objects (if present)
- Determine whether an Aboriginal heritage impact permit (AHIP) is required.

Should items of Aboriginal cultural heritage be identified during the Aboriginal Cultural Heritage Assessment and an AHIP be required, consultation with the NSW Office of Environment and

Heritage (OEH) and other stakeholders is required in accordance with the *Aboriginal Cultural Heritage Community Consultation Requirements for Proponents* (DECCW, 2010).

During construction the recommendations and requirements of the Aboriginal Cultural Heritage Assessment and the outcomes of consultation should be incorporated into the construction environmental management plan. At a minimum, the following mitigation measures should also be included:

- In the event of a find, all work and other activities within the vicinity of the find should cease, and OEH contacted. Works would only recommence pending a thorough inspection of the find by stakeholder representatives. Finds should be protected with a temporary barrier or flagging tape until inspection has occurred.
- In the event of a find stakeholder representatives should be asked to provide advice on the appropriate management action which will be followed by all personnel onsite
- If human skeletal remains are discovered during development works all works within 100 m of the remains should cease and the area fenced or flagged. The NSW Police and Cultural Heritage Coordination Unit of the Office of Environment and Heritage, as well as Aboriginal stakeholder representatives should be contacted as a matter of urgency.

Waste

Installation of the proposed mains has the potential to generate waste materials that will require management. The *Waste Avoidance and Resource Recovery Act* 2001, establishes a waste hierarchy for the management of waste, which is:

1. Avoidance including action to reduce the amount of waste generated by households, industry and all levels of government.
2. Resource recovery including reuse, recycling, reprocessing and energy recovery, consistent with the most efficient use of the recovered resources.
3. Disposal including management of all disposal options in the most environmentally responsible manner.

Construction waste must be managed in accordance with the *Protection of the Environment Operations Act* 1997, which makes it illegal to:

- Wilfully or negligently dispose (dump, abandon, discharge) of waste in a manner that harms or is likely to harm the environment.
- Transport waste to a place that cannot lawfully be used as a waste facility for that waste.
- Use land as a waste facility without lawful authority.
- Give false or misleading information about waste to another person in the course of dealing with the waste (eg lying about what type of waste it is).

Recommendations and mitigation measures

The following mitigation measures should be included in the construction environmental management plan to minimise waste introduced onto site and encourage its appropriate management:

- Construction waste should be minimised by purchasing materials with minimal packaging and ensuring that only necessary material is purchased.

- All wastes generated on site should be adequately stored, transported and recycled, where appropriate.
- Disposal of introduced construction materials on-site to be prohibited, except cleared native vegetation and excess excavated material.
- All oils, oily waste (e.g. oil filters, containers), fuels and fuel containers as to be removed from site and disposed of at an appropriately licensed oil recycling or disposal facility.
- Non-recyclable wastes should be disposed of at approved waste disposal facilities
- Burying of rubbish and land-farming of volatile substances is to be prohibited.
- Portable toilet wastes should be removed off site by a licensed contractor for disposal.
- Clearly marked containers should be provided to allow for the segregation of waste streams to allow for recycling.
- Smoking should be restricted to designated areas with appropriate disposal facilities.

3.8 Technical Assessment

Performance

The hydraulic performance of the proposed sewerage system has been assessed using Infoworks CS. The hydraulic modelling of the system has modelled the proposed system including the loading assessment, proposed ground levels, depths and the proposed pipe sizes. Refer to Appendix G for the Inforworks CS model schematic and results.

The hydraulic performance of the proposed sewerage system has been assessed using Infoworks CS. The hydraulic modelling of the system has modelled the proposed system including the loading assessment, proposed ground levels, depths and the proposed pipe sizes. Refer to Appendix G for the Infoworks CS model schematic and results.

An analysis of the hydraulic modelling has reviewed the system performance for the Peak Wet Weather Flow (PWWF). The system is able to perform in these conditions in terms of Hunter Water's design requirements as per the water and sewer design manual.

The issues surrounding supercritical to subcritical flow between M18 and M19 was reviewed in infoworks and discussed below.

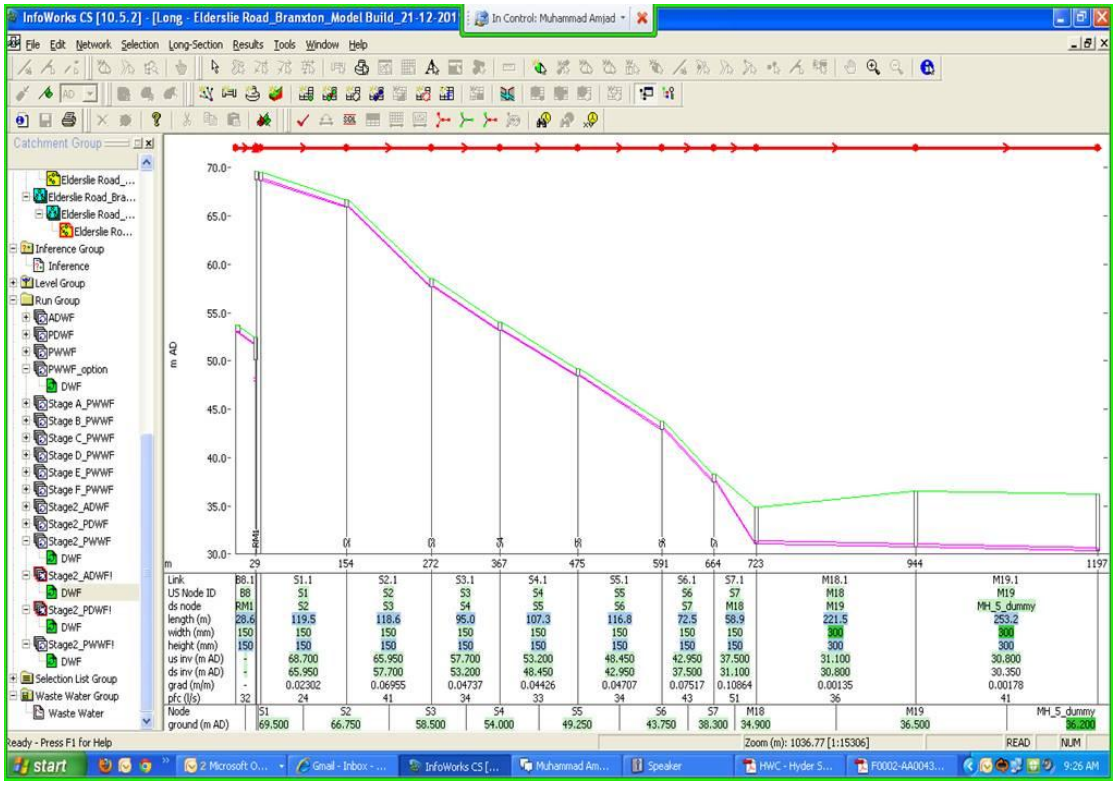


FIGURE 6: LONGITUDINAL SECTION OF COLLECTION SYSTEM

The figure above shows the longitudinal section between S1 and M19. Hunter water raised concerns regarding the potential for a hydraulic jump to occur at the M18 Manhole, due to the 1:10 slope.

This concern was investigated with the following outcomes:

- Hydraulic Jump does not occur during max (PWWF) or Min (ADWF). –
- Pipe slope (and subsequent velocity) does not meet Hunter Water standard specification (refer to section 3.4).

To mitigate this issue (non-conformance), the model was redeveloped with the following changes:

- Slope between M18 and M19 increased to 1 in 400 to meet standard velocities.

The model was then re-run and checked for the occurrence of a hydraulic jump (transfer from sub-critical to super –critical or vice versa).

Please refer to the following three figures (ADWF and AWWF) which show the calculations check, and the new longitudinal sections of the collection system.

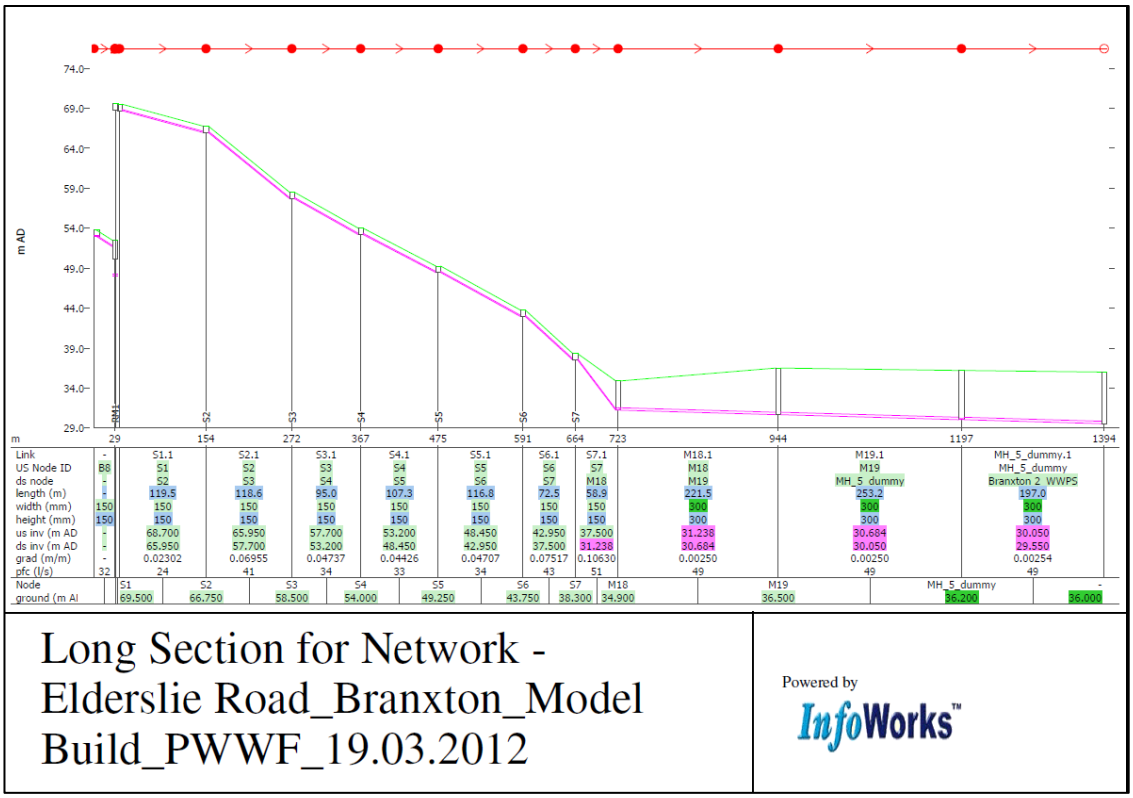


FIGURE 7: LONGITUDINAL SECTION OF COLLECTION SYSTEM WITH MODIFIED PIPE GRADIENT

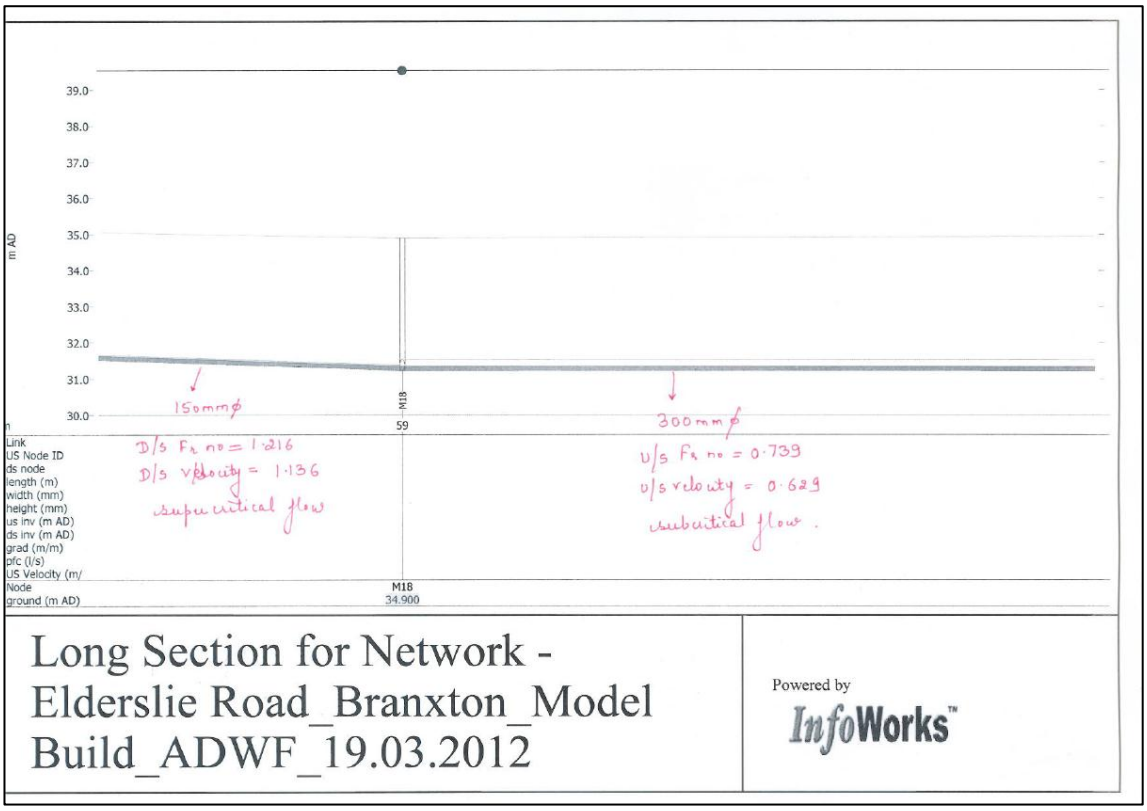


FIGURE 8: FLOW PARAMETERS FOR ADWF

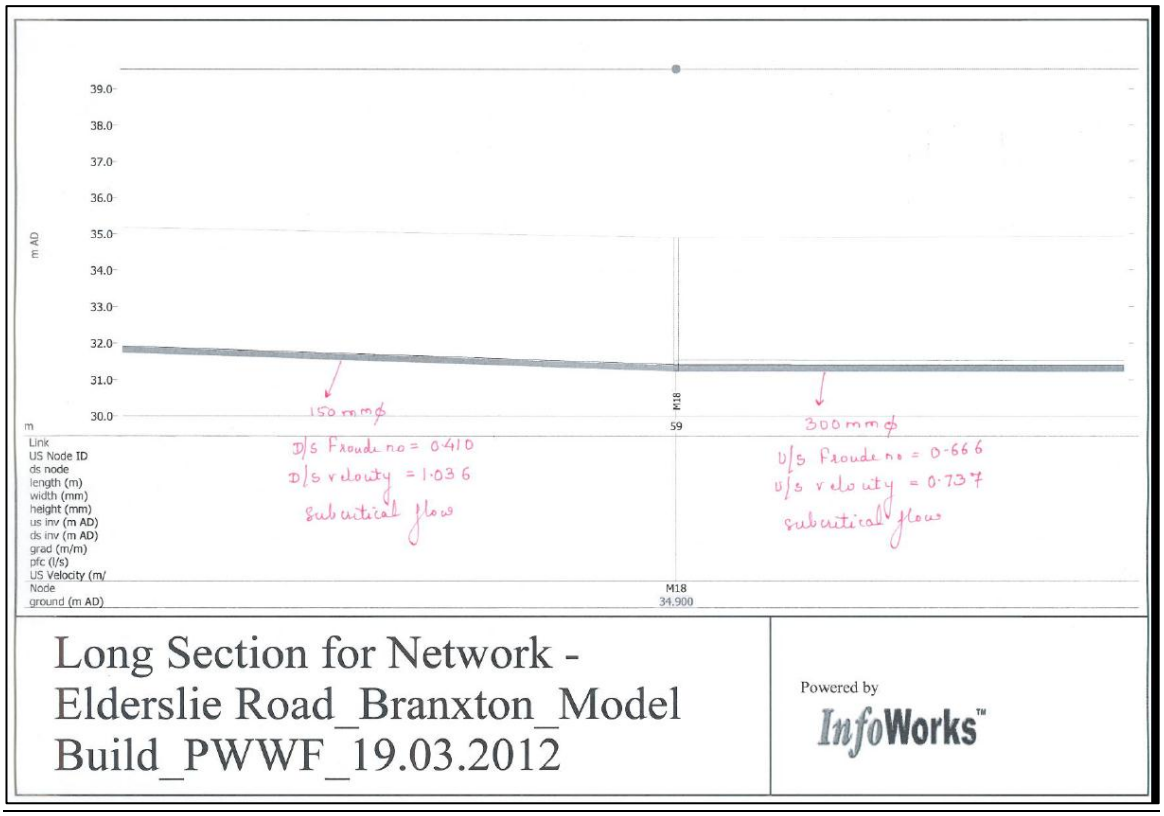


FIGURE 9: FLOW PARAMETERS FOR PWWF

From this, Figure 9 identifies that during PWWF the flow will be subcritical at both the upstream and downstream sections of M18. However during ADWF, the flow will be supercritical at

upstream section of M18 and subcritical at downstream section which will cause hydraulic jump in M18.

Therefore during ADWF, a hydraulic jump will occur, which may create minor odour, however, as the manhole is sealed it is assumed to be negligible at the manhole and too dissipate further downstream.

The hydraulic analysis has also reviewed the effect of external changes to the system. The review has considered the effect of external system change and the ability of the system to meet the system requirements.

System Reliability

The proposed system has been assessed to confirm the ability of the system to service the development as per Hunter Water's standards. The assessment has considered the staging of the development and its ability to meet the PWWF requirements at each stage of construction. The proposed system is able to meet Hunter Water's requirements for the PWWF at each stage of further development.

Adaptability

The proposed internal reticulation system has been designed to allow for the changes in flow within the development. The design has considered the PWWF and self cleansing flows. In both cases, the system will function as per the requirements of the water and sewer design manual.

The design of the system has considered the further growth of the surrounding developments (refer to section 4.3). These adjacent developments have been considered in the design of the transfer main. The transfer main has been developed to allow for the additional capacity required once the development areas "B", "C", "F", "G", "H" and "I" have been developed.

Staging Assessment

The hydraulic assessment of the system has considered the effect of the development of infrastructure beginning with the transfer main and culminating with the reticulation, pumping station and rising main to service the full development. The assessment has considered the flow throughout the system and its ability to meet drain to Branxton 2 WWPS. The system is able to service the development with transfer main completed at stage A and the pump station/rising main completed in Stage B.

The timing of the implementation of the transfer main and pump station allows the development of the development to be staged concurrently with the sewerage network.

Maintainability

The current design has considered maintenance as part of the sewerage main design. The design has considered pipeline locations, manhole locations and pipeline depths. The pipeline has been designed at standard depths in consideration of the existing ground levels. Further design in the detailed design phase will consider further maintenance considerations.

4 RECOMMENDED OPTION

Progress meeting number 2 was held with Hunter Water on the 21st of March 2012 for the sewerage servicing strategy. The meeting discussed the following:

- Queries and responses on the sewerage servicing strategy.
- Updated sewerage reticulation layout.
- Results from hydraulic jump analysis.
- The proposed option of a pumping station and connection to Branxton No. 2 WWPS.

The meeting confirmed Option 2 of a Transfer Main, reticulation main, pump station and rising main as the selected option for progression in the strategy. Refer to Appendix B – Appendix H for the presentation of the recommended option.

Bibliography

James, M. (2007). *About Branxton*. Retrieved August 24, 2011, from Branxton Hunter Valley Australia: http://www.branxtonhuntervalley.com/About%20Branxton%20Hunter%20Valley.html

APPENDIX A – CORRESPONDENCE

HUNTER WATER CORPORATION . PO BOX 5171 HRMC NSW 2310 . TEL 1300 657 657
36 HONEYSUCKLE DRIVE NEWCASTLE . ABN 46 228 513 446 . HUNTERWATER.COM.AU

11 March 2009 Ref: 2006-1292

Belford Land Corporation
P O Box 89
Singleton NSW 2330

Attention: Daniel Golenia

Dear Sir/Madam

RE INDICATIVE REQUIREMENTS FOR PROPOSED DEVELOPMENT

Hunter Water has considered your request for our requirements for the provision of water and sewer services to your proposed subdivision of 4 lots into approximately 175 lots at Lot 22 DP 861508, Lot 121 DP 628116, Lot 140 DP 619407 & Lot 13 DP 595347, Elderslie Road, Branxton.

General information on water and sewer issues relevant to the proposal is included in this correspondence. This information is based on Hunter Water's knowledge of its system performance and other potential development in the area at the present time.

As you will appreciate, there may be significant changes that occur by the time the development proceeds to the lodging of a development application, therefore this preliminary advice is not a commitment by Hunter Water and may be subject to significant change prior to the development proceeding.

When you proceed with a development application you will need to lodge a further application with Hunter Water to then determine the formal requirements that shall apply. Hunter Water will then issue a **Notice of Formal Requirements**. You will need to comply with each of the requirements in this Notice for the issue of a Section 50 Compliance Certificate for the specific development.

In this instance, Hunter Water's preliminary advice is as follows:

1. Developer Charges

   As of 1.00pm December 17, 2008 the NSW State Government has announced that developer charges for water and sewer within Hunter Water's area of operations have been abolished.

   Accordingly, this Notice of Formal Requirements does not include a requirement to pay for water and sewer developer charges.

   Contributions by developers will still be required for recycled water schemes, out of sequence development and infrastructure required in advance of Hunter Water's current Forward Capital Works Program.

   All other fees and charges remain applicable.

2. System Capacity

Water Supply

A developer funded local water servicing strategy is to be prepared to determine the servicing requirements for this development. The strategy is to be prepared by an accredited consultant in accordance with the attached *Guidelines for the Preparation of Strategy Studies*. The water supply services are then to be designed and constructed in accordance with the approved strategy.

The proposed development site is located in the Maitland – North Rothbury Water Supply System. A preliminary review by Hunter Water indicates that the existing water supply system is insufficient to service the proposed development. Hunter Water's Forward Capital Works Program includes funding for upgrades for the Maitland – North Rothbury Water Supply System in 20013/14. However, it should be noted that the proposed timing for the Maitland – North Rothbury Water Supply System upgrades are indicative only as such works are generally undertaken on a priority basis. Following completion it is envisaged that there will be sufficient capacity in the system to service the proposed development.

The nominal water connection point for your development is the 250mm watermain in The New England Highway (Maitland St). An additional connection will be required for security of supply. The available capacity in the existing system required to meet Hunter Water's security of supply requirements should be assessed in the water servicing strategy.

The water servicing strategy should assess:

- The proposed staging of the development.
- Hunter Water's proposed upgrade works in the Maitland – North Rothbury Water Supply System.
- Security of supply.
- The need for a high level zone within the proposed development.
- Identify and include other potential and proposed developments sites in the strategy.
- Minimise dead ends and duplicate (high level / low level) watermains.

A Strategy review fee should be paid when the wastewater strategy is submitted.

Wastewater Transportation

A developer funded local wastewater servicing strategy is to be prepared to determine the servicing requirements for this development. The strategy is to be prepared by an accredited consultant in accordance with the attached *Guidelines for the Preparation of Strategy Studies*. The wastewater services are then to be designed and constructed in accordance with the approved strategy.

The development site was partially included in the Branxton WWTW Transportation System Servicing Strategy (2005). At the time this Servicing Strategy was prepared, the southern half of the proposed development site was not expected to be approved for rezoning in the foreseeable future. Therefore the Servicing Strategy has not made allowance for your proposed ultimate Lot yield.

The development site is located within the Branxton No.2 Wastewater Pumping Station catchment. Currently, this pumping station has sufficient spare pump capacity and emergency storage capacity to service the proposed development.

However, the Branxton WWTW Transportation System Servicing Strategy (2005) identifies other developments in the catchment that may utilise some of the existing capacity and as such, may impact on the ability and extent of your development to connect to Branxton No.2. WWPS. If capacity is not available at Branxton No.2 WWPS at the time of connection it will be necessary for the developer to fund an upgrade of the station.

The nominal wastewater connection point for your development is Branxton No.2 WWPS carriermain. Hunter Water's preliminary review indicates that a developer funded wastewater pumping station will be required to service some sections of the proposed development.

The wastewater servicing strategy should assess:

- Study area to include the natural catchment boundaries and include adjoining lands that have the potential for development. It is desirable that agreement be reached with Hunter Water prior to proceeding past this stage.
- Identify sub catchments within the development site and determine the most appropriate servicing option for each catchment
- Identify staging of the development and issues such as self cleansing and odour control in the interim prior to full development being realized
- The concept wastewater transportation system layouts, including proposed pump station, rising main and gravity main sizes.
- Capital, operating costs and NPV analysis for all options considered in the strategy.

Please contact Hunter Water to discuss the details of both servicing strategies prior to commencement.

To minimise any delays in processing, Hunter Water requires separate water and wastewater strategies to be submitted.

A Strategy review fee should be paid when the wastewater strategy is submitted.

Recycled Water Transportation

Hunter Water supports the use of recycled water where feasible and environmentally sustainable. There may be scope to service your proposed development with a recycled water system from Branxton Wastewater Treatment Works.

A developer funded local recycled water servicing strategy would need to be prepared to determine the servicing requirements for this development. The strategy is to be prepared by an accredited consultant in accordance with the attached *Guidelines for the Preparation of Strategy Studies.* The recycled water services would then to be designed and constructed in accordance with the approved strategy.

A Recycled Water DSP charge would be levied on a per lot basis.

Should a recycled water system be utilised there is potential for any trunk watermain infrastructure to be reduced in size due to lower peak demands The servicing strategy should give due consideration to this possibility.

Please contact Hunter Water to discuss this opportunity in more detail.

A Strategy review fee should be paid when the recycled water strategy is submitted.

Wastewater Treatment

The proposed development is in the Branxton Wastewater Treatment Works catchment. Currently, there is insufficient capacity at Branxton WWTW to service the proposed development. Hunter Water's Forward Capital Works Program includes funding for upgrades for Branxton WWTW's in 2010/11.

At present any available spare capacity at Branxton WWTW's is reserved for other subdivision developments in the catchment. Please contact Hunter Water to discuss the potential to release capacity for any initial staged development.

3. Reimbursement payments towards the cost of water and sewer infrastucture that was constructed by third party developers may become payable. These reimbursement costs will be determined when water and sewer design plans are assessed and approved.

4. There may be some advantage for a joint arrangement between the various developers in the north Branxton area to share the costs for providing water and/or wastewater infrastructure. Hunter Water recommends this issue should be discussed with the other developers and would be happy to assist in this regard.

   Evidence of any commercial arrangements for cost sharing needs be revealed to Hunter Water for reimbursement purposes.

5. Prior to providing final approval of designs, Hunter Water may require a Review of Environmental Factors (REF) to be submitted (refer Section 1 of Hunter Water's Water and Sewer Design Manual). A REF considers the likely impacts a development may have on the environment. At all times, methods for preventing or reducing adverse environmental impacts should be considered and where appropriate, incorporated into the project design. Hunter Water, where appropriate, may make a determination in accordance with the EP& A Act 1979.

6. The preparation of the servicing strategies may require entry to an adjoining party property. It is the responsibility of the developer to arrange for entry with the affected landowner and have evidence of consent by way of a signed Entry Permit. The Permit is to be submitted prior to accessing third party properties.

Should you require any additional information, please do not hesitate to contact Barry Calderwood on 4979 9721 or email: barry.calderwood@hunterwater.com.au

Yours faithfully

Brett Lewis
Manager Sales and Business Development

Singleton City Council

From: Pearson, Gary [mailto:gpearson@singleton.nsw.gov.au]
Sent: Thursday, 17 September 2009 12:26 PM
To: Ryan Smith
Subject: LA 64 2008 Elderslie Rd Branxton - Water and Sewer Servicing Strategy

Hi Ryan,

I apologise for the time taken to respond to your request.

The candidate areas as identified in the *Singleton Land Use Strategy* are for rural-residential type rezonings and is aimed at providing 10 years supply. The ongoing viability and sustainability of rural-residential type development has been of concern to public authorities. Due to this, the strategy does not project past the 10 year point for this type of development (i.e. to 15 years).

The strategy has associated with it a land release monitor. Using this monitor as a guide, reviews of the strategy will occur to consider whether supply is being met or not met and whether a revision of candidate areas is required. Details of the staging and expected timeframe for completion of the Huntlee New Town Site is explained in the information provided on the Department of Planning's website (as it is a ~~"~~major project"). Huntlee crosses between the Singleton Shire Council LGA and the Cessnock City Council LGA.

Below are details of the proposals for residential/rural-residential type rezonings. There is also a proposal adjoining a candidate area which the *Singleton Land Use Strategy* provides to be considered. Separate from these rezoning proposals is the recently rezoned *Huntlee "New Town"* site.

Timeframes for development of the sites subject of the following rezoning proposals will predominantly be determined by the market. Rezoning proposals separate from those currently being considered would be expected to be submitted for those pieces of the candidate areas which still do not have proposals lodged for them.

Rezoning Proposals for land within Candidate Areas identified by the Singleton Land Use Strategy			
Council File Reference	**Property Description**	**Proposed Minimum Lot Size Provisions**	**Candidate Area**
LA37/2003	Lot 209, DP: 877391 and Lot 208, DP: 839648, Big Ridge Nth End Lane, SEDGEFIELD and Lot 204, DP: 839648, Gresford Road, SEDGEFIELD	2ha minimum lot size with 5ha minimum average lot size.	**Sedgefield**
LA42/2005	Lot 120, DP:752455, 11 Long Gully Road, WATTLE PONDS	8,000m² minimum lot size with 1ha minimum average lot size.	**Wattle Ponds North East**
LA43/2005	Lot 252, DP: 804008; Lot 11, DP: 1062336; Lot 12, DP: 1062336, 79 Mirannie Road, SEDGEFIELD	2ha minimum lot size with 5ha minimum average lot size.	**Sedgefield**
LA46/2005	Lot 138, DP: 752455, 6 Long Gully Road, WATTLE PONDS	8,000m² minimum lot size with 1ha minimum average lot size.	**Wattle Ponds North East**
LA50/2005	Lot 22, DP:582824 and Lot 221, DP: 823112, 502 Bridgman Road, WATTLE PONDS/OBANVALE	8,000m² minimum lot size with 1ha minimum average lot size.	**Wattle Ponds North West**
LA55/2007	Lot 2, DP:237936, Lot 3, DP: 237936, Lot 52, DP:787775, Lot 512, DP: 1096873, 233, 249 and 273B Standen Drive, LOWER BELFORD.	4ha minimum lot size with 5ha minimum average lot size.	**Lower Belford**
LA59/2007	Lot 142, DP: 752455, 36 Long Gully Road, WATTLE PONDS	8,000m² minimum lot size with 1ha minimum average lot size.	**Wattle Ponds North East**
LA61/2007	Lot 140, DP: 752455, 8 Long Gully Road, WATTLE PONDS	8,000m² minimum lot size with 1ha minimum average lot size.	**Wattle Ponds North East**
LA64/2008 (Subject Proposal)	Lot 22, DP: 861508; Lot 121, DP: 628116; Lot 140, DP: 619407; 103A, 211 and 181, Elderslie Road Branxton	2,000m² minimum lot size with 4,000m² minimum average lot size.	**Branxton North West**
LA65/2008	Lot 11, DP: 844443; Lot 12, DP: 1100005; Lot 13, DP: 1100005; Lot 6, DP: 237936; Lot 2, DP: 739822, 7, 5, 133 and 147, Standen Drive, LOWER BELFORD.	8,000m² minimum lot size	**Lower Belford**
LA67/2009	Lot 2, DP: 618713; Lot 3, DP: 618713; 144 and 118, Elderslie Road, BRANXTON	2,000m² minimum lot size with 4,000m² minimum average lot size.	**Branxton North West**
LA70/2009	Lot 5, DP: 1058431, 208A Roughit Lane, ROUGHIT	2ha minimum lot size with 5ha minimum average lot size.	**Sedgefield**

Rezoning Proposals for land outside of the Candidate Areas identified by the Singleton Land Use Strategy			
Council File Reference	**Property Description**	**Proposed Minimum Lot Size Provisions**	**Adjoining Candidate Area**
LA68/2009	Lot 21, DP: 861508, 97 Elderslie Road, BRANXTON	4ha minimum lot size with 5ha minimum average lot size.	**Branxton North West**

NOTE

The land for ~~H~~Huntlee New Town" was rezoned as part of Amendment 35 to *State Environmental Planning Policy (Major Projects) 2005*. Details are available from the NSW Department of Planning's website: http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=1043

Council's online mapping tool, which is available from the Council website; may help in the identification of the land for your research.

I hope this information is helpful.

Cheers

Gary Pearson
B/Urban & Regional Planning Hons, MBA
Strategic Landuse Planner

Singleton Shire Council

T 02 6578 7304 ◆ **F** 02 6572 4197
Civic Centre, 12-14 Queen Street, Singleton NSW 2330
Postal Address PO Box 314, SINGLETON NSW 2330
DX 7063, SINGLETON NSW 2330
E gpearson@singleton.nsw.gov.au ◆ **www.singleton.nsw.gov.au**

From: Ryan Smith [mailto:Ryan.Smith@hyderconsulting.com]
Sent: Wednesday, 9 September 2009 2:49 PM
To: Pearson, Gary
Cc: golenia@bigpond.com; John Mcdermott; Gustavo Pereira
Subject: TRIM: re: LA 64 2008 Elderslie Rd Branxton - Water and Sewer Servicing Strategy

Gary,

Further to our brief conversation on Monday, the information we seek from Council primarily relates to proposed/potential developments in the area surrounding the above proposed development that will need to be taken into account when looking at providing water and sewer services to the site.

We have reviewed the Singleton Land Use Strategy (SLUS) and note that there are a number of candidate blocks flagged as potential Rural Residential development. It would be appreciated if you could assist us by providing further information on:

1. Land that is currently proposed to be developed and likely timeframes for development. In addition it would be helpful if you could identify density of development.
2. Land that may potentially be developed within the next 15 years that is not identified as 'candidate areas' in the SLUS and likely densities for this development.

We are trying to assess the likely water and sewer demands that we would need to take into account when providing a connection to the proposed development.

Feel free to give me a call to discuss.

Ryan Smith

Principal Engineer

Hyder Consulting Pty Ltd

Locked Bag 6503 North Sydney NSW 2060 Australia

Level 5, 141 Walker Street North Sydney NSW 2060 Australia

Phone: +61 (0) 2 89079000 I Fax: +61 (0) 2 8907 9001
Direct: +61 (0) 2 8907 8252 I Mob: +61 (0) 422 848 250
Web: www.hyderconsulting.com

Progressive engineering, environment and management solutions

Hunter Water Corporation
ABN 46 228 513 446
Customer Enquiries 1300 657 657
enquiries@hunterwater.com.au

PO Box 5171
HRMC NSW 2310
36 Honeysuckle Drive
NEWCASTLE NSW 2300

10 April 2012

Ref:2009-1553

Belford Land Corporation Pty Ltd
C/- Hunter Valley Surveyors Pty Ltd
P O Box 89
Singleton NSW 2330

Dear Sir

RE NOTICE OF FORMAL REQUIREMENTS FOR PROPOSED DEVELOPMENT

Hunter Water's requirements for the provision of water and sewerage facilities to the subdivision of 4 lots into 166 lots at Lot 13 DP 595347, Lot 22 DP 861508, Lot 121 DP 628116 & Lot 140 DP 619407, 137, 103A, 211 & 181 Elderslie Road , Branxton are as follows:

1 **It is a condition of this notice letter that formal evidence of Council approval and DA conditions be submitted to Hunter Water prior to the issuing of a Section 50 Certificate**.

2 Construct **Major Works**, (refer to the attached booklet) on behalf of Hunter Water, to connect each of the lots to the existing water and sewer system(s) of Hunter Water.

Construct water and sewer services to each of the proposed lots in accordance with the approved Water and Sewer Servicing Strategies. Please note that the water and sewer strategies have been submitted to Hunter Water and are currently being reviewed.

A Major Works assessment/administration fee of $2,299 should be paid when designs are submitted.

3 A reimbursement contribution may be required towards the cost of any water and sewer infrastructure that is constructed by a third party developer and utilised to serve this development. Reimbursements can not be determined until the connection points are defined. You will be advised of any reimbursements after the design plans are assessed and the connection points are approved (Refer to the attached guide).

4 Prior to providing final approval of designs, Hunter Water will require a Review of Environmental Factors (REF) to be submitted (refer Appendix HW 1 of Water Supply Code of Australia – Hunter Water Edition) covering the proposed watermain extension. A REF considers the likely impacts a development may have on the environment. At all times, methods for preventing or reducing adverse environmental impacts should be considered and where appropriate, incorporated into the project design. Hunter Water will make a determination in accordance with the EP& A Act 1979. An environmental report assessment fee of $623 should be paid when the REF is submitted

5 Please note that Hunter Water requires 3 copies of the final plan of subdivision and a DXF file of the subdivision showing only lot numbers and boundaries directly on the MGA grid. The lot boundaries should be produced directly from your calculation software, should be all edge matched and unbroken, and should also match as near as possible the final deposited plan of the subdivision. This information should be emailed to plan.check@hunterwater.com.au .

6 The investigation, survey and construction of water and wastewater infrastructure may require entry to an adjoining party property. It is the responsibility of the developer to arrange for entry with the affected landowner and have evidence of consent by way of a signed Entry Permit. The Permit is to be submitted prior to release of the signed contract.

The above requirements are valid for 12 months from the date of this letter and are specific to this development. Within this period Hunter Water's fees are subject to CPI adjustment. Please refer to the attached *Development and Design Assessment booklet*, which details the conditions under which water and sewer facilities are available to new customers. Hunter Water reserves the right to amend its requirements if we find an error has been made.

Yours faithfully

Paul McKoy
R/Senior Account Executive

Enquiries: Michael Breedon
Tel: 4979 9784
Email: michael.breedon@hunterwater.com.au
Your Ref: 08400

APPENDIX B – EXHIBITS

Exhibit A –Regional Plan

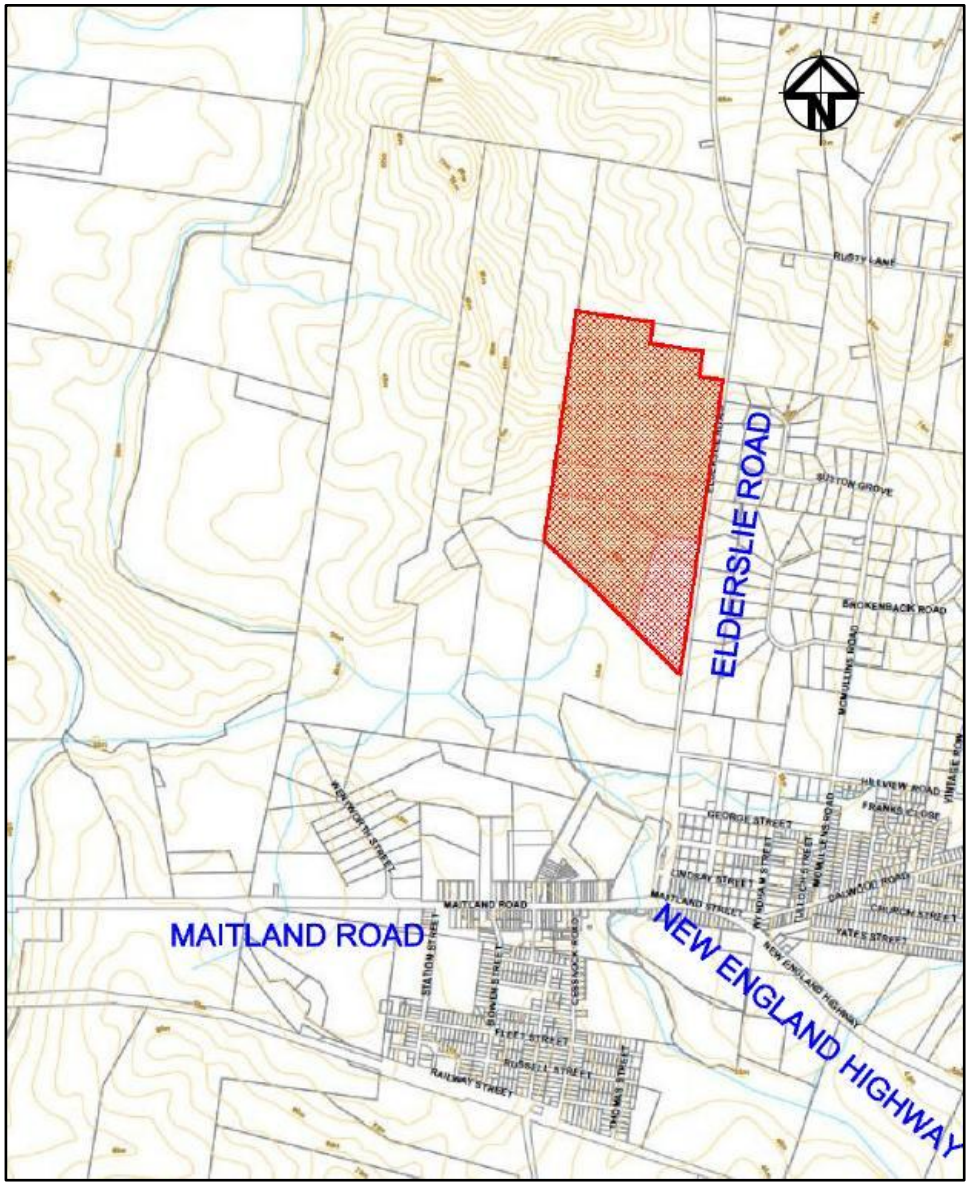


Exhibit A –Hunter Water Area of Operation

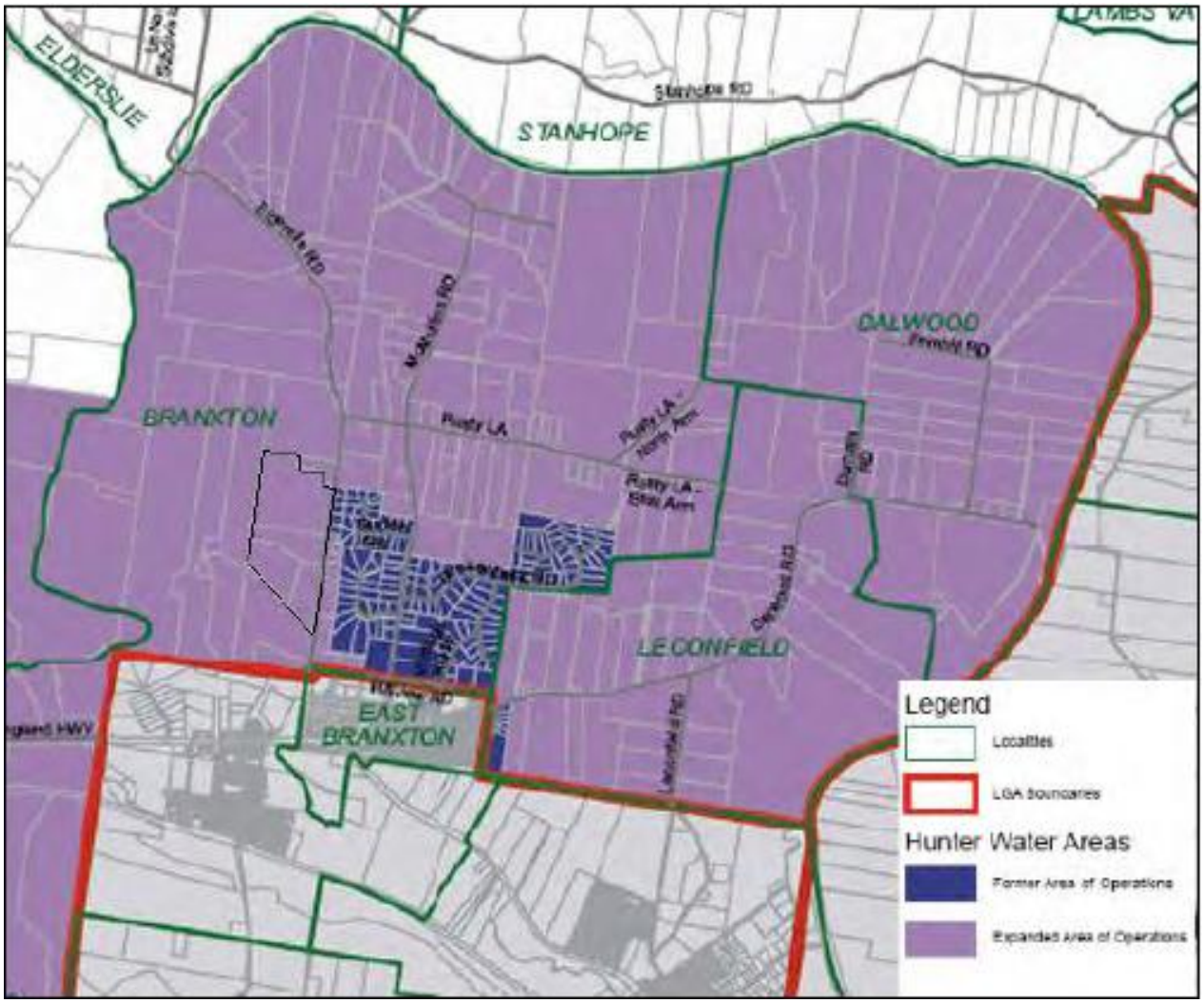


Exhibit B –Local Plan

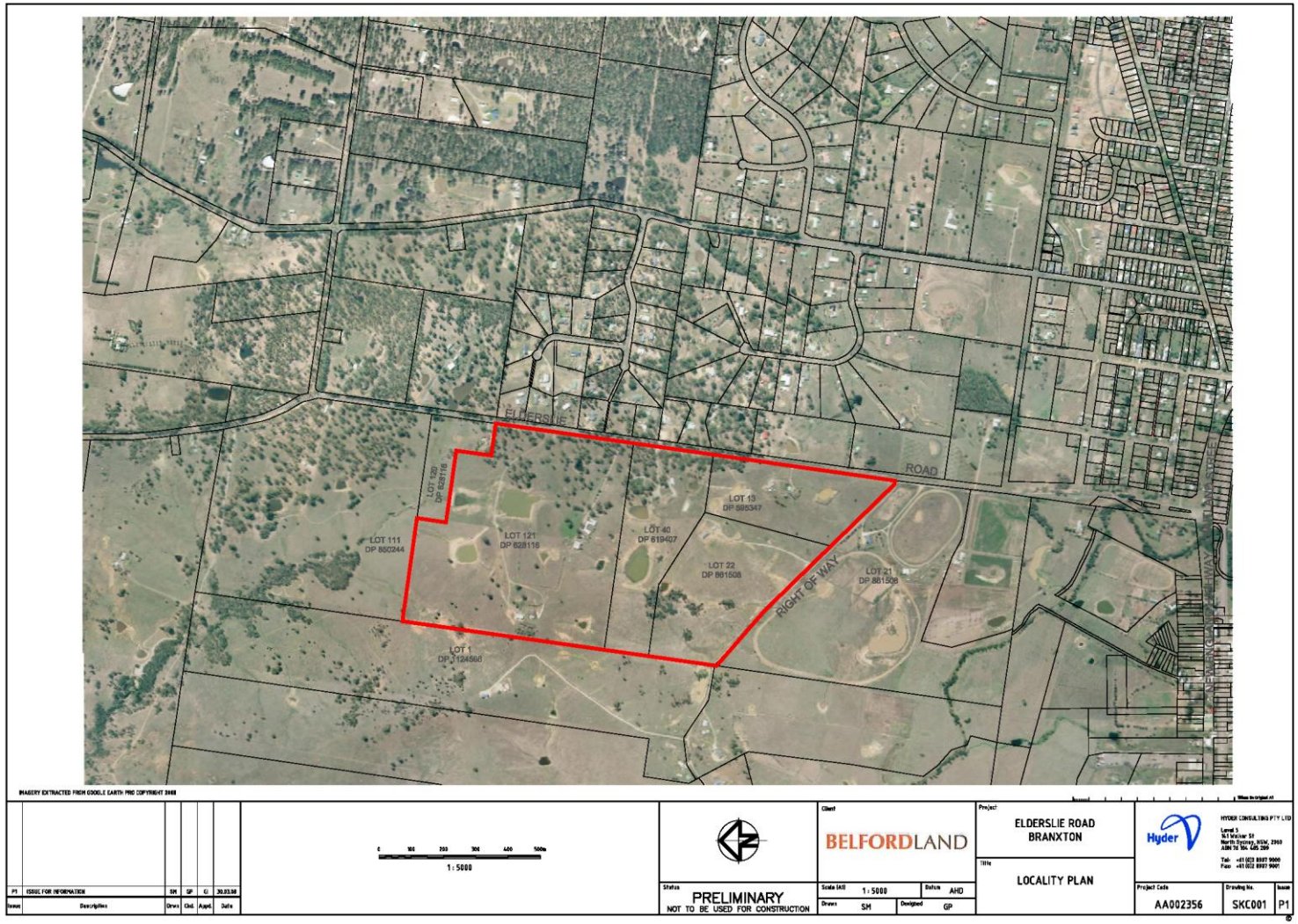


Exhibit C –Singleton Land Use Strategy

Exhibit D –Environmental Plan

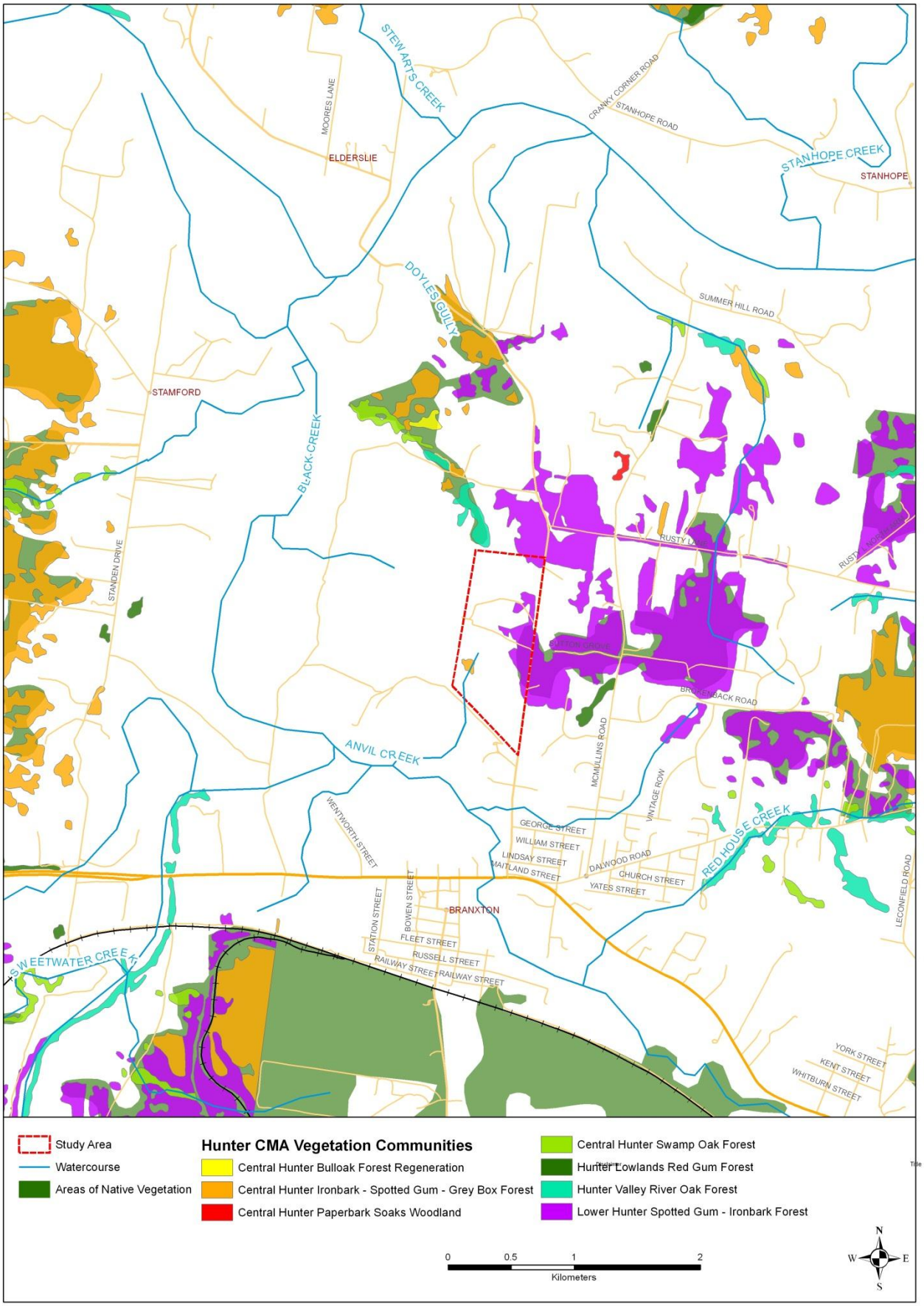


Exhibit E –Staging Plan

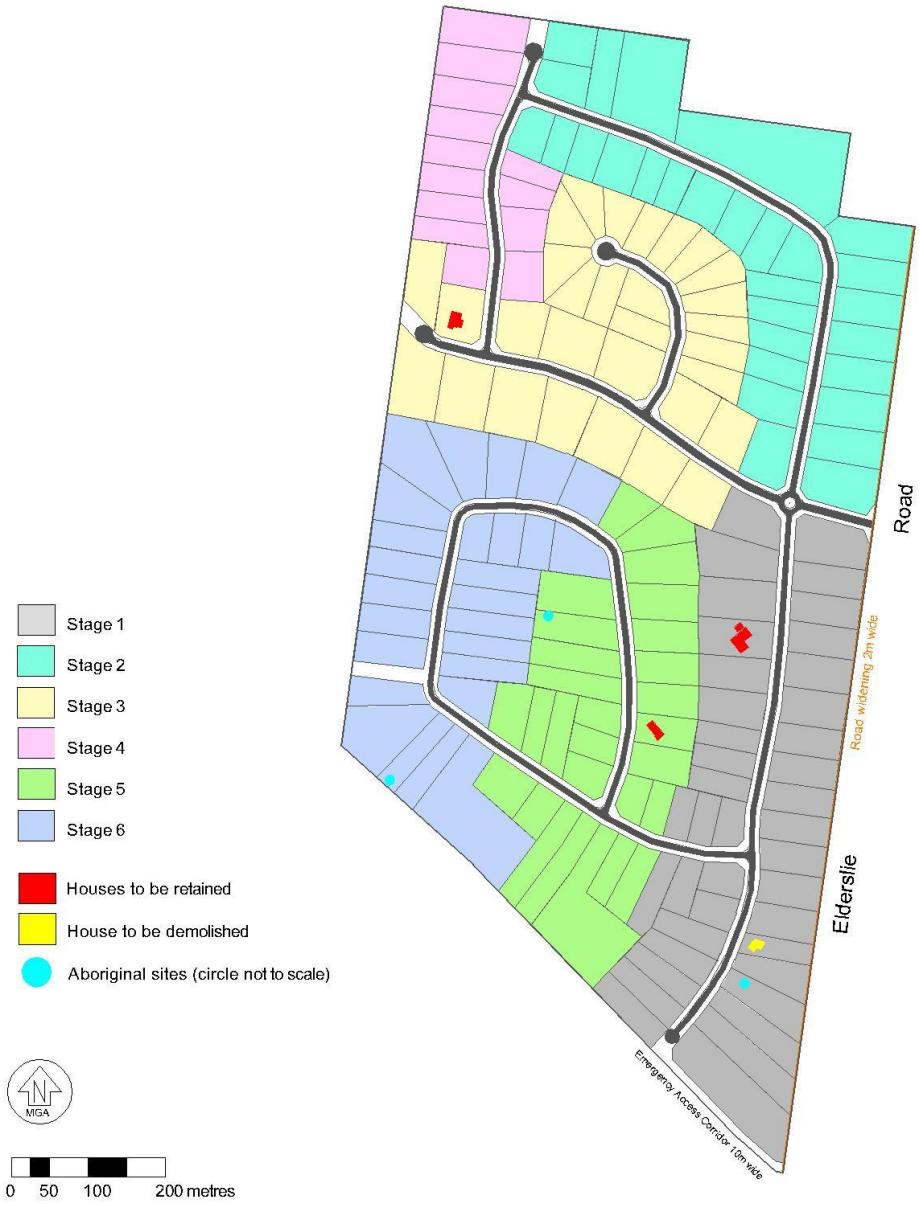


Exhibit F – Sewerage Network Infrastructure overlay on Topographical and Environmental Features

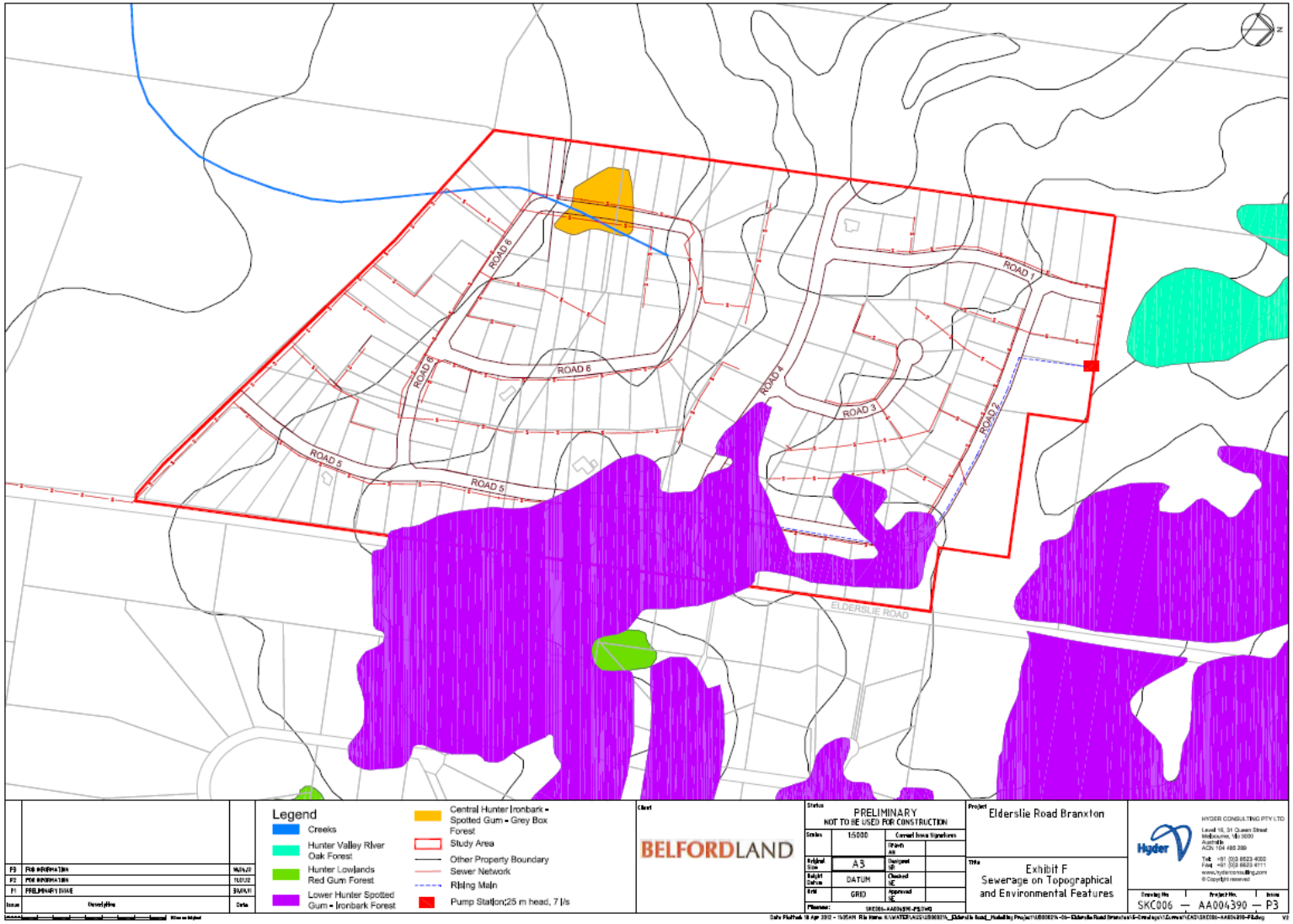
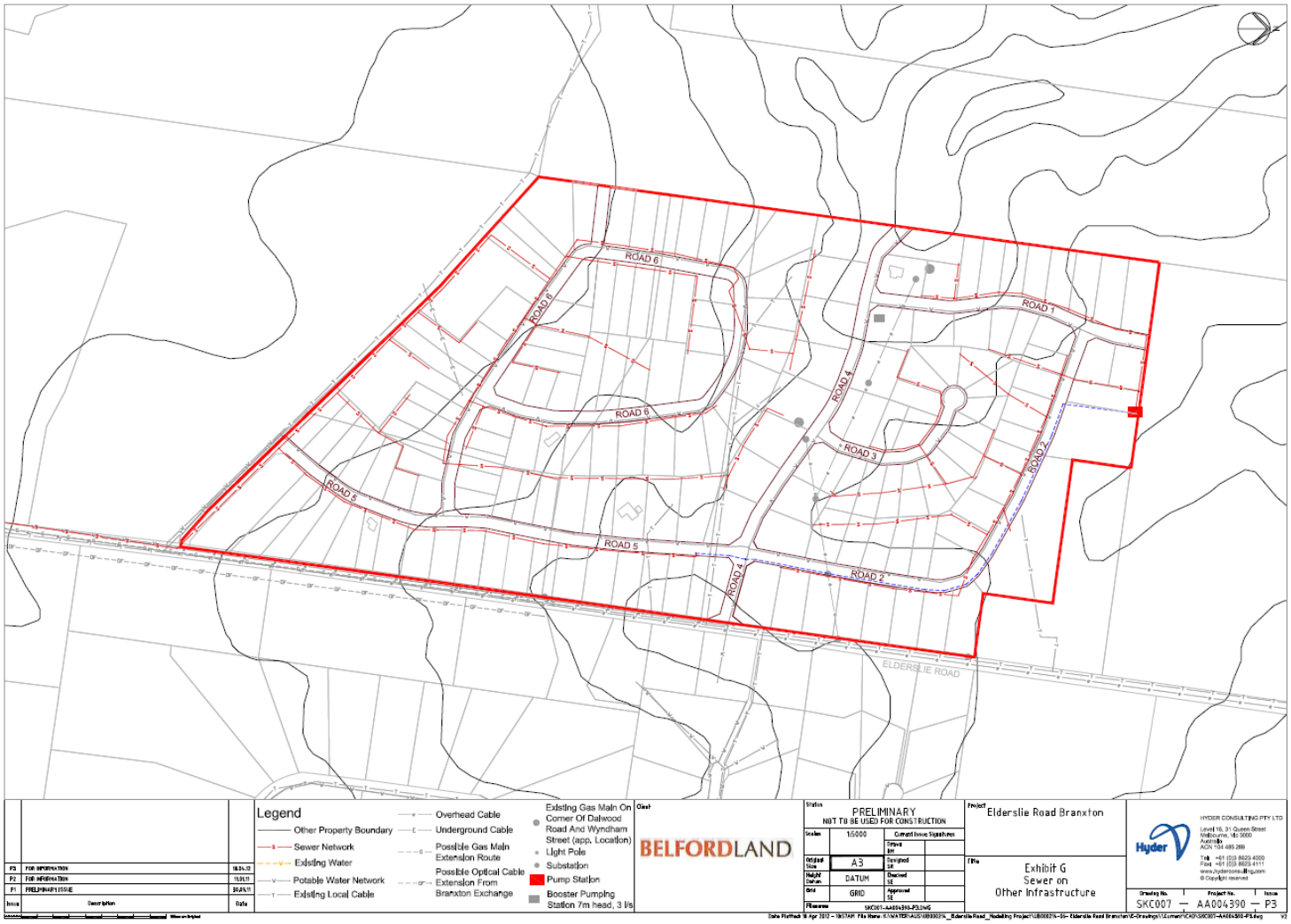


Exhibit G – Sewerage Network Infrastructure overlay on Other Infrastructure



APPENDIX C – OPTIONS REVIEW

Options Review - Sewerage

Option	Option Description	Demand Assessment	Constraints	Infrastructure requirements	Financial Assessment	Social Impact	Environmental Impact	Technical Assessment	Option Recommendation
1	Connection to existing system at Branxton 2 WWPS (Gravity only)	101 ET's from development & 23 ET's from adjacent development	Full development is not served by option. Ability to connect into Branxton 2 WWPS is dependent on available capacity	2,285 m of 150mm reticulation main, 270 m of 225 mm reticulation main, 180m of 300mm reticulation main and 760 m of 300 mm transfer main.	$2.19 M Present Value. $56k Operation and maintenance costs $0 replacement costs	Construction: * Potential disruption to traffic along Elderslie Road during construction	Construction: * 6,000m^2 construction footprint	Construction There will be minimal impact to the operation of existing assets.	Option does not allow for sewerage discharge for whole development. Option discarded.
2	Connection to existing system at Branxton 2 WWPS (Pump Station & Rising Main)	166 ET's from development & 179 ET's from adjacent developments "B", "C", "F", "G", "H" & "I".	Ability to connect into Branxton 2 WWPS is dependent on available capacity.	6,340 m of 150mm reticulation main, 270 m of 225mm reticulation main, 180m of 300 mm reticulation main and 760 m of 300 mm transfer main, 11,000 Litre pumping station and 860 m of 100 mm Rising Main.	$3.11M Present Value. $238k Operation and maintenance costs $34k replacement costs	Construction: * Potential disruption to traffic along Elderslie Road during construction Operation: * Potential for odour and noise impacts from pump station during operation	Construction: * 6,000m^2 for rising main + 400m^2 for pumping station construction footprint Operation: * Increase in enegy use/ demand due to operation of pump station	Construction There will be minimal impact to the operation of existing assets. Operation The pump station operation will provide discharge to all areas of the development. The pump station will require regular maintenance and operation.	Option provides discharge to Branxton 2 WWPS and services development. **Recommended option.**
3	Connection to existing system at Branxton 2 WWPS (Pump Station & Rising Main)	166 ET's from development & 23 ET's from adjacent developments "B" & "C". Northern and Western adjacent developments not serviced by transfer main.	Adjacent developments are not serviced by option. Ability to connect into Branxton 2 WWPS is dependent on available capacity.	6,340 m of 150mm reticulation main, 690 m of 225 mm reticulation main, 760 m of 225 mm transfer main, 11,000 Litre pumping station and 860 m of 100 mm Rising Main.	$2.24M Present Value. $243k Operation and maintenance costs $34k replacement costs	Construction: * Potential disruption to traffic along Elderslie Road during construction Operation: * Potential for odour and noise impacts from pump station during operation	Construction: * 6,000m^2 for rising main + 400m^2 for pumping station construction footprint Operation: * Increase in enegy use/ demand due to operation of pump station	Construction There will be minimal impact to the operation of existing assets. Operation The pump station operation will provide discharge to all areas of the development. The pump station will require regular maintenance and operation.	Option does not allow for sewerage discharge of adjacent developments "F", "G", "H" and "I". Option discarded.

Assumptions:
- All pipe work will be buried at a maximum depth of 2.5m (i.e. no benching required)
- Area of disturbance for pipeline installation is approximately 6 m width along the corridor

APPENDIX D – OUTPUT FROM PIPELINE AND PUMP STATION ESTIMATING GUIDELINES

PROJECT DESCRIPTION: Elderslie Road, Branxton - Sewerage Infrastructure

Item No.	Item Description	Qty	Unit	Rate $/Unit	Amount $	Application of Schedule of Rates
HW0001	All work not included elsewhere in this schedule	Item	Lump Sum	$ 32,666.00	$ 32,666.00	**Payment**: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0002	Site Establishment <Insert Max $>	Item	Lump Sum	$ 30,000.00	$ 30,000.00	**Payment**: 100% after completion.
HW0003	Site Disestablishment <Insert Min $>	Item	Lump Sum	$ 30,000.00	$ 30,000.00	**Payment**: 100% after completion.
HW0004	Preparation and implementation of the Construction EMP	Item	Lump Sum	$ 23,000.00	$ 23,000.00	**Payment**: Maximum of 30% on submission of complying Construction EMP, then 10% per month up to maximum of 80%. Remainder at Practical Completion. **Submit:** Construction EMP.
HW0005	Preparation and implementation of the Safety Management Plan.	Item	Lump Sum	$ 50,000.00	$ 50,000.00	**Payment**: Maximum of 30% on submission of complying plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion. **Submit:** Safety Management Plan.
HW0006	Preparation and implementation of the Traffic Control Plan.	Item	Lump Sum	$ 23,320.00	$ 23,320.00	**Payment**: Maximum of 30% on submission of complying Traffic Control Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.
HW0007	Preparation and Implementation of Quality Management Plan	Item	Lump Sum	$ 17,133.22	$ 17,133.22	**Payment**: Maximum of 30% on submission of complying Quality Management Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.

Sewer Pipeline - Gravity - section will be present if one or more gravity mains are specified

Item	Construction of Sewer Gravity Mains	Qty	Unit	Rate $/Unit	Amount $	Application of Schedule of Rates
HWG001	Service Location	Item	Lump Sum	$ 4,937.25	$ 4,937.25	**Payment**: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HWG005	Clear, excavate, lay, join, bed, backfill & test pipelines (installation). Up to **1.5 m** depth to invert in OTR.					**Measurement:** Actual metres of pipe installed with design depth of excavation up to and including 1.5m. **Retention:** 10% <or other appropriate percentage> until satisfactory testing. **Submit:** Relevant Quality Records including as constructed lengths, levels and coordinates. **Limits of Accuracy:** <To be inserted>.
00FV03	Nominal DN150 PVC (Trench type 3)	4998	m	$ 85.40	$ 426,829.20	
016V03	Nominal DN225 PVC (Trench type 3)	272	m	$ 92.40	$ 25,132.80	
01EV03	Nominal DN300 PVC (Trench type 3)	527	m	$ 108.25	$ 57,047.75	
HWG006	Clear, excavate, lay, join, bed, backfill & test pipelines (installation). Nominal depth **>1.5m** to **3.0m** depth to invert in OTR					**Measurement:** Actual metres of pipe installed with design depth of excavation > 1.5m to and including 3.0m. **Retention:** 10% <or other appropriate percentage> until satisfactory testing. **Submit:** Relevant Quality Records including as constructed lengths, levels and coordinates. **Limits of Accuracy:** <To be inserted>.
00FV03	Nominal DN150 PVC (Trench type 3)	1350	m	$ 136.40	$ 184,140.00	
01EV03	Nominal DN300 PVC (Trench type 3)	760	m	$ 203.40	$ 154,584.00	
HWG009	Excavate, backfill, supply and install access chambers including base, chamber, cover & surround and access ladder for the following nominal diameter access chambers:					**Measurement:** Actual metres of access chamber installed measured from surface level to invert of outlet pipe. **Retention:** 10% <or other appropriate percentage> until satisfactory testing. **Submit:** Relevant Quality Records including as constructed lengths, levels and coordinates. **Limits of Accuracy:** <To be inserted>.

HWG009.01	DN900 Access Chamber	93	m	$ 2,512.81	$ 233,691.00	
HWG027	Preparation of line sheets	7907	each	$ 1.00	$ 7,907.00	**Measurement:** Length of pipelines constructed as per design. **Limits of Accuracy:** <To be inserted>.
HWG029	**Miscellaneous**					
HWG000	***Sub Total***				$1,094,269	

Sewer Pipeline - Rising - section will be present if one or more rising mains are specified

Item	Construction of Sewer Rising Mains	Qty	Unit	Rate $/Unit	Amount $	Application of Schedule of Rates
HWR001	Service Location	Item	Lump Sum	$ 514.20	$ 514.20	**Payment**: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HWR006	Clear, excavate, lay, join, bed, backfill & test pipelines (installation). Nominal depth **>1.5m to 3.0m** to invert in OTR.					**Measurement:** Actual metres of pipe installed with design depth of excavation > 1.5m to and including 3.0m. **Retention:** 10% <or other appropriate percentage> until satisfactory testing. **Submit:** Relevant Quality Records including as constructed lengths, levels and coordinates. **Limits of Accuracy:** <To be inserted>.
10AD03	Nominal DN100 DICL (Trench type 3)	857	m	$ 112.40	$ 96,326.80	
HWR027	Preparation of line sheets	857	m	$ 1.00	$ 857.00	**Measurement:** Length of pipelines constructed as per design. **Limits of Accuracy:** <To be inserted>.
HWR029	**Miscellaneous**					
HWR000	***Sub Total***				$97,698	

Sewer Pumping Station 10kW

Item	*Pump Station - Name*	Qty	Unit	Rate $/Unit	Amount $	Application of Schedule of Rates
HW0501	**Sewer Pumping Station 10kW 1.5m dia 1 Pump(s)**					
	Clear, excavate & backfill in OTR conditions, supply and construct pipework, pump station, includes sliding aluminium hatch covers, screens & ancillary metal work & fittings. Supply & place formwork, reinforcement, concrete, roof slab, thrust blocks.	Item	Lump Sum	$ 150,000.00	$ 150,000.00	**Payment**: <Insert appropriate percentages to reflect the value of work at key milestones eg excavation, pump well, metalwork etc>. **Submit:** Relevant Quality Records.
HW0502	**Pumps for Pumping Stations -** Supply and install pumps and associated fittings, connection to pipework, testing and commissioning.	1	Lump Sum	$ 12,825.00	$ 12,825.00	**Payment**: <Insert appropriate percentages for key milestones eg installation, precommissioning, commissioning>. **Submit:** Relevant Quality Records including those for pump test.
HW0503	**Pumping Station Electricals**					
HW0503.01	Pit and Conduit System	Item	Lump Sum	$ 4,812.50	$ 4,812.50	**Payment**: Percentage of work completed. **Submit:** Relevant Quality Records.
HW0503.02	LV Station Power Supply	Item	Lump Sum	$ 5,625.00	$ 5,625.00	**Payment**: Percentage of work completed. **Submit:** Relevant Quality Records.
HW0503.05	Switchboard	Item	Lump Sum	$ 38,750.00	$ 38,750.00	**Payment**: Percentage of work completed. **Submit:** Relevant Quality Records.
HW0503.06	PLC / Telemetry Hardware	Item	Lump Sum	$ 10,625.00	$ 10,625.00	**Payment**: Percentage of work completed. **Submit:** Relevant Quality Records.
HW0503.07	PLC / Telemetry / Scada Engineering and Software Development	Item	Lump Sum	$ 23,125.00	$ 23,125.00	**Payment**: Percentage of work completed. **Submit:** Relevant Quality Records.
HW0503.11	Installation/Cabling (Electrical)	Item	Lump Sum	$ 9,975.00	$ 9,975.00	**Payment**: Percentage of work completed. **Submit:** Relevant Quality Records.

HW0506	**Service Location**	Item	Lump Sum	$ 135.00	$ 135.00	**Payment**: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0515	Acid sulphate soil					
HW0515.01	Initial testing for acid sulphate soils and prepare and submit report	5	per test	$ 110.00	$ 550.00	**Submit:** Result for each test. **Limits of Accuracy:** <To be inserted>
HW0530	Pre commissioning and commissioning	Item	Lump Sum	$ 8,000.00	$ 8,000.00	**Payment**: 50% at completion of satisfactory precommissioning. Remainder at Practical Completion. **Submit:** Relevant Quality Records.
HW0531	Preparation and submission of Work as Constructed Information	Item	Lump Sum	$ 6,000.00	$ 6,000.00	**Payment:** 100% at Practical Completion. **Submit:** Complying Work As Constructed Information.
HW5SP	***Sub Total***				$270,423	

Item No.	Item Description	Qty	Unit		Amount $	Application of Schedule of Rates
HW0013	Work as Constructed Information <Insert Min $>	Item	Lump Sum	$ 70,112.00	$ 70,112.00	**Payment**: 100% at Practical Completion.

A.	**TOTAL ESTIMATED CONTRACT AWARD SUM**	$ 1,738,620.72

B.	**PRE-CONSTRUCTION COST (Table 10)**	
HW0016	Design	$ 208,634.49
HW0017	Project Management of Design	$ 51,726.90
HW0024	Community Consultation	
	Sub Total(B1)	$ 260,361.38
	Pre construction contingency (30% of B1)	$ 78,108.42
	TOTAL PRE-CONSTRUCTION COST (B)	$ 338,469.80

C.	**CONSTRUCTION COST**	
	Total Estimated Contract Award Sum (A)	$ 1,738,620.72
00FVSS	Nominal DN150 PVC pipe	$ 76,176.00
016VSS	Nominal DN225 PVC pipe	$ 9,520.00
01EVSS	Nominal DN300 PVC pipe	$ 87,516.00
10ADSS	Nominal DN100 DICL pipe	$ 29,995.00
HW0023	Construction Management (Table 11)	$ 173,862.07
	Sub Total (C1)	$ 2,115,689.80
	Construction contingency (Table 12) (30% of C1) Preliminary Estimate	$ 634,706.94
	TOTAL CONSTRUCTION COST (C)	$ 2,750,396.74

	TOTAL PRELIMINARY PROJECT ESTIMATE (B+C) (Preliminary Estimate)	$ 3,088,866.54

APPENDIX E – EXAMPLE OF COST EFFECTIVE ANALYSIS

Option Reference	Elderslie Road, Sewerage	Option B
Real Discount Rate		7.0%

Costs

2010/2011 Energy Cost	0.157	/ kWh
Annual Real Energy Increase	2.18%	
2010/2011 GHG Cost	25.00	/ tonnes CO_2-e
Real GHG Increase	3.52%	

								1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
FY Ending		**Units**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Discount Factor			1.00	0.93	0.86	0.80	0.75	0.70	0.65	0.60	0.56	0.52	0.48	0.45	0.42	0.39	0.36	0.34	0.31	0.29	0.27	0.25	0.23	0.22	0.20	0.19	0.18	0.16	0.15	0.14	0.13	0.12
Developer Capital Costs ($ 2010/2011)																																
Water Supply																																
Mains		$																														
Pump Station		$																														
Resevoir		$																														10,630
Telementry & SCADA		$																	-													
Chemical Dosing		$																														
Total Water Supply Cost		*$*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*10,630*
Sewer																																
Mains		$	1,850,742	302,613	143,286	202,471	216,292																									
Pump Station		$		270,423																												
Telementry & SCADA		$																														
Chemical Dosing		$																														
Total Sewer Cost		*$*	*1,850,742*	*573,036*	*143,286*	*202,471*	*216,292*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Developer Capital Costs		**$**	**1,850,742**	**573,036**	**143,286**	**202,471**	**216,292**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**10,630**
Total Developer PV	**2,833,546**	**$**	**1,850,742**	**532,924**	**123,928**	**162,859**	**161,798**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1,296**
HWC Capital Costs ($ 2010/2011)																																
Water Supply																																
Mains		$																														
Pump Station		$																														
Resevoir		$																														
Telementry & SCADA		$																														
Chemical Dosing		$																														
Total Water Supply Cost		*$*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sewer																																
Mains		$																														
Pump Station	3.00%	$																														26852.70
Telementry & SCADA	3.00%	$																					$52,581									$151,799
Chemical Dosing		$																														
Total Sewer Cost		*$*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*52,581*	-	-	-	-	-	-	-	-	*178,652*
Total HWC Capital Costs		**$**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**52,581**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**178,652**
Total HWC Capital PV	**34,094**	**$**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**12,317**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**21,778**
HWC Operating Costs ($ 2010/2011)																																
Water Supply																																
Mains	#DIV/0!	$				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pump Station	3.00%	$																														
Resevoir	#DIV/0!	$				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical Dosing	#DIV/0!	$				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Water Supply Cost		*$*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sewer																																
Mains	#DIV/0!	$																														
Pump Station	3.00%	$				9,000	9,270	9,548	9,835	10,130	10,433	10,746	11,069	11,401	11,743	12,095	12,458	12,832	13,217	13,613	14,022	14,442	14,876	15,322	15,782	16,255	16,743	17,245	17,762	18,295	18,844	19,409	19,992
Chemical Dosing	#DIV/0!	$																														
Total Sewer Cost		*$*	-	-	*9,000*	*9,270*	*9,548*	*9,835*	*10,130*	*10,433*	*10,746*	*11,069*	*11,401*	*11,743*	*12,095*	*12,458*	*12,832*	*13,217*	*13,613*	*14,022*	*14,442*	*14,876*	*15,322*	*15,782*	*16,255*	*16,743*	*17,245*	*17,762*	*18,295*	*18,844*	*19,409*	*19,992*
Energy																																
kWh/year		kWh/year	-	-	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526	4,526
$/kWh	2.18%	$/kWh	0.156	0.162	0.169	0.176	0.183	0.191	0.199	0.207	0.215	0.230	0.233	0.246	0.252	0.254	0.250	0.254	0.256	0.261	0.262	0.265	0.265	0.269	0.271	0.282	0.281	0.282	0.281	0.291	0.280	0.287
Total Energy Cost		*$*	-	-	*764*	*796*	*829*	*863*	*899*	*936*	*974*	*1,041*	*1,056*	*1,112*	*1,141*	*1,149*	*1,131*	*1,149*	*1,158*	*1,182*	*1,186*	*1,197*	*1,197*	*1,216*	*1,226*	*1,277*	*1,273*	*1,278*	*1,272*	*1,318*	*1,267*	*1,301*
GHG Costs																																
kg CO_2-e/kWh		kg CO_2-e/kWh	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Tonnes CO_2-e		Tonnes CO_2-e	-	-	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
$ / tonne CO_2-e	3.52%	$	25.00	25.88	26.79	27.73	28.71	29.72	30.77	31.85	32.97	34.13	35.33	36.58	37.86	39.20	40.58	42.01	43.48	45.01	46.60	48.24	49.94	51.70	53.51	55.40	57.35	59.37	61.46	63.62	65.86	68.18
GHG Cost		*$*	-	-	*108*	*112*	*116*	*120*	*124*	*128*	*133*	*138*	*142*	*147*	*153*	*158*	*164*	*169*	*175*	*181*	*188*	*194*	*201*	*208*	*216*	*223*	*231*	*239*	*248*	*256*	*265*	*275*
Total Operating Costs		**$**	**-**	**-**	**9,872**	**10,177**	**10,492**	**10,817**	**11,152**	**11,498**	**11,854**	**12,247**	**12,599**	**13,003**	**13,389**	**13,765**	**14,126**	**14,535**	**14,947**	**15,385**	**15,816**	**16,267**	**16,720**	**17,206**	**17,697**	**18,243**	**18,749**	**19,280**	**19,815**	**20,419**	**20,941**	**21,567**
Total Operating PV	**142,071**	**$**	**-**	**-**	**8,538**	**8,186**	**7,849**	**7,525**	**7,215**	**6,918**	**6,633**	**6,373**	**6,098**	**5,853**	**5,605**	**5,359**	**5,114**	**4,894**	**4,680**	**4,480**	**4,283**	**4,097**	**3,917**	**3,748**	**3,585**	**3,437**	**3,285**	**3,142**	**3,003**	**2,878**	**2,745**	**2,629**
HWC Maintenance Costs ($ 2010/2011)																																
Water Supply																																
Mains	3.00%	$																														
Pump Station	#DIV/0!	$																														
Resevoir	#DIV/0!	$																														
Chemical Dosing	#DIV/0!	$																														
Total Water Supply Cost		*$*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sewer																																
Mains	3.00%	$				6,575	6,772	6,975	7,185	7,400	7,622	7,851	8,086	8,329	8,579	8,836	9,101	9,374	9,656	9,945	10,244	10,551	10,867	11,193	11,529	11,875	12,231	12,598	12,976	13,366	13,767	14,180
Pump Station	3.00%	$				1,720	1,772	1,825	1,879	1,936	1,994	2,054	2,115	2,179	2,244	2,312	2,381	2,452	2,526	2,602	2,680	2,760	2,843	2,928	3,016	3,107	3,200	3,296	3,395	3,496	3,601	3,709
Chemical Dosing	#DIV/0!	$																														
Total Sewer Cost		*$*	-	-	-	*8,295*	*8,544*	*8,800*	*9,064*	*9,336*	*9,616*	*9,905*	*10,202*	*10,508*	*10,823*	*11,148*	*11,482*	*11,827*	*12,181*	*12,547*	*12,923*	*13,311*	*13,710*	*14,122*	*14,545*	*14,982*	*15,431*	*15,894*	*16,371*	*16,862*	*17,368*	*17,889*
Total Maintenance Costs		**$**	**-**	**-**	**-**	**8,295**	**8,544**	**8,800**	**9,064**	**9,336**	**9,616**	**9,905**	**10,202**	**10,508**	**10,823**	**11,148**	**11,482**	**11,827**	**12,181**	**12,547**	**12,923**	**13,311**	**13,710**	**14,122**	**14,545**	**14,982**	**15,431**	**15,894**	**16,371**	**16,862**	**17,368**	**17,889**
Total Maintenance PV	**108,866**	**$**	**-**	**-**	**-**	**6,672**	**6,391**	**6,122**	**5,864**	**5,618**	**5,381**	**5,154**	**4,937**	**4,730**	**4,531**	**4,340**	**4,157**	**3,982**	**3,814**	**3,654**	**3,500**	**3,353**	**3,212**	**3,076**	**2,947**	**2,823**	**2,704**	**2,590**	**2,481**	**2,377**	**2,277**	**2,181**
Total O & M Costs		**$**	**-**	**-**	**9,872**	**18,472**	**19,036**	**19,617**	**20,216**	**20,834**	**21,470**	**22,152**	**22,801**	**23,511**	**24,212**	**24,913**	**25,609**	**26,361**	**27,128**	**27,932**	**28,739**	**29,578**	**30,431**	**31,328**	**32,242**	**33,224**	**34,180**	**35,174**	**36,186**	**37,281**	**38,309**	**39,456**
Total O & M PV	**250,937**	**$**	**-**	**-**	**8,538**	**14,858**	**14,240**	**13,648**	**13,080**	**12,536**	**12,014**	**11,528**	**11,035**	**10,582**	**10,135**	**9,698**	**9,271**	**8,876**	**8,495**	**8,134**	**7,783**	**7,450**	**7,128**	**6,825**	**6,532**	**6,260**	**5,989**	**5,732**	**5,484**	**5,254**	**5,021**	**4,810**
Lifecycle Costs		**$**	**1,850,742**	**573,036**	**153,158**	**220,943**	**235,329**	**19,617**	**20,216**	**20,834**	**21,470**	**22,152**	**22,801**	**23,511**	**24,212**	**24,913**	**25,609**	**26,361**	**27,128**	**27,932**	**28,739**	**29,578**	**83,012**	**31,328**	**32,242**	**33,224**	**34,180**	**35,174**	**36,186**	**37,281**	**38,309**	**228,738**
Total PV (Inc GHG)	**3,118,578**	**$**	**1,850,742**	**532,924**	**132,466**	**177,717**	**176,038**	**13,648**	**13,080**	**12,536**	**12,014**	**11,528**	**11,035**	**10,582**	**10,135**	**9,698**	**9,271**	**8,876**	**8,495**	**8,134**	**7,783**	**7,450**	**19,445**	**6,825**	**6,532**	**6,260**	**5,989**	**5,732**	**5,484**	**5,254**	**5,021**	**27,883**
Total PV (Ex GHG)	**3,116,938**	**$**	**1,850,742**	**532,924**	**132,373**	**177,627**	**175,951**	**13,564**	**13,000**	**12,458**	**11,940**	**11,456**	**10,966**	**10,516**	**10,071**	**9,637**	**9,212**	**8,819**	**8,440**	**8,081**	**7,733**	**7,401**	**19,398**	**6,779**	**6,488**	**6,218**	**5,949**	**5,693**	**5,446**	**5,218**	**4,987**	**27,850**

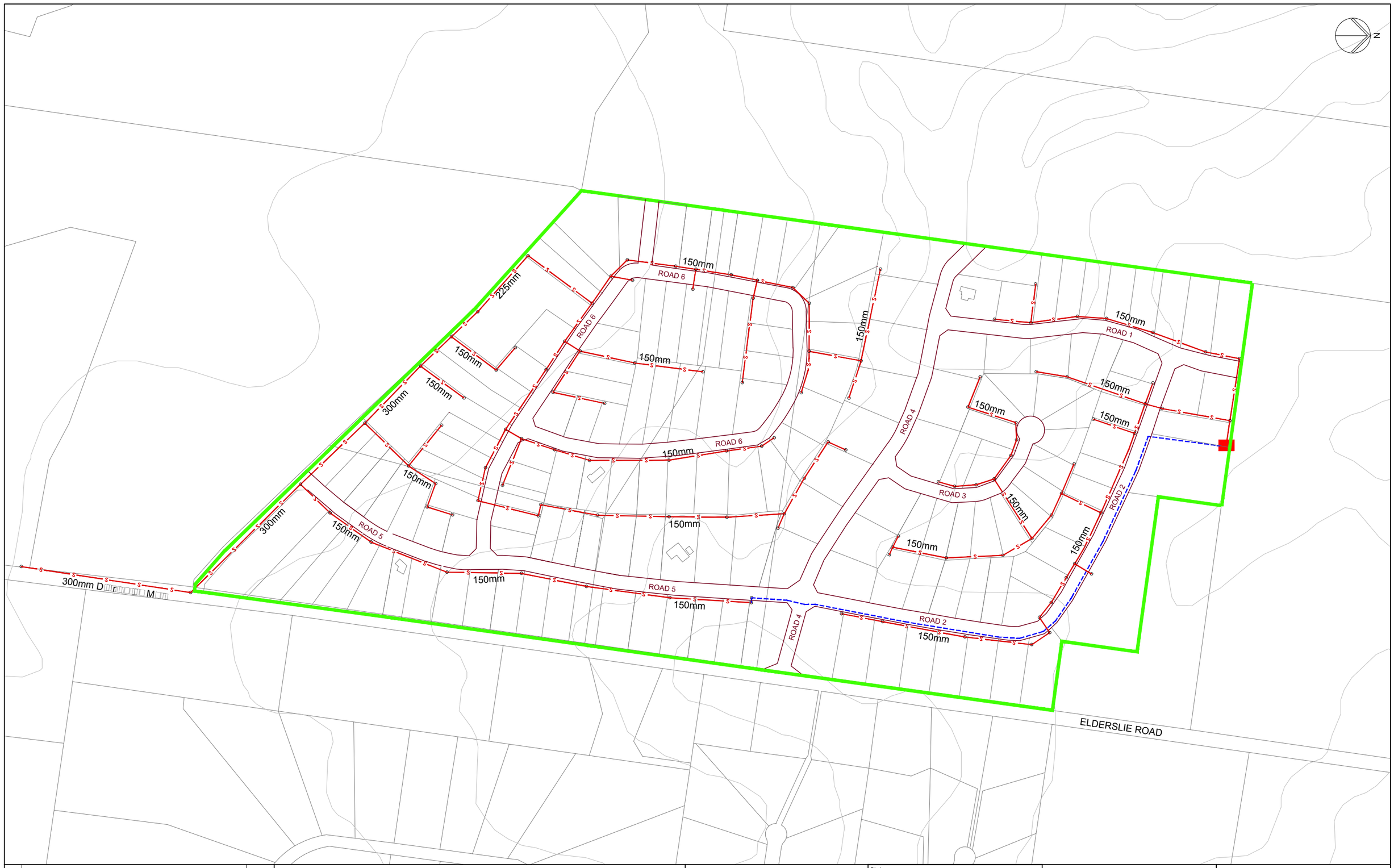
Assumptions

1. Replacement cost of telemetry at 15 years and 25 years after installation
2. Replacement cost of pumps is at 25 years after installation.
3. CPI increase at 3% per year

APPENDIX F – OPTIONS PRESENTATION

Options Presentation - Sewerage

Option	Option Description	Demand Assessment	Constraints	Infrastructure requirements	Financial Assessment	Social Impact	Environmental Impact	Technical Assessment	Option Recommendation
2	Connection to existing system at Branxton 2 WWPS (Transfer Main, Pump Station & Rising Main)	166 ET's from development & 179 ET's from adjacent developments "B", "C", "F", "G", "H" & "I". Total load rates development is as follows: ADWF = 3.81 L/s PDWF = 13.02 L/s PWWF = 33.00 L/s Proposed infrastructure will meet the demand requirements.	Pipelines and Pump station to be designed to Hunter Water standards. Further design to be completed in detailed design. Proposed infrastructure will meet the discharge requirements as per Hunter Water's Water and Sewer design manual.	* 6,340 m of 150mm reticulation main * 270 m of 225 mm reticulation main * 180 m of 300 mm reticulation main * 760 m of 300 mm transfer main * 11,000 Litre pumping station * 860 m of 100 mm Rising Main	$3.11M Present Value. $238k Operation and maintenance costs $34k replacement costs	Construction: * Potential disruption to traffic along Elderslie Road during construction Operation: * Potential for odour and noise impacts from pump station during operation	Construction: * 6,000m^2 for rising main + 400m^2 for pumping station construction footprint Operation: * Increase in enegy use/ demand due to operation of pump station	Construction * There will be minimal impact to the operation of existing assets. * Proposed assets to be designed in accordance with HW design manual. Operation * The pump station operation will provide ability to discharge to all areas of the development. * The pump station will require regular maintenance and operation. * Pump station and pipe network designed to reduce maintenance.	Option provides ability for whole development and adjacent developments to be serviced. **Option to be taken forward for detailed design.**



Issue	Description	Date
P4	FOR INFORMATION	19.03.12
P3	FOR INFORMATION	16.03.12
P2	FOR INFORMATION	11.01.12
P1	PRELIMINARY ISSUE	30.09.11

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- S□d□Ar□□
- D□□□□□m□□□L□□□
- Ex□□□□□ L□□□
- R□□□□ M□□□
- S□□□r N□□□r□
- C□□□□r 10m
- □□m□S□□□□□:25 m □□□d□7 /□

Client: BELFORDLAND

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Scales	1:5000	Current Issue Signatures	
		Drawn	AN
Original Size	A3	Designed	SR
Height Datum	DATUM	Checked	SE
Grid	GRID	Approved	SE

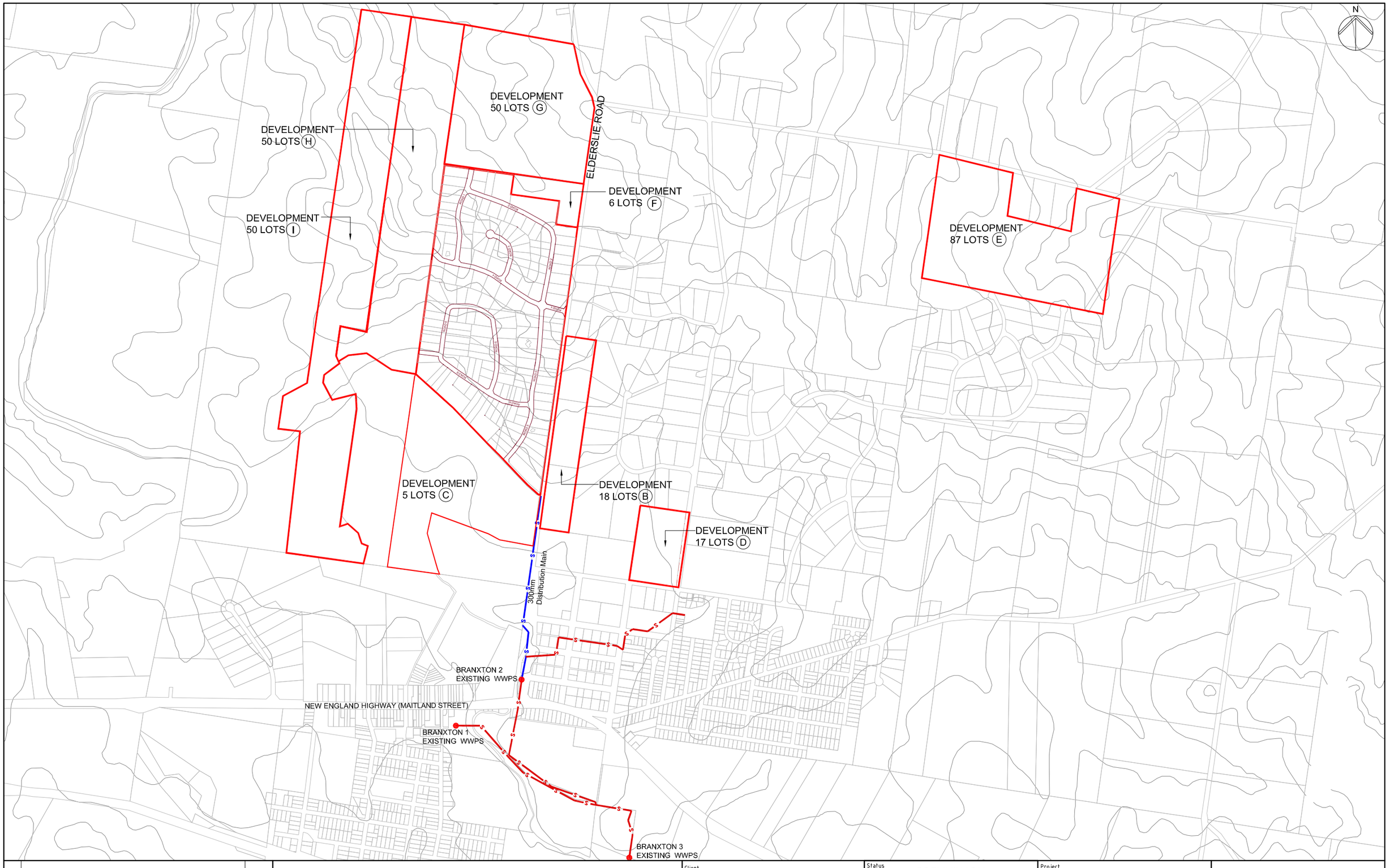
Filename: SKC009-AA004390-P3.DWG

Project: Elderslie Road Branxton

Title: Appendix-F
Internal Sewer Servicing

H□DER CONSULTING □T□ LTD
L□□□□16□31 □ □□□□□S□r□□□
M□□□□□r□□□V□3000
A□□r□□□
ACN 104 485 289
T□□: □61 (0)3 8623 4000
F□x: □61 (0)3 8623 4111
□□□□.□□d□r□□□□□□□□□□□□m

Drawing No.	Project No.	Issue
SKC009	AA004390	P4



Issue	Description	Date
P2	FOR INFORMATION	12.01.12
P1	PRELIMINARY ISSUE	30.09.11

100mm on Original

LEGEND

- Development Area
- Study Area
- Development Lots
- Existing Lots
- New Distribution Main
- Existing Sewer
- Contour 10m

Client: BELFORDLAND

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

		Current Issue Signatures	
Scales	1:16000	AN	
Original Size	A3	SR	
Height Datum	DATUM	SE	
Grid	GRID	SE	

Filename: SKC008-AA004390-P2.DWG

Project: Elderslie Road Branxton

Title: Appendix-F
Regional Details for Sewerage

HYDER CONSULTING PTY LTD
Level 16, 31 Queen Street
Melbourne, Vic 3000
Australia
ACN 104 485 289
Tel: +61 (0)3 8623 4000
Fax: +61 (0)3 8623 4111
www.hyderconsulting.com

Drawing No.	Project No.	Issue
SKC008	AA004390	P2

Date Plotted: 12 Jan 2012 - 12:05PM File Name: K:\WATER\AUS\UB000214_Elderslie Road_Modelling Project\UB000214-06- Elderslie Road Branxton\E-Drawings\1.Current\CAD\SKC008-AA004390-P2.dwg V2

APPENDIX G – INFOWORKS CS MODEL SCHEMATIC AND RESULTS

Issue	Description	Date
P2	PRELIMINARY ISSUE	18.04.12
P1	PRELIMINARY ISSUE	12.01.12

100mm on Original

LEGEND

- INFOWORKS MODEL
- RISING MAIN
- PUMP STATION

Client: BELFORDLAND

Status: **PRELIMINARY**
NOT TO BE USED FOR CONSTRUCTION

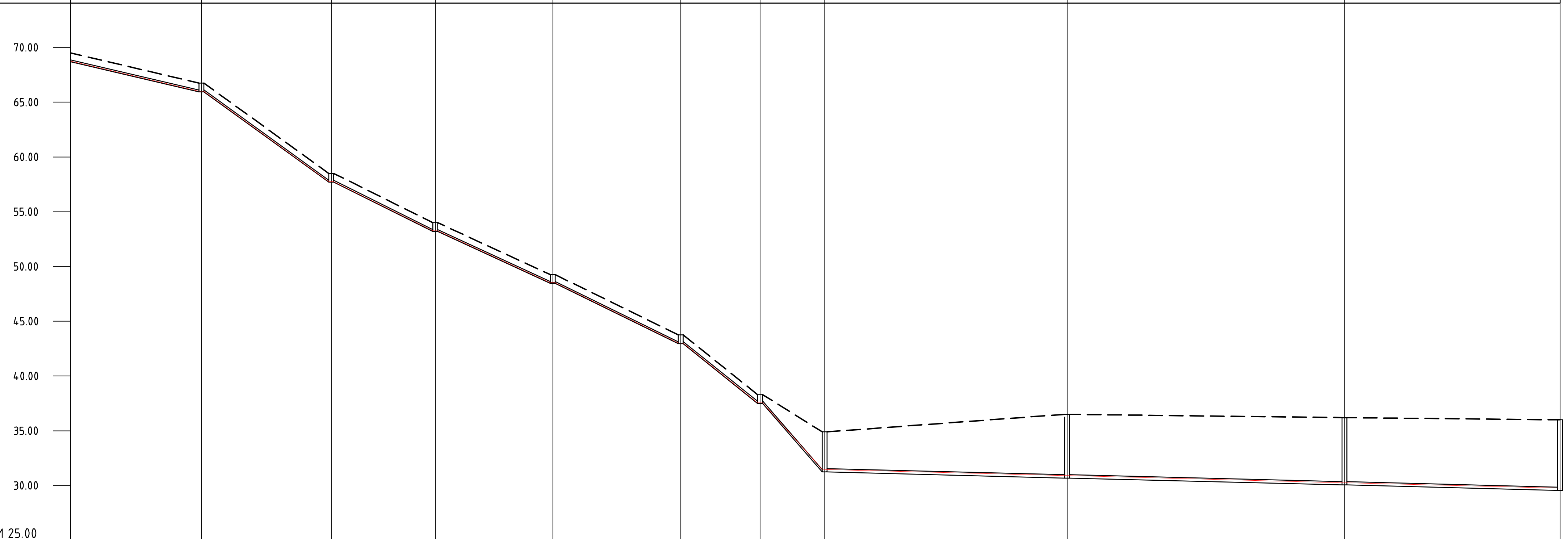
Scales	1:5000	Current Issue Signatures	
		Drawn AN	
Original Size	A3	Designed SR	
Height Datum	DATUM	Checked SE	
Grid	GRID	Approved SE	
Filename:	SKC010-AA004390-P2.DWG		

Project: Elderslie Road Branxton

Title: Sewerage Model Schematic

HYDER CONSULTING PTY LTD
Level 16, 31 Queen Street
Melbourne, Vic 3000
Australia
ACN 104 485 289
Tel: +61 (0)3 8623 4000
Fax: +61 (0)3 8623 4111
www.hyderconsulting.com

Drawing No.	Project No.	Issue
SKC010	AA004390	P2



STRUCTURE NAME	S1		S2		S3		S4		S5		S6		S7		M18		M19		MH_5_DUMMY		Branxton 2WWPS
LINK		S1.1		S2.1		S3.1		S4.1		S5.1		S6.1		S7.1		M18.1		M19.1		BRANXTON 2_WWPS	
CHAINAGE/ LENGTH (m)	0.00	119.50	119.50	118.60	238.10	95.00	333.10	107.30	440.40	116.80	557.20	72.50	629.70	58.90	688.60	221.50	910.10	253.20	1163.30	197.00	1360.30
PIPE SIZE (mm)		150mm Dia		150mm Dia		150mm Dia		150mm Dia		150mm Dia		150mm Dia		150mm Dia		300mm Dia		300mm Dia		300mm Dia	
INV-LVL(mAD)	68.700		65.950		57.700		53.200		48.450		42.950		37.500		31.238		30.684		30.050		29.550
GRADIENT (mm)		43.440		14.378		21.110		22.593		21.245		13.303		9.205		400.00		400.000		393.701	
GROUND (m AD)	69.500		66.750		58.500		54.000		49.250		43.750		38.300		34.900		36.500		36.200		36.000
FLOOD DEPTH (m)	-0.68		-0.73		-0.72		-0.72		-0.72		-0.73		-0.73		-3.49		-5.63		-5.96		
UPSTREAM VELOCITY (m/s)		3.354		2.101		1.852		1.811		1.855		2.197		2.483		0.737		0.738		0.749	
DEPTH TO INVERT (m)	0.8		0.8		0.8		0.8		0.8		0.8		0.8		3.8		5.8		6.2		6.5

Issue	Description	Date
P2	PRELIMINARY ISSUE	16.04.12
P1	PRELIMINARY ISSUE	11.01.12

100mm on Original

Client: BELFORDLAND

Status: **PRELIMINARY** NOT TO BE USED FOR CONSTRUCTION

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Scales	HOR = 1:5000 VER = 1:500	Drawn AN	
Original Size	A3	Designed SR	
Height Datum	DATUM	Checked SE	
Grid	GRID	Approved SE	

Filename: SKC011-AA004390-P2.DWG

Project: Elderslie Road Branxton

Title: Sewerage Longitudinal Section Line S

Hyder

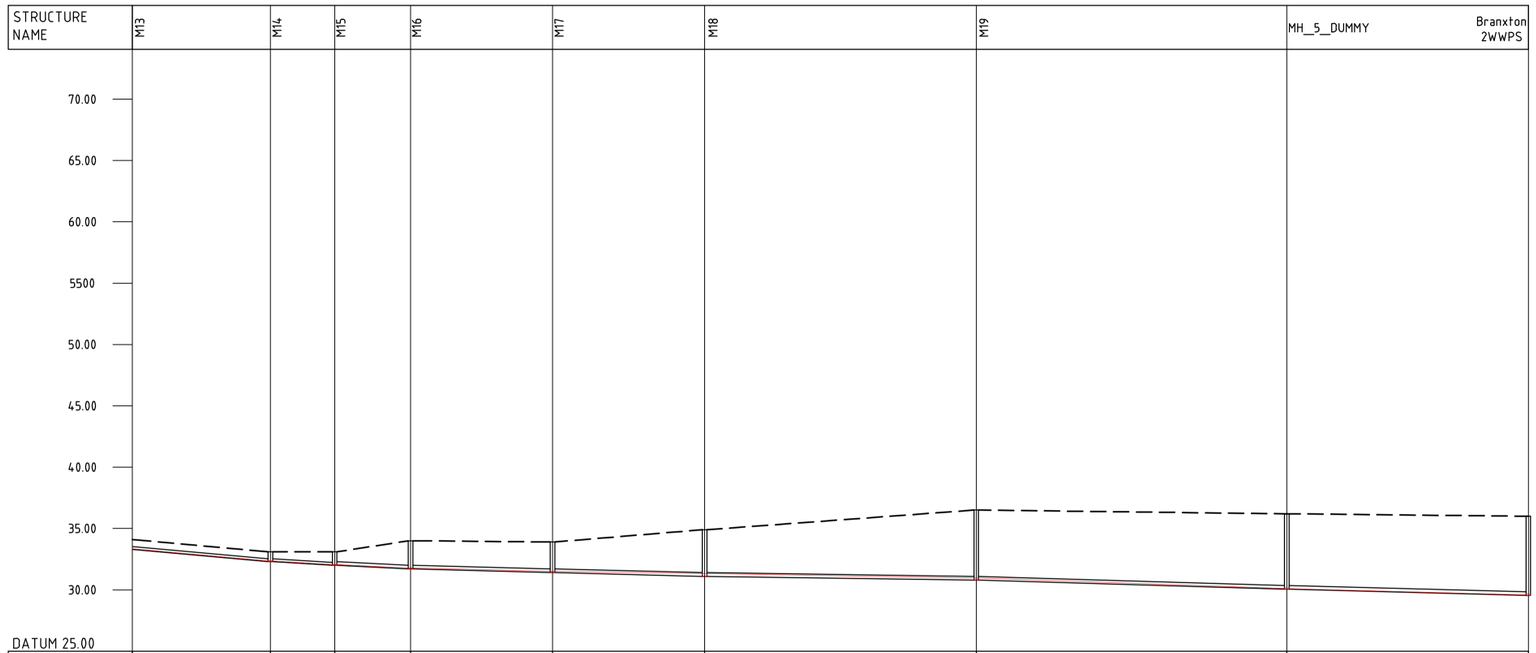
HYDER CONSULTING PTY LTD

ACN 104 485 289

Tel: +61 (0)3 8623 4000
Fax: +61 (0)3 8623 4111

Drawing No. SKC011 — Project No. AA004390 — Issue P2

Date Plotted: 16 Apr 2012 - 11:14AM File Name: K:\WATER\AUS\UB000214__Elderslie Road__Modelling Project\UB000214-06- Elderslie Road Branxton\E-Drawings\1.Current\CAD\SKC011-AA004390-P2.dwg V3



LINK	M13.1		M14.1		M15.1		M16.1		M17.1		M18.1		M19.1		BRANXTON 2_ WWPS	
CHAINAGE/ LENGTH (m)	0.00	112.6	112.60	52.4	165.00	61.9	226.90	115.8	342.70	124.8	467.50	221.5	689.00	253.2	942.20	197.0	1139.20
PIPE SIZE (mm)	225mm Dia		225mm Dia		300mm Dia		300mm Dia		300mm Dia		300mm Dia		300mm Dia		300mm Dia	
INV-LVL(mAD)	33.300		32.300		32.000		31.840		31.550		31.238		30.684		30.050		29.550
GRADIENT (mm)	112.612		174.520		386.100		400.000		400.000		400.000		400.000		393.700	
GROUND (m AD)	34.100		33.100		33.100		34.000		33.900		34.900		36.500		36.200		36.000
FLOOD DEPTH (m)	-0.72		-0.71		-1.00		-2.06		-2.25		-3.49		-5.63		-5.96		-5.63
UPSTREAM VELOCITY (m/s)	0.869		0.747		0.557		0.550		0.558		0.737		0.738		0.749	
DEPTH TO INVERT (m)	0.8		0.8		1.1		2.3		2.5		3.8		5.8		6.2		6.5

Issue	Description	Date
P2	PRELIMINARY ISSUE	16.04.12
P1	PRELIMINARY ISSUE	11.01.12

100mm on Original

Client: BELFORDLAND

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Scales: HOR = 1:5000, VER = 1:500
Original Size: A3
Height Datum: DATUM
Grid: GRID
Filename: SKC012-AA004390-P2.DWG

Current Issue Signatures
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Designed SR
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Approved SE

Project: Elderslie Road Branxton

Title: Sewerage Longitudinal Section Line M

H□DER CONSULTING □T□ LTD
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Drawing No. SKC012 — Project No. AA004390 — Issue P2

Date Plotted: 16 Apr 2012 - 11:13AM File Name: K:\WATER\AUS\UB000214_Elderslie Road_Modelling Project\UB000214-06- Elderslie Road Branxton\E-Drawings\1.Current\CAD\SKC012-AA004390-P2.dwg V3

Node ID	Ground Level (m AD)	Max water level in manhole at PWWF (m)	Freeboard (m AD)	Max DS Flow (l/s)
A1	77.40	76.62	0.78	0.10
B1	75.70	74.92	0.78	0.11
B2	73.10	72.32	0.78	0.31
B3	70.25	69.47	0.78	0.51
B4	67.90	67.12	0.78	0.61
B5	63.20	62.43	0.77	0.92
B6	58.70	57.93	0.77	1.12
B7	55.50	54.73	0.77	1.22
B8	53.75	53.00	0.75	6.55
C1	63.00	62.22	0.78	0.21
C2	59.50	54.43	5.07	5.13
C3	57.30	54.31	2.99	5.23
D1	65.80	65.02	0.78	0.10
D2	65.20	64.43	0.77	0.30
D3	66.00	63.82	2.18	0.50
D4	61.90	61.13	0.77	0.81
D5	59.90	59.13	0.77	1.12
D6	56.80	56.04	0.77	1.63
D7	56.00	55.25	0.75	1.83
D8	56.00	55.02	0.99	3.89
D9	57.00	54.57	2.44	4.62
E1	60.10	59.32	0.78	0.10
F1	66.00	65.22	0.78	0.21
F2	59.00	58.22	0.78	0.42
G1	60.75	59.97	0.78	0.33
G2	59.00	58.23	0.77	0.54
G3	59.00	57.24	1.76	1.63
G4	59.00	57.02	1.98	1.74
G5	58.25	56.83	1.42	1.96
H1	62.00	61.22	0.78	0.11
I1	60.75	59.97	0.78	0.11
J1	68.70	67.92	0.78	0.11
J2	65.30	64.52	0.78	0.22
J3	64.90	64.12	0.78	0.33
J4	63.50	62.72	0.78	0.44
J5	62.40	61.62	0.78	0.44
J6	59.70	57.61	2.09	0.77
K1	61.60	60.82	0.78	0.11

Node ID	Ground Level (m AD)	Max water level in manhole at PWWF (m)	Freeboard (m AD)	Max DS Flow (l/s)
K2	59.70	58.92	0.78	0.22
K3	58.50	57.73	0.78	0.22
L1	56.20	55.42	0.78	0.10
M1	64.00	63.22	0.78	0.11
M10	38.20	37.44	0.76	1.75
M11	38.10	37.15	0.95	2.74
M12	37.50	36.76	0.74	6.82
M13	34.10	33.38	0.72	11.12
M14	33.10	32.39	0.71	11.12
M15	33.10	32.10	1.00	11.45
M16	34.00	31.94	2.06	11.45
M17	33.90	31.65	2.25	13.38
M18	34.90	31.41	3.49	31.05
M19	36.50	30.87	5.63	33.50
M2	64.00	62.92	1.08	0.32
M3	62.00	58.09	3.91	0.43
M4	54.00	53.23	0.77	0.54
M5	53.00	52.23	0.77	0.65
M6	53.80	51.93	1.87	0.87
M7	52.00	51.23	0.78	0.98
M8	44.30	43.53	0.77	1.31
M9	39.80	39.03	0.77	1.53
MH_1	36.00	35.46	0.54	2.04
MH_2	35.50	34.86	0.64	4.08
MH_3	50.00	49.15	0.85	1.22
MH_4	37.00	30.87	6.13	2.58
MH_5_dummy	36.20	30.24	5.96	35.34
N1	48.20	47.42	0.78	0.11
N2	47.90	47.12	0.78	0.22
N3	41.70	40.93	0.78	0.55
N4	39.30	38.53	0.77	0.88
O1	64.10	63.32	0.78	0.20
O10	44.30	43.53	0.77	1.61
O11	39.30	38.52	0.78	0.30
O12	37.70	36.92	0.78	0.60
O2	61.70	60.92	0.78	0.31
O3	61.00	60.23	0.77	0.31
O4	61.50	59.93	1.57	0.51
O5	60.00	59.23	0.77	0.71
O6	61.00	58.93	2.08	0.91
O7	53.00	52.23	0.78	1.11
O8	46.00	45.24	0.76	1.31
O9	48.75	44.93	3.82	1.51

Node ID	Ground Level (m AD)	Max water level in manhole at PWWF (m)	Freeboard (m AD)	Max DS Flow (l/s)
P1	61.50	60.72	0.78	0.20
prop_1	42.00	41.03	0.97	1.61
Q1	43.20	42.42	0.78	0.10
Q2	41.50	40.72	0.78	0.20
R1	59.00	58.22	0.78	0.00
RM1	52.50	50.67	1.83	17.00
RM2	69.60	68.93	0.67	17.82
RM_new development	49.50	48.38	1.12	10.00
S1	69.50	68.82	0.68	17.69
S2	66.75	66.02	0.73	17.86
S3	58.50	57.78	0.72	18.03
S4	54.00	53.28	0.72	18.30
S5	49.25	48.53	0.72	18.49
S6	43.75	43.02	0.73	18.76
S7	38.30	37.57	0.73	19.03
T1	53.20	52.42	0.78	0.11
T2	51.70	50.92	0.78	0.21
T3	51.00	50.23	0.77	0.41
T4	53.20	49.93	3.27	0.61
T5	48.30	47.53	0.78	0.81
T6	44.70	43.93	0.78	0.91
T7	41.70	40.93	0.77	1.11
T8	40.30	39.55	0.76	2.92
T9	37.30	36.52	0.78	0.00
U1	44.00	43.22	0.78	0.10
V1	47.00	46.22	0.78	0.20
V2	42.73	41.92	0.81	0.40
V3	39.30	38.53	0.77	1.16
V4	38.20	37.46	0.74	4.08
V5	38.70	37.95	0.75	2.92
V6	37.00	36.22	0.78	0.00
V7	38.00	35.92	2.08	0.33
W1	44.10	41.52	2.58	0.10
W2	40.70	39.92	0.78	0.43
Z1	38.50	37.72	0.78	0.10
Z2	62.00	60.62	1.38	0.11
Z3	59.00	58.22	0.78	0.10
Z4	58.20	57.63	0.57	0.41
Z5	58.00	56.83	1.18	0.41

Issue	Description	Date
P2	PRELIMINARY ISSUE	16.04.12
P1	PRELIMINARY ISSUE	11.01.12

100mm on Original

Client: BELFORDLAND

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Scales	NTS	Current Issue Signatures	
		Drawn AN	
Original Size	A3	Designed SR	
Height Datum	DATUM	Checked SE	
Grid	GRID	Approved SE	

Filename: SKC013-AA004390-P2.DWG

Project: Elderslie Road Branxton

Title: Infoworks Model Results
Peak Wet Weather Flow

H□DER CONSULTING □T□ LTD
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M□□□□□n□□□ V□□3000
A□□□r□□□
ACN 104 485 289

T□□: □61 (0)3 8623 4000
F□x: □61 (0)3 8623 4111
□□□□.□□d□n□□□□□□□□m□□□m

Drawing No. SKC013 | Project No. AA004390 | Issue P2

APPENDIX H – PUMP STATION DESIGN

Branxton Sewer Pump System

1) Design Flows

The design flow is the peak wet weather flow (PWWF) from the catchment
(Section 4.2.9 of Hunter Water Corporation Design Manual)

ET's	PDWF (L/s)	SA (L/s)	PWWF (L/s)	ADWF (L/s)
65	2.792	3.77	6.562	0.715
Adopted pump flow rate:			**7 L/s**	

2) Rising Main

Minimum velocity of 0.6m/s (Section 4.3.4 of HWC Design Manual)
Maximum velocity of 3m/s (Section 4.3.4 of HWC Design Manual)

Pipe k values (Tables for the Hydraulic Design of Pipes and Sewers)

velocity (m/s)	k (mm)
1	0.30
1.5	0.15
2	0.06

Rising Main Length

L = 860.00 m

Detention Time (Section 4.3.5 HWC Design Manual)

$T = (0.025Qp + 0.218 LD^2)/ADWF$

Qp = Pump Capacity (L/s)
L = Rising Main Length (m)
D = Internal Diameter of Pipe (m)
T = Detention Time (hours)
ADWF = Average Dry Weather Flow (L/s)

Diameter (mm)	T (hr)	Velocity (m/s)
100	2.87	0.89
150	6.14	0.40
225	13.52	0.18

Friction Loss

$v = -(32gRS)^{0.5}\log[k/14.8R + 1.225u/R(32gRS)^{0.5}]$

v =	velocity	0.89	m/s
R =	A/P	0.025	m
A =	Area	0.0079	sq.m
P =	Perimeter	0.314159	m
S =	friction loss	0.011205	m/m

g =	gravity	9.81	sq.m/s
u =	viscosity	1.14E-06	sq.m/s
k =	roughness	0.0003	m

Total Loss (TL)

Length 860.00 m

Extra length adopt to compensate singular losses: 10%

Total L= 950.00 m

TL =	10.6446	m

3) Wet Well

Well Diameter

Ø =	1.80	m

Volume Required (Section 4.5.3 HWC Design Manual)

V = 900 x Qp / S

Qp =	7	L/s (pump capacity)
S =	10	Allowable number of starts per hour
V =	630	L (control volume)
H =	0.25	m

Emergencial Storage

4 hours at ADWF (Section 4.2.11 HWC Design Manual)

ADWF =	0.715	L/s
Storage =	10,296	L
H =	4.0	m

4) Pump System Levels (Section 4.5.3 HWC Desing Manual)

a) Surface Level (SL)

SL = 52 mAHD

b) ES - Emergencial Storage Level (above Flood Alarm Level)

ES = 51.55 mAHD

(adopted 300mm cover slab plus 150mm freeboard)

c) FAL - Flood Alarm Level

FAL = 47.45 mAHD

d) MTWL - Maximum Top Water Level (same as inlet pipe IL) - 150mm below FAL

MTWL = 47.30 mAHD

e) Top Water Level (TWL) - 150mm below MWTL

TWL = 47.15 mAHD

f) BWL - Bottom Water Level

BWL =	46.85	mAHD	0.30

Total depth	5.15	m

5) Pressure Required

Pipe sytem losses

I	TL =	10.65	m

Minimum head

II	BWL =	46.85	m

Final Head

RL = 69 mAHD

III	IL =	68.00	mAHD	(assumed 1.0m detph)

Pressure Required - PR = III + I - II

PR =	31.80	m

Note: During the initial stages of the development prior to 55 ET's, septicity and odour controls will be required due to increased detention time. The management of septicity and odour may be required through makeup water or iron salts dosing.

Appendix C

POWER SOLUTIONS ELECTRICAL SERVICING REPORT

power solutions

Quality designs in a guaranteed time

Subject: Electrical Servicing for the Proposed Development Area

Site: Elderslie Road, Radford Park Wednesday, 9 March 2022

Dear Dayne Harris,

Power Solutions, a local ASP3 design company with 30 years' experience, has been engaged to review the proposed development plans and determine whether the existing electrical infrastructure is suitable to allow the site to be adequately serviced.

Ausgrid Requirements

The existing site is located within the Ausgrid network area and is required to comply with Ausgrid's NS109 and NS110. The rural residential development supply arrangement is expected to match the adjacent developments and be serviced via new underground reticulation in the form of High Voltage (HV, 11kV) cables and kiosk substations which transformer the HV supply into usable Low Voltage (LV, 415V). The LV network is also reticulated via underground cables, pillars and streetlights.

HV Feeder Location

The development has access to one existing HV feeder in proximity to the site, feeder 83743, sourced from Branxton Zone Substation, ZN00512. This Zone substation is approximately 2km to the South and is located adjacent to Rosary Park Catholic School. HV feeder 83743 predominately supplies small rural residences to the North, East and West of the development.

Development Load

A preliminary assessment of the proposed development has been completed based upon 160 additional rural residential lots. Ausgrid requires a After diversity Maximum Demand (ADMD) of 5kVA per lot. Applying the NS110 requirements this equates to a Maximum demand of 676kVA or 35A at 11kV**.**

HV Feeder Capacity

The existing HV feeder capacity is not known without a formal Ausgrid application request. However, the analysis in this section is based upon the Ausgrid HV system diagram and GIS conductor types. The HV feeder circuit breaker at the Zone Substation has a pickup rating of 372A, implying it's rating. The feeder route to the site is made up of overhead Mercury (335A rated) and Cherry (312A rated) conductors. The proposed development load therefore represents approximately 10% of the feeder rating. It is anticipated that the existing HV feeder capacity will be sufficient without lead-in upgrades.

Assessment

Power Solutions has assessed the existing High Voltage network regarding its accessibility, capacity, and likely suitability to allow for the proposed development. The proposed development has access to one existing Ausgrid 11kV feeder fit for purpose. The development presents no unusual electrical supply risks and can be serviced via the standard Ausgrid Contestable process.

Yours faithfully,

Scott Clothier – Managing Director
Power Solutions (NSW) Pty Ltd

Attachments

- *Proposed Development Site Plan*
- *Ausgrid Electrical – GIS Extract*
- *Ausgrid Electrical – 11kV System Diagram*

Postal
PO Box 278
Charlestown NSW 2290

Head Office
The Landmark
C106/215 Pacific Highway
Charlestown NSW

Sydney Office
Suite 710, Level 7
91 Philip Street
Parramatta NSW 2150

Phone 1300 732 293
office@powersol.com.au
www.powersol.com.au

240272-PSK-001-D-C3D

• urban design • visualisation • development feasibility • surveying

• town planning • social impact • superintendency • infrastructure • civil engineering • economic analysis • project management

Overall Concept Master Plan

location:	ELDERSLIE ROAD, RADFORD PARK
council:	SINGLETON
dwg ref:	240272-PSK-001-D-C3D
client:	RADFORD PARK

ver.	date	comment	drawn	pm	level information	scale (2A0 original size)	notes
D	23/12/21	UPDATE PRESENTATION OF PLAN	RC	LG	DATUM: AHD CONTOUR INTERVAL: 0.5m	0 25.0 50.0 62.5m SCALE: 1:1250 (FULL)	

working beyond expectations

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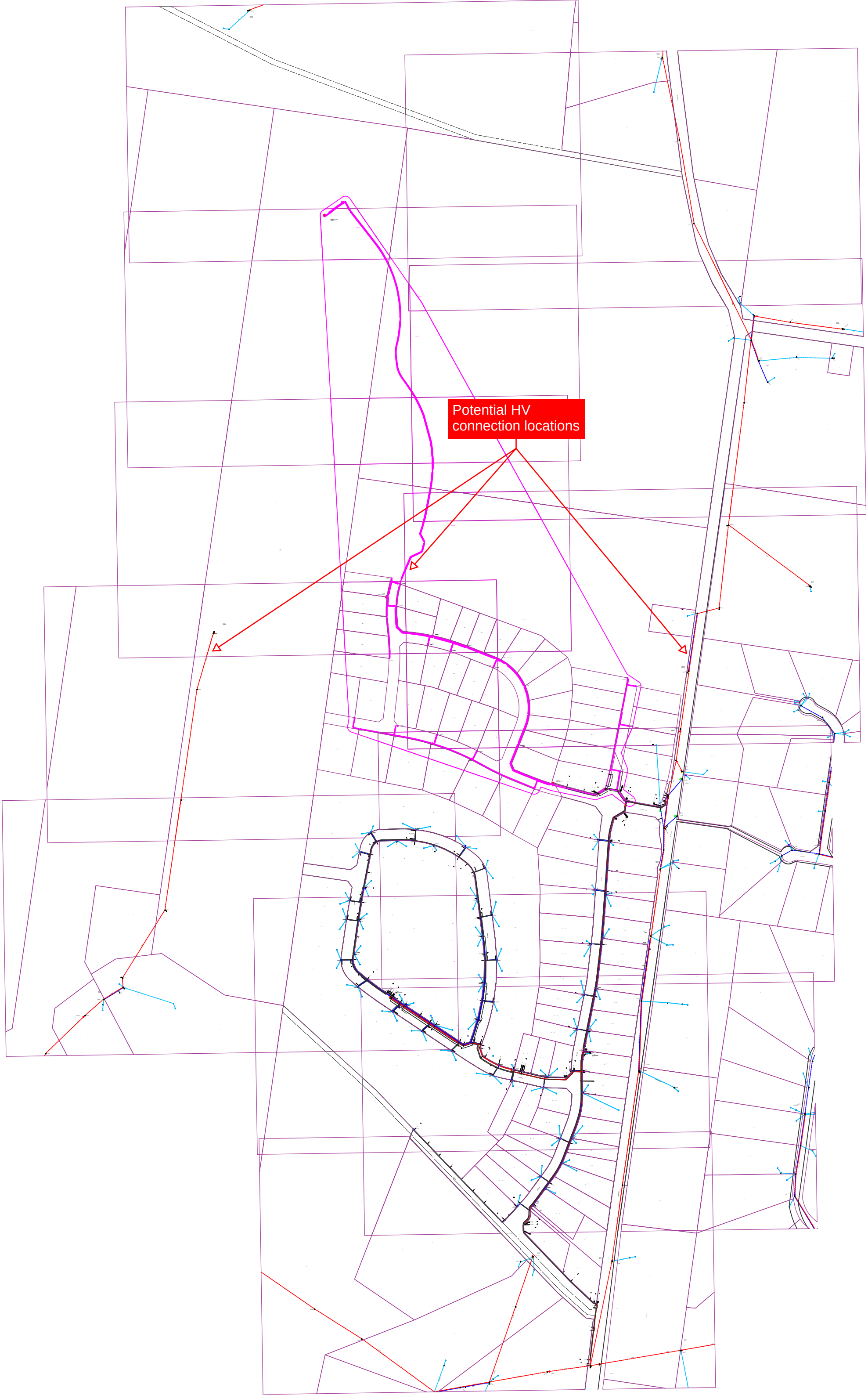
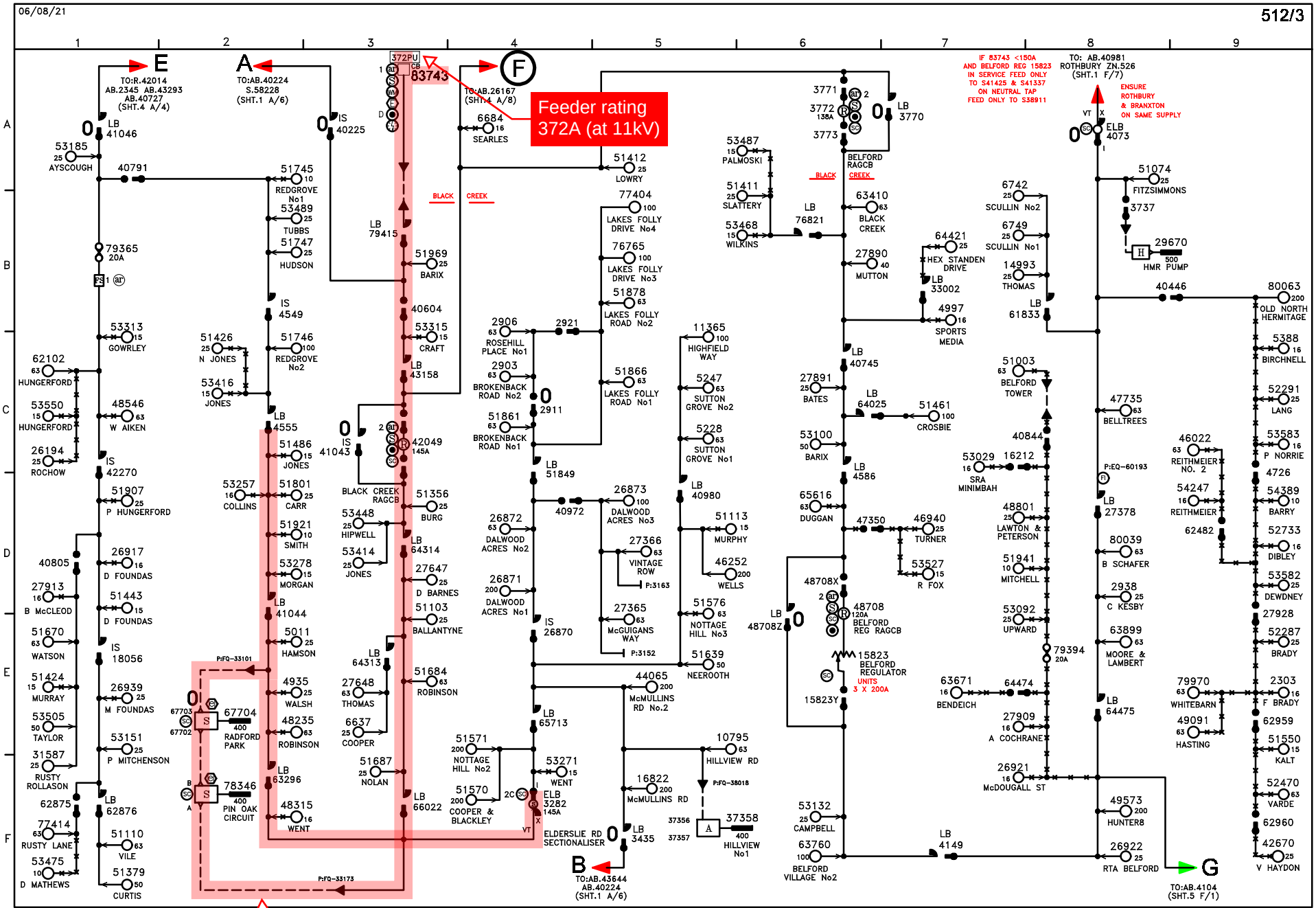
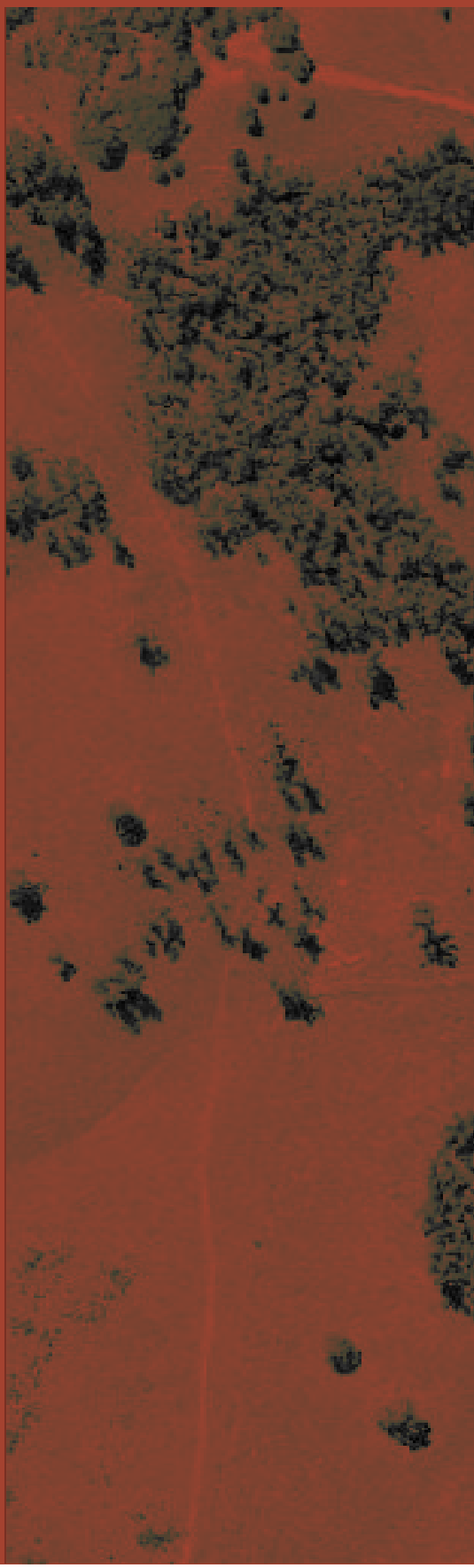
central coast office ph: (02) 4305 4300
hunter office ph: (02) 4978 5100
sydney office ph: (02) 8046 7411
www.adwjohnson.com.au

Plotted By: Robert Cromarty Plot Date: 23/12/21 3:01:45PM Cad File: N:\240272\DWG\PLANNING\PSK\240272-PSK-001-D-C3D.DWG

This plan includes coloured information. If you have a black and white copy you do not have all of the information. This note is coloured RED.


Potential HV
connection locations


06/08/21
512/3
Feeder rating
372A (at 11kV)
372PU
83743
IF 83743 <150A AND BELFORD REG 15823 IN SERVICE FEED ONLY TO S41425 & S41337 ON NEUTRAL TAP FEED ONLY TO S38911
ENSURE ROTHBURY & BRANXTON ON SAME SUPPLY
BRANXTON 11kV DIST SHEET 512/3
FOR OFFICIAL USE ONLY
11kV Feeder 83743 from Braxton Zone to Development



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