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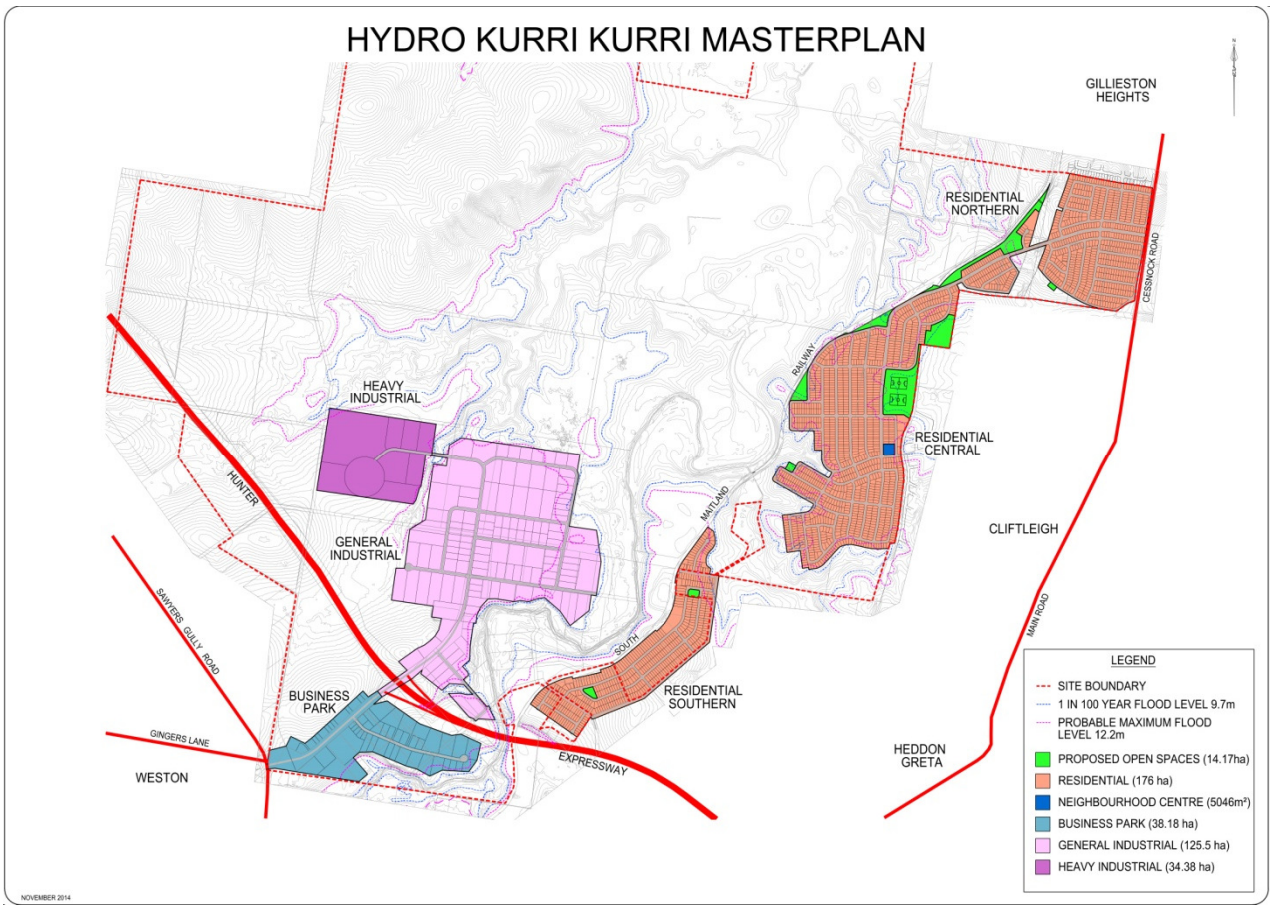
Hydro Aluminium Kurri Kurri Infrastructure Servicing Strategy



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Document Register

Issue	Details of Change	Prepared	Reviewed	Date
A	Draft Issue for joint review / discussion	BC	MD	24 / 9 /14
A.1	Correction to 300mm main length	RH	DE	2/10/14
B	Final, following review period	RH	DE	26/11/14
C	Bring plans up to date, improve legends, check and update tables	RH	DE	16/12/14

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Pulver Cooper & Blackley acknowledges the collaboration with RPS Australia East Pty Ltd (Newcastle) for compiling the findings of the water and sewer servicing strategy component of this study.

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1 Overview

The purpose of this report is to provide both Hydro and Council with a servicing strategy for the development of Hydro's land at Kurri Kurri. This was done by refining a previous study[1] assessing the infrastructure constraints and opportunities for proposed industrial and residential re-development of the subject land. The resulting designs are largely in keeping with the Preliminary Masterplan by dwp suters Architects but amended in response to site and supply constraints.

Key elements of the proposed strategy are that:

- Water
    - supply of potable water to the development would be instigated at the developer's expense based on a staging that provides security of supply in the short-term and adequate main sizes for the ultimate growth;
    - on completion of the rezoning process, further investigation will be performed through the preparation of a developer funded Water Servicing Strategy to Hunter Water Corporation standards, identifying the means of supplying potable water to the high-level area in the north east corner of the residential precinct and ensuring security of supply for ultimate growth;
- Sewer
    - supply of sewer will be by means of conventional gravity mains draining to a series of Waste Water Pump Stations, each pumping flows to an adjacent catchment and ultimately to the Kurri Kurri Waste Water Treatment Works;
    - on completion of the rezoning process, further investigation will be performed through the preparation of a developer funded Sewer Servicing Strategy to Hunter Water Corporation standards, identifying the means of supplying sewer to the development, reducing where possible the number of pump stations;
- Electricity
    - electricity will be delivered to the development through underground cable located in common shared trenching through the road reserves. Underground cabling will extend the Ausgrid feeder network at higher voltages to a series of above-ground kiosk substations that 'distribute' the electricity in the low-voltage network;
    - on completion of the rezoning process, further investigation will be performed through Ausgrid's preparation of a developer funded Identification of Needs Masterplan, identifying the means of supplying electricity to the development, including refined estimates of ultimate demand;
- Gas - connection to the gas network will be available and determined on a staging basis, with an assessment of the connection methods determined by Jemena Gas Networks once the first application is made;
- Communications - communications connections will be available and determined by the National Broadband Network (NBN Co) once the first application is made; and
- Start-up costs for each of the first stages of the Industrial and Residential Precincts can be expected to be high to support the construction of essential lead-in infrastructure.

[1] "Preliminary Infrastructure Servicing Assessment" report by PCB, 31/10/2013

2 Introduction

Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) operates the aluminium smelter on Hart Road, Kurri Kurri. The smelter operations were suspended in September 2012 with decommissioning of the smelter expected to occur over the next several years. Hydro have begun discussions with the NSW Department of Planning and both Cessnock City Council and Maitland City Council regarding the potential for redevelopment of the site to other uses.

The site encompasses approximately 80ha of a disused smelter plant and some 2,000ha of buffer lands located on the border of both Maitland and Cessnock Local Government areas. The landform over the site varies, however the vast majority of the potential development land is of gentle slope up to 1V:20H, suitable for residential and industrial development.

Preliminary plans have been prepared showing the potential for residential development starting at Gillieston Heights in the north east through to Cliftleigh in the East as well as the subdivision of the smelter site, after decommissioning, as potential industrial land. The key development potential of the subject land is represented by the highlighted areas in Figure 1.

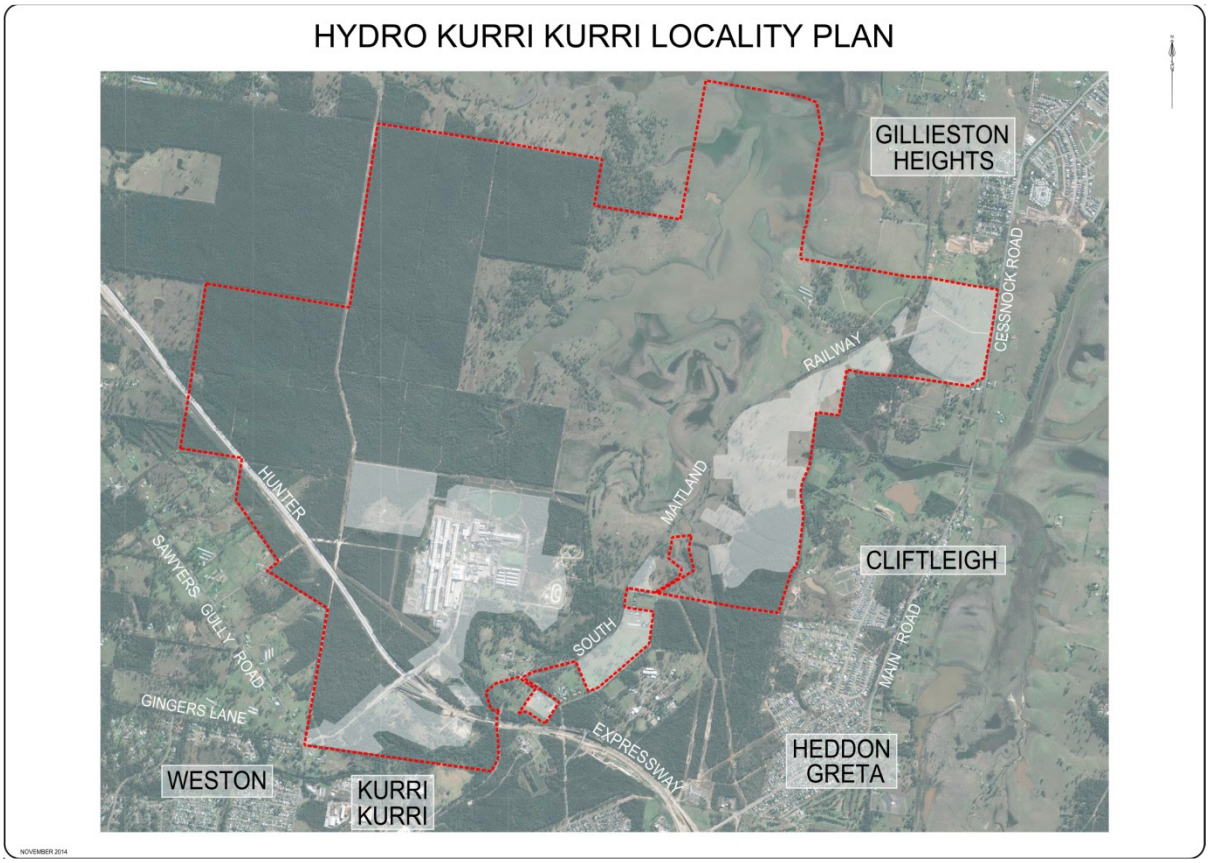


Figure 1: Location & Surrounds

2.1 The Development

2.1.1 Industrial

The industrial precinct is located in the south western portion of the property holdings, adjoining and divided by the recently constructed Hunter Expressway. The majority of this industrial precinct utilises the former Hydro Aluminium smelter footprint with additional areas of suitable land also being considered.

2.1.2 Residential

Preliminary investigations indicate that land area is flood free and suitable for residential development along the ridge between Gillieston Heights and Cliftleigh. The residential precinct extends from existing residential housing developments in Gillieston Heights beside Cessnock Road that would ultimately join with the Cliftleigh development. The landform over the site varies, however the vast majority of the potential development land is of gentle slope up to 1V:20H, suitable for residential development.

2.2 Desktop Assessment of Current Information

A Preliminary Infrastructure Servicing Assessment (above) was prepared by PCB to inform the Preliminary Masterplan. This report and material was revisited. This assessment incorporated a brief overview of the existing network of infrastructure within and around the subject site. This information was compiled based on the written responses from each of the network operators through their basic assessment of the Masterplan.

A summary of the findings of this assessment are listed below, in decreasing order of complexity:

- Hunter Water Corporation recommended developer-funded servicing strategies for both water and wastewater as the next phase of investigation, which consider lot layout and staging of development;
- Ausgrid identified that a long-term servicing strategy for both the Proposed Employment and Residential Development Areas will need to be developed as greater understanding of the development potential evolves;
- Both Telstra and Jemena provided preliminary advice indicating that both the Proposed Employment and Residential Development Areas are serviceable from their respective networks;
- The next phase of the investigation would lead toward an assessment of staging both the Proposed Residential Development Area and the Proposed Employment Development Area with respect to the known site constraints, which includes the findings of this infrastructure assessment.

2.3 Consultation

The refined subdivision design has been used for further discussion with both Hunter Water and Ausgrid, with the intent for this to further define the constraints, outline the connection requirements, cost estimates and staging sequence. The outcomes of this consultation added value to the subdivision design for the purpose of rezoning.

2.4 Connection Process

A detailed assessment of the connection and servicing requirements for each authority is provided in the following sections of this strategy. The actual connection and reticulation of service mains to the development would not be supported by the authorities without further investment in preparation of detailed servicing strategies or master planning to the authority requirements. It is anticipated that these servicing strategies can be prepared after completion of the rezoning.

3 Assessment of Service Constraints

This section provides a brief description of the existing services that surround and transect the subject land.

3.1 Water Supply

Potable water is currently available[2] to the former aluminium smelter through a 200mm water main extending from Northcote Street along McLeod Road, Dawes Avenue and Dickson Roads. This main connects to a 100mm main located along Hart Road. Hunter Water Corporation (HWC) mains in the vicinity of the subject land are shown on Figure 2.

A 300mm water main is located along Cessnock Road, extending from Gillieston Heights in the north through to Cliftleigh and Heddon Greta in the south.

HWC have indicated that there is sufficient capacity in the trunk water main system servicing the Coalfields (i.e. Maitland through to Cessnock) to service the proposed residential and industrial subdivisions.

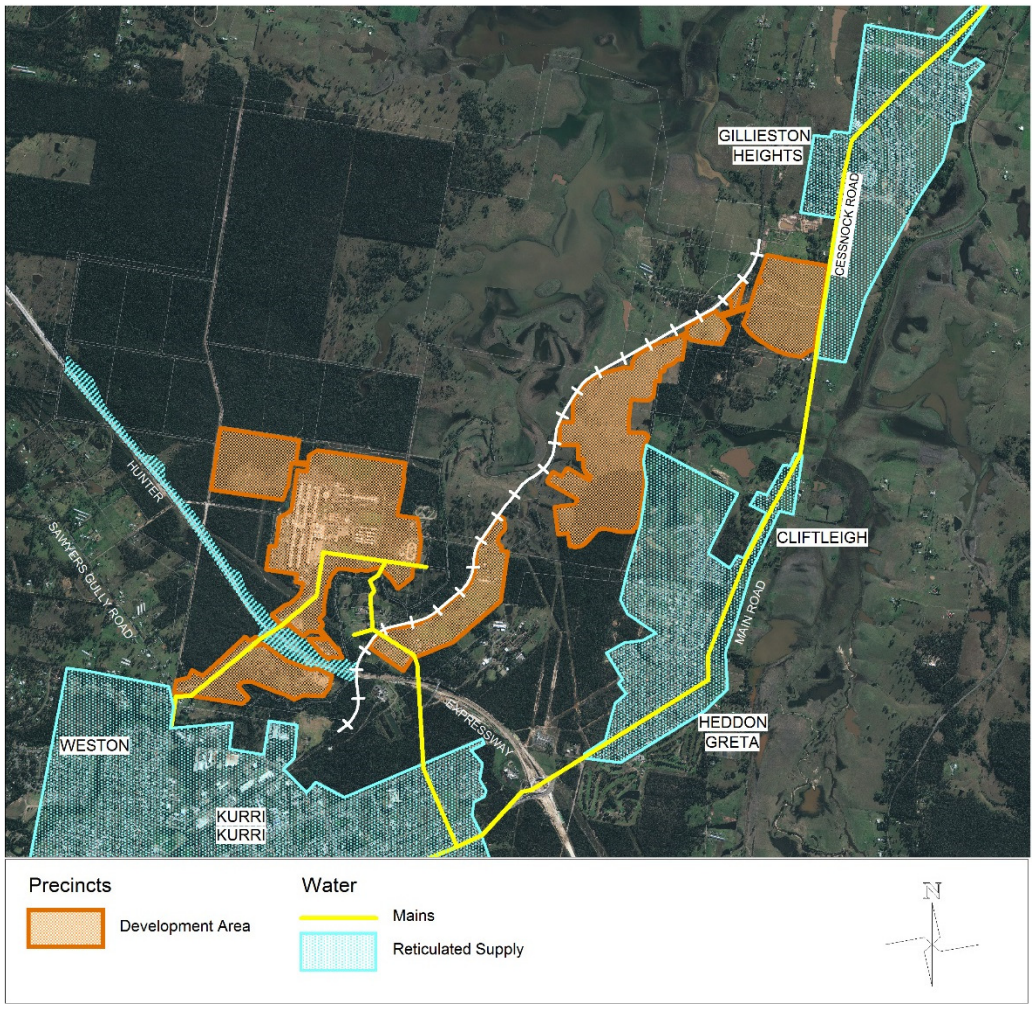


Figure 2: Schematic of the Existing Water main network

[2] Existing water & sewer detail sourced from Hunter Water Corporation by RPS Australia, September 2014

3.2 Sewer

Sewer from the former aluminium smelter site was pumped directly to the Hunter Water Corporation (HWC) Kurri Kurri Wastewater Treatment Works (WWTW) via a private pump system. HWC has advised that they are not likely to accept the existing private system as HWC infrastructure to service the proposed development as the type of construction and materials used may not be compliant with current standards.

There is no existing sewer infrastructure servicing the buffer lands. HWC has advised that there is capacity available to service the proposed development in both the Kurri Kurri and Farley WWTW.

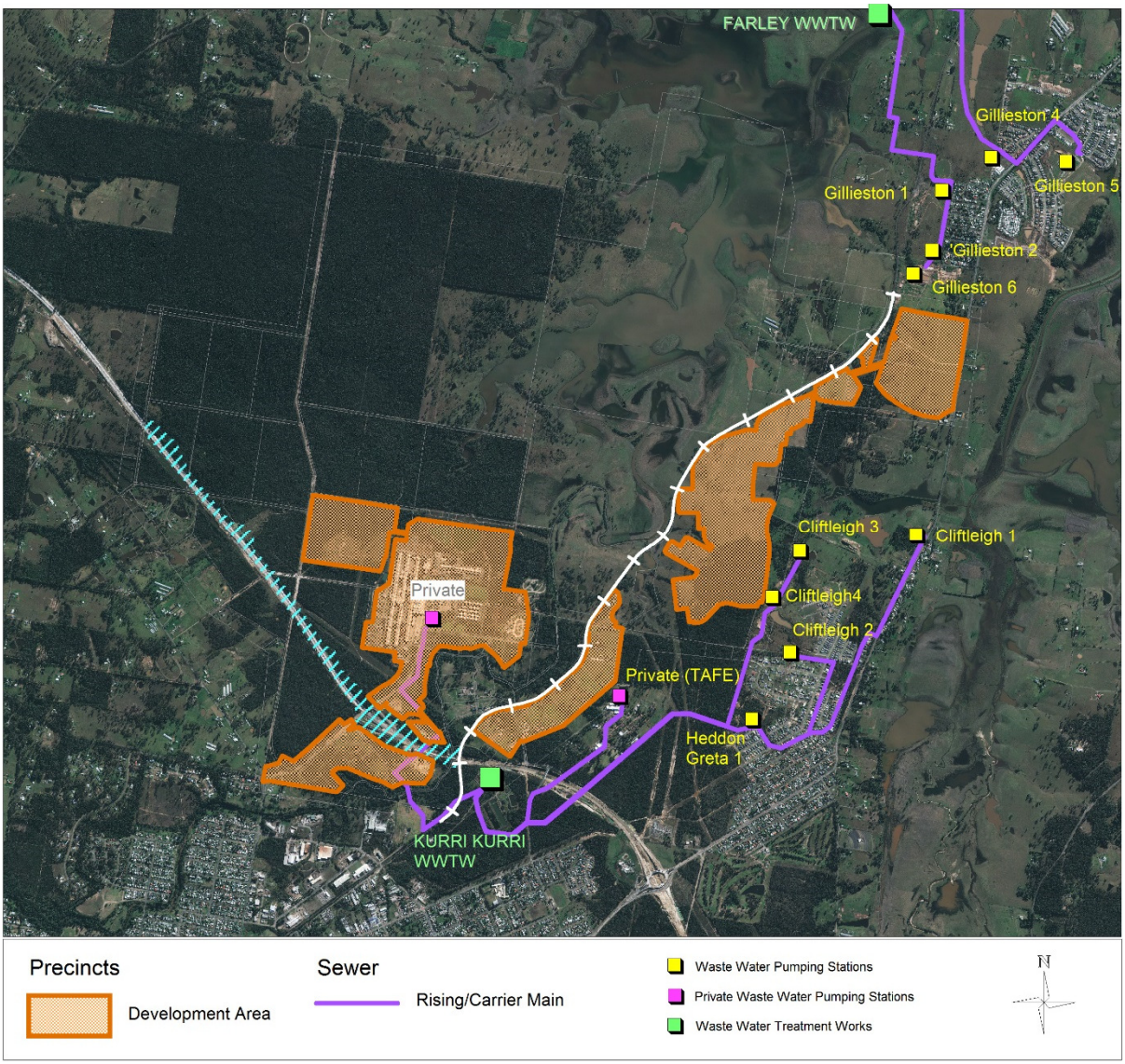


Figure 3: Existing Sewer Rising/Carrier Main Network

A plan detailing the existing sewer infrastructure within the subject area is included as Figure 3. Existing sewer infrastructure at Gillieston Heights is at or near capacity and represented by the open squares in Figure 3. Any further sewer connection from the northern section of the residential precinct to Farley WWTW would require a direct connection as the existing infrastructure cannot be readily upgraded. A direct connection to Farley WWTW has been disregarded due to inherent environmental constraints, lack of capacity in existing infrastructure and access issues to the land required for the construction of new sewer. Due to the identified constraints it has been concluded

that all sewer from the site will be discharged to the Kurri Kurri WWTW. All other WWPS's through Cliftleigh and Heddon Greta are either at capacity or sized to cater for the proposed Cliftleigh development only.

3.3 Electricity

Overhead high-voltage (330kV, 132kV, 66kV and 33kV) wires transect the site, leading to the existing electrical switch yard on the northern edge of the former Smelter. In particular, the 132kV overhead transmission wires, which traverse the subject land, were installed solely to service the former smelting operations. Prior to closure of the site, the smelter was the single biggest power user in the Ausgrid network.

Preliminary discussions with Ausgrid[3], who owns and operates the network of poles and wires in the Hunter Region, have determined that the existing sub-station is not to a current standard that Ausgrid would be willing to accept as part of their network. Ausgrid has indicated that substantial upgrades will be required to bring this asset up to current standards.

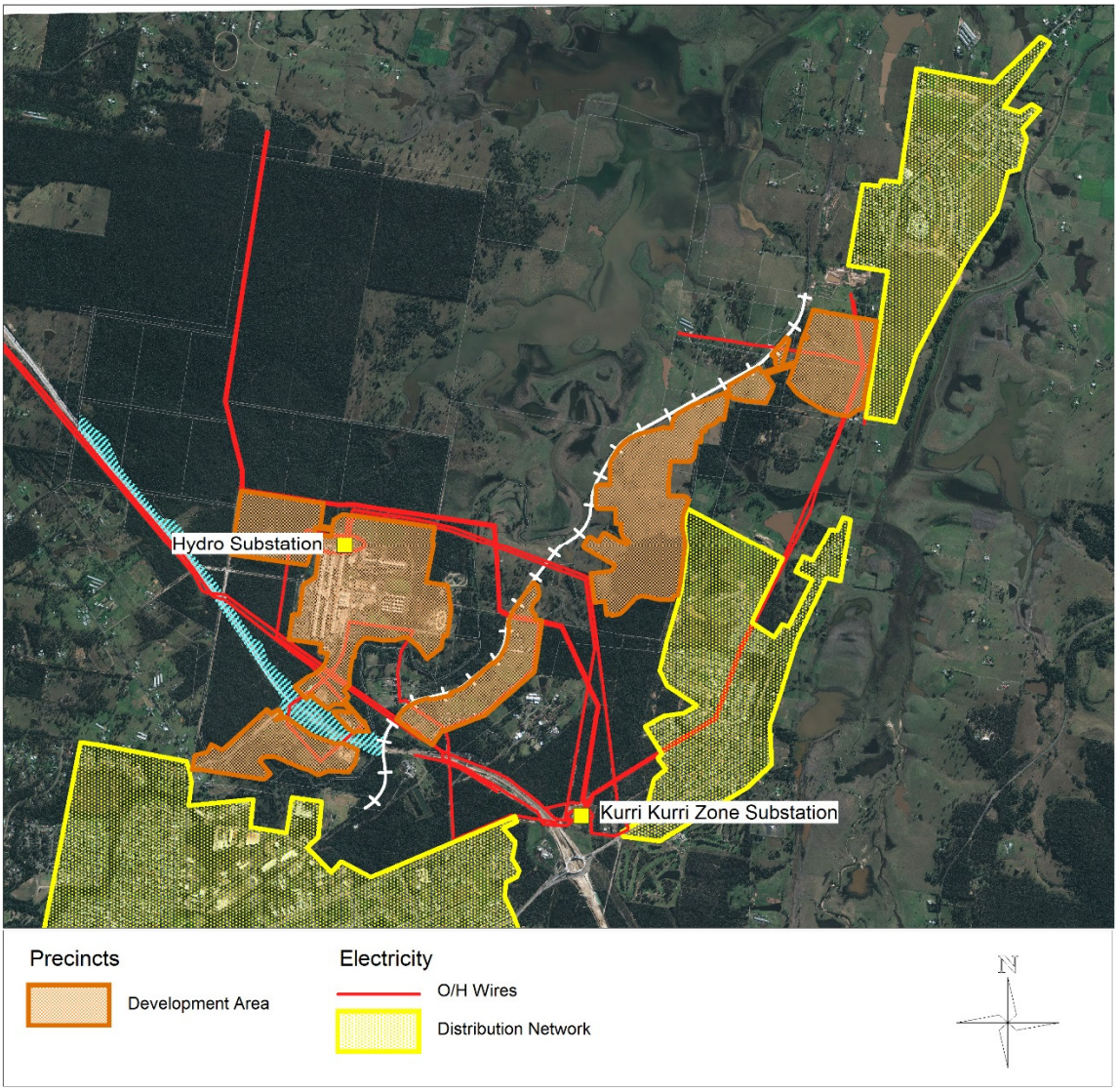


Figure 4: Schematic of Electricity Network (Poles & Wires)

[3] Face to face meeting between PCB and several Ausgrid staff covering plans and servicing options.

Kurri Kurri Zone Substation, located adjacent to the Kurri Kurri Interchange of the Hunter Expressway, currently supplies two 11kV feeder connections to the industrial development. There is capacity of up to 2.3MVA to support initial stages of the industrial development. Further stages may be supplied through network upgrades.

The residential precinct is proposed to be serviced by feeders from both the Telarah Zone Substation and the Kurri Kurri Zone substation. Ausgrid advises that up to 750 residential lots may be adequately serviced from the existing feeder network. Upgrades of the feeder network would be required to ultimately service the full residential development. Staging for any upgrade of the feeder network will be dependent on the progress of other developments within the adjoining areas and will need to be assessed as development of the Hydro lands proceeds.

A brief schematic of the existing Ausgrid Poles and Wires network is presented in Figure 4. Note that the different voltage lines are not distinguished as definitive information was not available.

3.4 Gas

Jemena, who operates the natural gas distribution system in the area, provided a written, high level response regarding the potential development of the site. There are existing high pressure gas mains along Hart Road that had serviced the former smelter operations. A pressure reducing valve, located off Dickson Road may enable reticulation to service the industrial development.

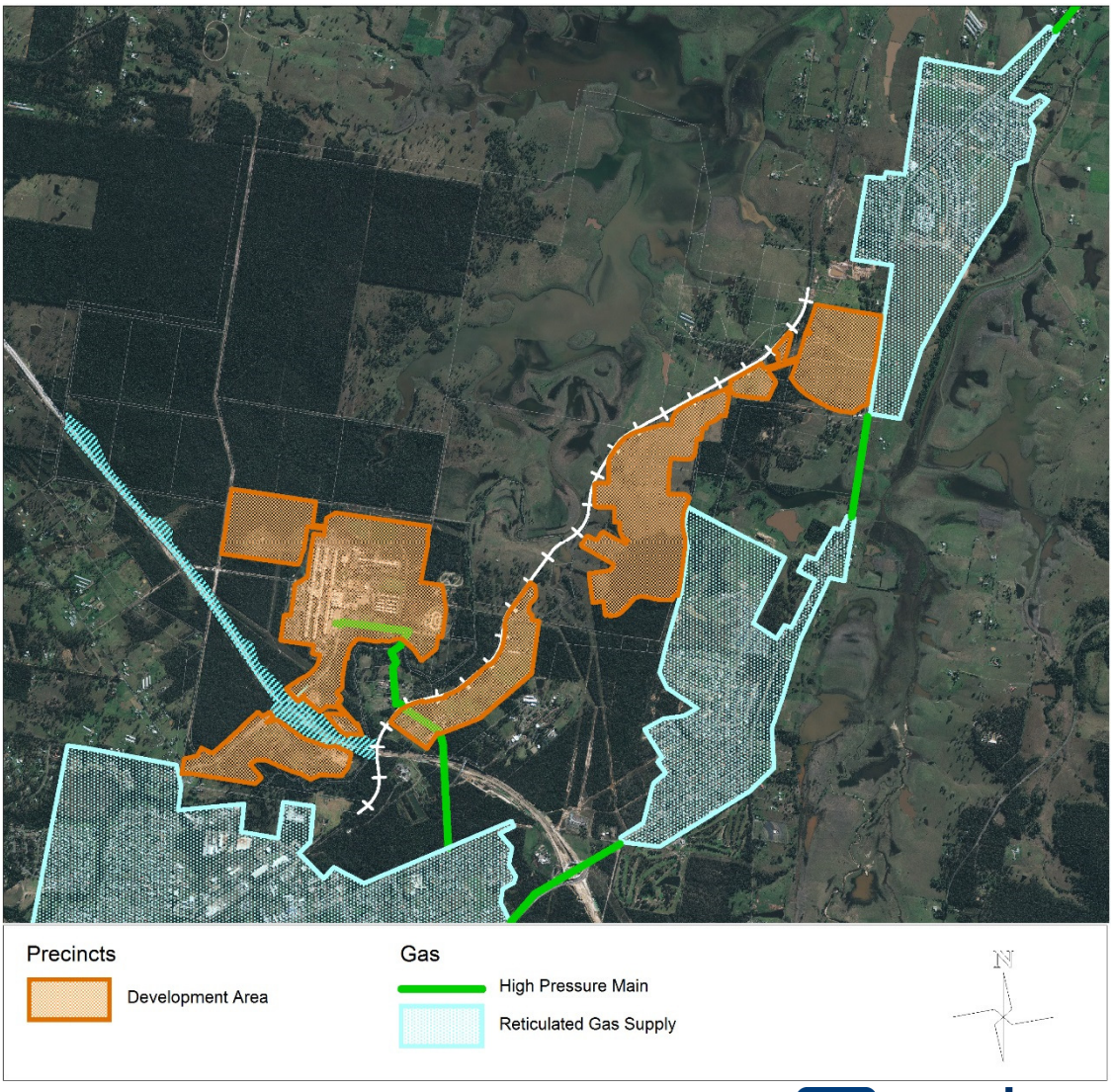


Figure 5: Schematic of Reticulated Gas Network

There are existing high pressure gas mains along Cessnock Road that may be connected to service the residential precinct. There are also low-pressure reticulation mains that may be extended from adjoining residential estates to the north. Jemena have indicated that there is enough capacity in the overall network to support growth in the area. A brief schematic of the Jemena Gas network is presented in Figure 5.

3.5 Telecommunications

Telecommunications are currently supplied from the Telstra network to the existing Hydro Aluminium Smelter along Hart Road. Telstra has advised that it maintains the existing network in the vicinity of the proposed residential and industrial lands, and has no objections to the proposed development and change on land use. Subject to final development plans and subdivision layouts, the existing network will need to be extended. The formal written response from Telstra is included in Appendix B.

The NBN Co rollout website (http://www.nbnco.com.au/when-do-i-get-it/rollout-map.html) indicates that existing NBN services are available in both Cliftleigh and Gillieston Heights. Guidelines regarding the servicing of new residential subdivisions indicate that developments greater than 100 lots will be serviced from the National Broadband Network, while developments less than 100 lots will be serviced from the Telstra copper network. On this basis the Proposed Residential Development Area would be serviced from an extension of the NBN network.

4 Water Connection Strategy

Hunter Water Corporation (HWC) owns and maintains the existing network of pipes, reservoirs and tanks supplying the Lower Hunter with drinking water. Water mains will be extended from existing mains to reticulate a supply of potable water to the subdivision and provide for fire-fighting purposes. These mains would be located within the public road reserve, typically between the kerb and footpath of a size range between 100mm and 300mm. Mains would cross connect at each street intersection to minimise dead ends that cause poor water quality and ensure security of supply. The proposed lot layout facilitates these design principles

After re-zoning of the subject land a full developer funded servicing strategy would be required prior to further planning and design commencing. This servicing strategy would need to address:

- Environmental Considerations;
- Constraint definition;
- Detailed evaluation of existing water infrastructure;
- Life cycle analysis;
- Concept Layout plans, maps and zoning diagrams;
- Options analysis;
- Hydraulic modelling; and
- Presentation to HWC standards.

4.1 Pressure Standards

HWC must ensure minimum pressure standards for properties as part of their statutory requirements in the Hunter Water Act (1991). A summary of the minimum pressures is outlined in Table 1.

Table 1: HWC Pressure Standards

SERVICE PRESSURE LIMIT	DEMAND	PRESSURE (m)
MAXIMUM	All applications	60
MINIMUM	Peak hour flow on a peak day of a peak week – Regular system	20
	Peak hour flow on a peak day of a peak week – Boosted system	25
	Peak hour flow on an extreme day of an extreme week	12
	Peak hour flow on a 95th percentile peak day plus fire fighting flow (at location of fire flow)	15
	Peak hour flow on a 95th percentile peak day plus fire fighting flow (other than location of a fire flow)	3

4.2 Demand Estimates

To estimate design flows, values in the Water Services Association of Australia (WSAA) Water Supply Code of Australia Hunter Water Corporation Version 1.0 were used. Theoretical loadings have been determined and are expressed in terms of equivalent tenements (ET). An ET is the theoretical water

demand for an average residential lot. Design flows based on the potential lot yield are shown in Table 2.

4.2.1 Residential

Average Day Demand for new residential properties in the development area has been determined, by HWC, to be 285Kl/yr.

Average Day Demand (L/s) = 0.009/ET

Peak Day Demand (L/s) = ADD x PDD Factor x Diversity Factor

Peak Day Factor – Domestic (Houses) = 2.25

Diversity Factor = $2.653 \times ET^{-0.1067}$

Extreme Day Demand (L/s) = PDD x 1.15

Unaccounted Water = 15% of Average Day Demand.

4.2.2 Industrial

Average Day Demand for new industrial properties in the development area has been determined, by HWC, to be 4,200Kl/Ha/yr.

Average Day Demand (L/s) = 0.13/Ha

Peak Day Demand (L/s) = ADD x PDD Factor

Peak Day Factor – Industrial = 1.20

Extreme Day Demand (L/s) = PDD x 1.15

Unaccounted Water = 15% of Average Day Demand.

Table 2: Theoretical Water Flows

	Estimated Loading	Average Day Demand (L/s)	Peak Day Demand (L/s)	Peak Day Demand 95%(L/s)	Extreme Day Demand (L/s)	Unaccounted Water (L/s)
Residential	2088 ET	18.87	49.83	39.86	57.30	2.83
Industrial	198.1 Ha	26.38	31.66	30.08	36.41	3.96

4.3 Proposed Infrastructure

A concept plan of the proposed residential water network is attached**.**

Water mains servicing the proposed residential development will be interconnected with mains servicing development currently being undertaken in Cliftleigh to the east. This will provide security of supply to the development.

Lots with ground levels above RL 30m AHD will receive pressures below 20m on a Peak Day. There are approximately 350 lots with ground levels higher than RL 30m AHD. It will be necessary to install

a water pump station to provide the lots with pressures greater than 25m as required by HWC. The proposed water pump station will have a duty of 10 L/s @ 25m head.

Lots with ground levels above RL 38m AHD will receive pressures below 12m on a Peak Day if the proposed water pump station fails. There are approximately 100 lots with ground levels higher than RL 38m AHD. It will be necessary to install a high level tank to maintain water pressures as required by HWC. The proposed tank will have to have an operating level of RL 59m and a capacity of 120kL.

The high level zone is shown on the plan included at **Exhibit A.**

4.4 Boundary Conditions

HWC has provided Hydraulic Grade Line (HGL) data for the identified connection points which have been used for modelling purposes. They are listed in Table 3.

Table 3: Water Boundary Conditions

Demand Scenario	375mm (Cessnock Rd)	375mm (Int'sn Northcote St & McLeod Rd)
Average Day Max. HGL (m)	85.4	81.1
Peak Day Min. HGL (m)	57.6	76.7
95th Percentile HGL (m)	63.5	76.5

4.5 Assessment of Network Model

Modelling of the proposed water network simulated a period of 48 hours for the peak, extreme and 95th percentile peak day with fire fighting flow. Based on this modelling the proposed water network meets the minimum/maximum pressure standards.

Detailed modelling results are available on request.

4.6 Security of Supply

A water main network must also satisfy HWC requirements to ensure the reliable supply of water in the event of failure in any one link in the network. The maximum number of lots that may be developed without security of supply is 100. The residential precinct will have security of supply by cross connection into the water supply system being constructed to service residential developments in Cliftleigh to the east. This cross connection is to be provided by the construction of an additional 300mm lead in main.

4.7 Summary of Water Connection Strategy

Elevated areas of the residential precinct above RL30 would not satisfy HWC's operating license for minimum pressures on a peak day of a peak week. A water pump station will need to be installed to boost pressures above 25m as required to meet HWC requirements. It is noted that boosted systems must also satisfy minimum pressures above 12m head in the event of a power failure of the booster pump. This is equivalent to a maximum elevation of RL38. There are approximately 100 lots with ground levels above RL38m AHD. It will be necessary to install a high level tank to maintain water

pressures as required by HWC. The proposed tank will have to have an operating level of RL 59m and a capacity of 120kL.

Security of supply to the proposed industrial development is to be provided by the construction of an additional 300mm lead-in main. It should be noted that HWC may require cross connection between the industrial and residential components of the developments to enhance security of supply.

It is considered that the water infrastructure network detailed in this report will provide the Residential and Industrial Development Areas with water services that meet HWC licence criteria.

The water servicing network detailed in this report is preliminary only. Sizing and location of the required infrastructure should be confirmed at detail design stages as the development progresses.

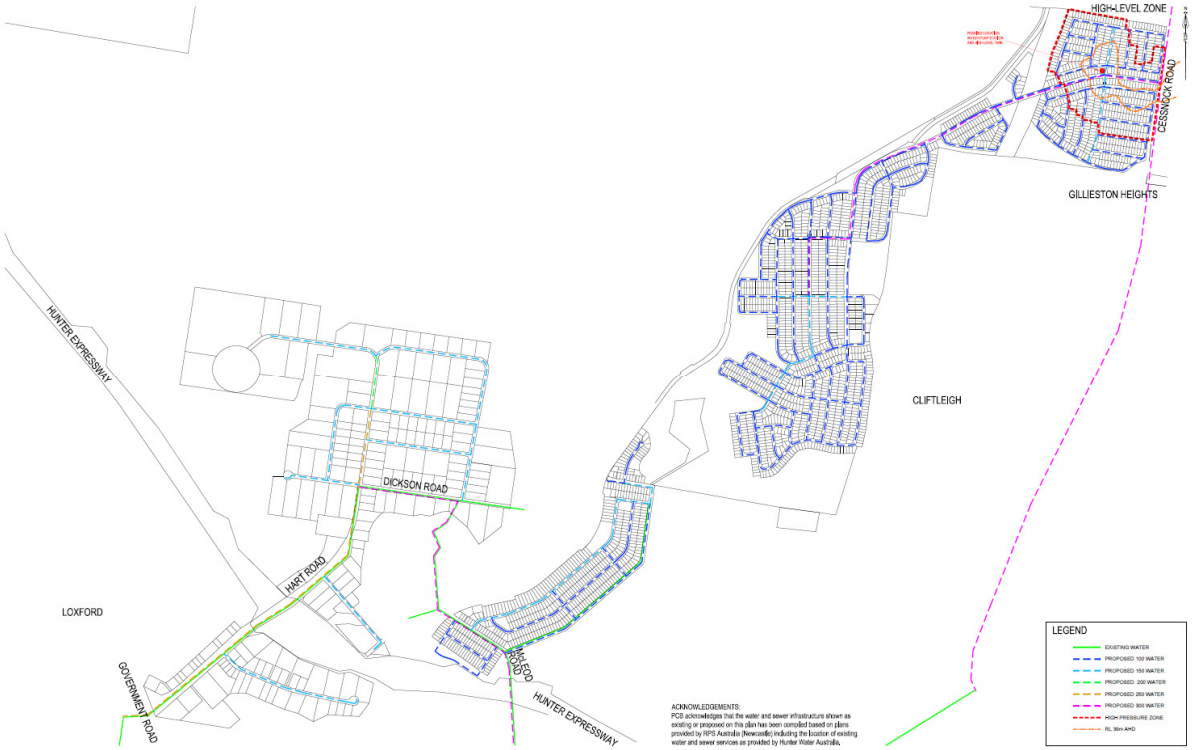


Figure 6 - Concept Water Servicing Plan

5 Sewer Connection Strategy

Hunter Water Corporation (HWC) owns and maintains the existing sewer network in the Lower Hunter. Sewer mains will be extended from existing mains to each lot providing a point of connection for future waste water services as the development progresses. These mains are typically located within private property, not located in an easement but typically adjacent to the side/rear boundaries so as to limit the encumbrance on the lot. Reticulation gravity sewer mains will drain to a network of Waste Water Pump Stations (WWPS) located in the lower elevations of the subdivision layout. Rising mains (pressure mains) will carry pumped sewer flows to a gravity sewer main in an adjoining sewer catchment.

After rezoning of the subject land a full developer funded servicing strategy would be required prior to further planning and design commencing. This servicing strategy would need to address:

- Environmental Considerations;
- Constraint definition;
- Detailed evaluation of existing water infrastructure;
- Life cycle analysis;
- Concept Layout plans, maps and zoning diagrams;
- Options analysis; and
- Presentation to HWC standards.

5.1 Residential

5.1.1 Demand Estimates

The subject site has been divided into catchment areas dependent upon the topography of the site. Note that these catchment areas are not the same as the stormwater catchment areas nor the Subdivision Stages. The loadings and proposed discharge points for each catchment are summarised in Table 4 below.

Table 4: Estimated Sewer Catchment Flows - Residential

Catchment	Estimated ET	Discharge Point	Average Dry Weather Flows (L/s)(ADWF)	Peak Dry Weather Flows (L/s)(PDWF)	Storm Allowance (L/s) (SA)	Peak Wet Weather Flows (L/s)(PWWF)
RES 1	117	Catchment RES 3	1.29	4.09	6.79	10.87
RES 2	81	Catchment RES 3	0.89	3.01	4.70	7.71
RES 3	397	Catchment RES 6	4.37	11.43	23.03	34.46
*RES 3A	(59)	Catchment RES 6	0.65	2.31	3.42	5.73
RES 4	94	Catchment RES 6	1.03	3.40	5.45	8.86
RES 5	86	Catchment RES 6	0.95	3.16	4.99	8.15
RES 6	255	Kurri WWTW	2.81	7.86	14.79	22.65
RES 7	59	Catchment RES 6	0.65	2.31	3.42	5.73
RES 8	139	Catchment RES 6	1.53	4.72	8.06	12.78
RES 9	112	Catchment RES 6	1.23	3.94	6.50	10.43

Catchment	Estimated ET	Discharge Point	Average Dry Weather Flows (L/s)(ADWF)	Peak Dry Weather Flows (L/s)(PDWF)	Storm Allowance (L/s) (SA)	Peak Wet Weather Flows (L/s)(PWWF)
RES 10	146	Catchment RES 6	1.61	4.92	8.47	13.38
RES 11	300	RES 6 Common Rising Main	3.30	9.01	17.40	26.41
RES 12	314	RES 6 Common Rising Main	3.45	9.37	18.21	27.58
RES 13	199	RES 6 Common Rising Main	2.19	6.37	11.54	17.92

*Included in total of Catchment RES 3, show here as is a distinct area

5.1.2 Proposed Infrastructure

Table 5 shows, for each residential catchment area, the number of lots being serviced, direction of drainage, the WWPS being used, length of different sized mains required and discharge point.

Table 5: Sewer Catchment Summary - Residential

CATCHMENT	LOTS (ET)	Drains to	WWPS	150mm SEWER (m)	225mm SEWER (m)	300mm SEWER (m)	DISCHARGES TO
Catchment RES 1	117	NE	1	2293			Catchment RES3
Catchment RES 2	81	NW	2	1434			Catchment RES3
Catchment RES 3	397	SW	3	6448	850		Catchment RES6
Catchment RES 4	94	SE	4	2232			Catchment RES6
Catchment RES 5	86	SW	5	1425			Catchment RES6
Catchment RES 6	255	SW	6	3112	800	365	Kurri Kurri WWTW
Catchment RES 7	59	SW	7	682			Catchment RES6
Catchment RES 8	139	NE	8	1864			Catchment RES6
Catchment RES 9	112	SW	9	1859			Catchment RES6
Catchment RES 10	146	SW	10	1241			Catchment RES6
Catchment RES 11	300	SW	11	591			Catchment RES10
Catchment RES 12	314	SW	12	4930	286		Kurri Kurri WWTW
Catchment RES 13	199	SW	13	3412	235		Kurri Kurri WWTW

5.2 Industrial

In accordance with the Water Services Association of Australia (WSAA) Sewerage Code of Australia, Hunter Water Corporation Version 1.0 an allowance of 10ET/Ha has been used to determine sewer loading in the industrial catchments.

Catchment IND 1

Covers an area of approximately 43Ha and drains to the South-East. This equates to a loading of 430ET. WWPS IND 1 will connect to the common rising main from IND 3 which will discharge directly to the Kurri Kurri WWTW.

Catchment IND 2

Covers an area of approximately 12Ha and drains to the South-East. This equates to a loading of 120ET. WWPS IND 2 will connect to the common rising main from IND 3 which will discharge directly to the Kurri Kurri WWTW.

Catchment IND 3

Covers an area of approximately 108Ha and drains to the South-East. This equates to a loading of 1080ET. WWPS IND 3 will discharge directly to Kurri Kurri WWTW.

Catchment IND 4

Covers an area of approximately 38Ha and drains to the North-West. This equates to a loading of 380ET. WWPS IND 4 will discharge into Catchment IND 3.

Table 6: Estimated Sewer Catchment Flows - Industrial

Catchment	Estimated ET	Discharge Point	Average Dry Weather Flows (L/s)(ADWF)	Peak Dry Weather Flows (L/s)(PDWF)	Storm Allowance (L/s) (SA)	Peak Wet Weather Flows (L/s)(PWWF)
Catchment IND 1	#430	IND3 Common Rising Main	4.73	12.24	24.94	37.18
Catchment IND 2	#120	IND3 Common Rising Main	1.35	4.26	7.13	11.39
Catchment IND 3	#1080	Kurri WWTW	11.87	26.98	62.58	89.56
Catchment IND 4	#380	Catchment IND 3	4.13	10.89	21.75	32.64

Equivalent tenements (ET) for the industrial area have been calculated on the basis of 10ET/Ha.

Table 7: Sewer Catchment Summary - Industrial

CATCHMENT	AREA (ha)	Equiv ET	150mm SEWER (m)	225mm SEWER (m)	300mm SEWER (m)	DISCHARGES TO
Catchment IND 1	43	430	3635			Catchment IND3
Catchment IND 2	12	120	545			Catchment IND3
Catchment IND 3	108	1080	5072	2610		Kurri Kurri WWTW
Catchment IND 4	38	380	2283			Catchment IND3

5.3 Summary

Construction of the proposed sewer infrastructure will provide sewer services to the development areas in accordance with Hunter Water Corporation criteria. Size and location of all sewer infrastructure is conceptual only and should be confirmed at the time of detail design.

Costs are indicative only and should be verified at the time of detail design.

Due to the scale of the site an alternative for the installation of a private sewer system under the Water Industry Competition Act (WICA) could also be considered. A privately owned system is possible under a Community Title Structure for both the residential and industrial precincts. It is considered that the installation of a private system may be more economically viable than

connection to the HWC sewer network but needs to be considered in light of construction, ongoing licensing and operational costs. At the time of preparation of this report HWC are not in favour of accepting cheaper package plant options which consequently results in only two alternatives – HWC owned and operated or privately owned and operated sewer services.

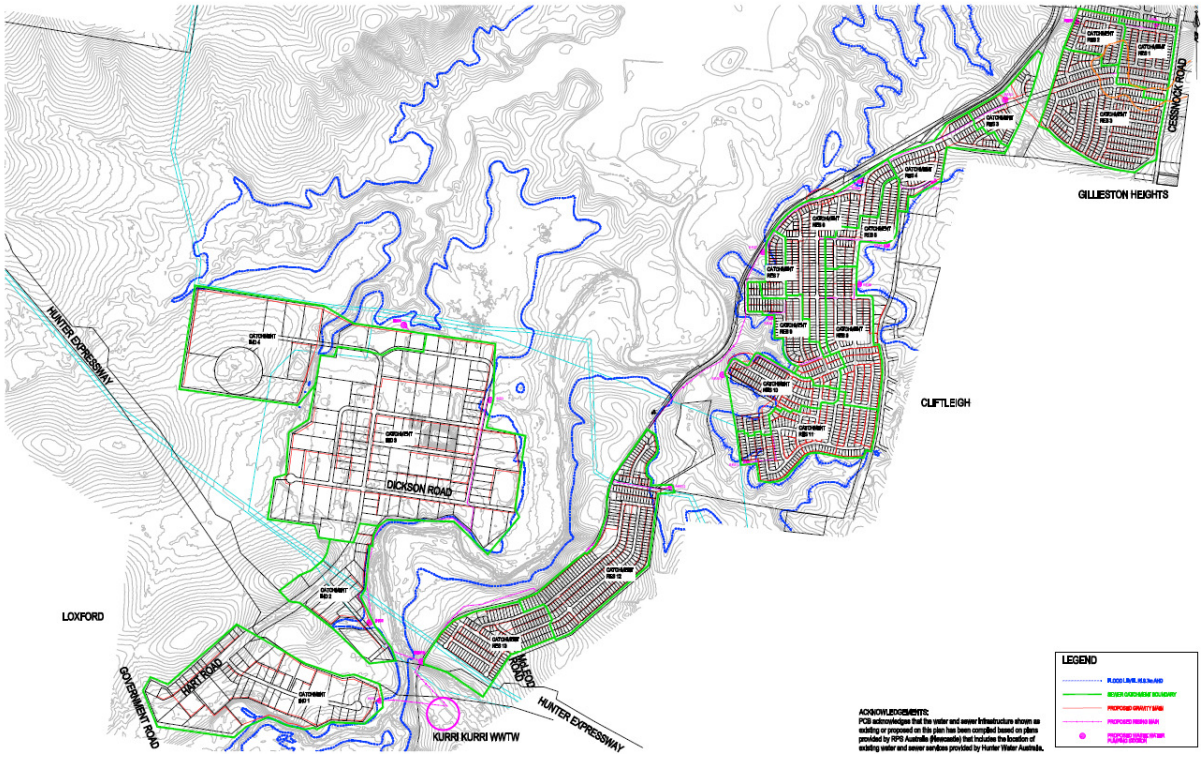


Figure 7 - Concept Sewer Servicing Plan

6 Electricity Connection Strategy

6.1 Residential

Residential development will connect to a low voltage reticulated networks supplied from 11kV kiosk substations. The locations of the kiosk substations are subject to detailed design and lot layout to ensure adequate supply within allowable supply parameters. The electrical energy authorities have varying requirements for the location of substations which generally exclude corner residential lots and public lands.

The reticulated electrical network provides for residential use as well as street lighting and public recreation use in parks and playgrounds.

6.2 Industrial

The proposed industrial precinct will be supplied by 11kV underground cables to kiosk substations at multiple locations throughout the development. The locations of the kiosk substations are subject to detailed design and lot layout to ensure adequate supply within allowable supply parameters. These kiosk substations reduce the voltage to a distribution network that is reticulated through the streets ultimately providing customer connection to each lot. Reticulation cables, in addition to the 11kV cables, are typically located within the Council road reserve within a common trench with telecommunications cables and gas cables in accordance with shared trenching arrangements.

It is not immediately clear at this stage of the redevelopment of the site whether the end-use of the industrial precinct will include any high-demand users and therefore whether any additional zone substations will be required. The nearest comparison for analysis of an industrial precinct can be found by looking at the developed Cardiff Industrial Estate or the Rutherford Industrial Estate. It is speculation at this stage suggesting that the industrial precinct will likely contain low to medium energy demand users, such as that for secondary industries. It is anticipated that most of the end users will require connection to the distribution network, with some need for high-voltage (11kV) electricity connections.

6.3 Connection Strategy

The suitability of the existing feeder network would need to be further investigated as part of an 'Identification of Needs' (IoN) Masterplan to be prepared by Ausgrid at the developer's expense. The IoN Masterplan provides a clearer understanding of both the developer and Ausgrid's expectations on timing, funding, contestability, security of supply and decisions on the need for any new zone substation. The IoN Masterplan, with an estimated cost to the developer of ~$10,000, would typically take between 6 and 12 weeks and would be prepared based on preliminary development/staging plans. The scope of the IoN Masterplan should include clarity on the above points, as well as discussion on the following options:

- Potential upgrading of the existing sub-station to Ausgrid specifications;
- Implications of using the existing sub-station in a community title scheme;
- Decommission the existing sub-station and remove redundant overhead high-voltage transmission wires across the employment land.

The IoN Masterplan exercise will investigate the viability of the existing on site sub-station with the results providing guidance for the potential inclusion of the sub-station in a community title development of the industrial lands.

7 Gas Connection Strategy

Gas is readily available to both the industrial and residential precincts. As such, gas connection is not a driver of the overall subdivision planning. The strategy is for gas connection to be planned as-required by the individual developers or land owners at Development Application stage.

7.1 Residential

Jemena Gas Networks (NSW) Ltd (Jemena) has advised that capacity exists for connection to their network. To date Jemena have not charged for the cost of installation or connection to the gas reticulation network for residential developments in the Hunter region.

7.2 Industrial

Jemena has advised that capacity exists for connection to their network, the cost to connect to their network is typically a commercial decision based on recovering the start-up cost over the life of the development. A formal reticulation offer by Jemena would occur after their assessment of the final development layout and load estimates.

7.3 Connection Strategy

Gas is readily available to both the industrial and residential precincts. The extension of the reticulated natural gas supply would be considered by Jemena at the time that a formal request is made based on a progressed development status.

8 Telecommunications Connection Strategy

8.1 Residential

No formal advice has been issued by NBN Co. for providing fast broadband internet services to the residential precinct, however, National Broadband Network Guidelines indicate that developments greater than 100 lots will be serviced from the National Broadband Network, while developments less than 100 lots will be serviced from the Telstra copper network. Given the scale of the residential component of the development it may be assumed that fibre optic cables will be extended into the residential precinct.

8.2 Industrial

Under the current legislative framework, subdivisions of the scale of this development would be included in a 'Greenfield' roll-out of the NBN, with pit and pipe installation costs borne by the developer. Such costs are typically limited to the internal reticulation of the subdivision only. The expense of extending NBN to the subject land is assumed to be borne by NBN Co.

Alternatively, under Telstra's Universal Service Obligation, the development will be provided with standard telephone service from Hart Road. The expense of augmentation of the wire network should it be required, would typically be borne by Telstra.

8.3 Connection Strategy

Telecommunications are readily available to both the industrial and residential precincts. It can be anticipated that based on the scale of the development, the National Broadband Network (NBN) will be available to both precincts. The developer would be expected to fund the installation of pit/pipe infrastructure within the footprint of the development.

9 Cost Estimates

The supply of infrastructure to service the proposed subdivision of the subject land is detailed in this section only to the extent of known major lead-in works, such as water and sewer mains. The figures provided have been utilised where possible in adding support to the subdivision cost estimates along with other remaining budget estimates such as planning, investigation, survey, design and construction. Cost estimates for other services not explicitly listed in this section have been incorporated in the subdivision design cost estimates and based on current market rates.

Note that the Subdivision Report restricts itself to Hydro owned lands only, whereas the amounts and costs here include provision of services to areas of the subdivision that are on lands not owned by Hydro.

Rates used in the cost estimates are based on contract rates for similar sized projects or developments in the lower Hunter Valley at the time that this report was prepared. An analysis of the water and sewer requirements for the Hydro site was undertaken to determine sizing for pump stations, rising mains, sewer mains and water mains. Further analyses will be required at the concept and detailed design stage.

9.1 Residential Precinct

Table 8: Cost Estimate for Water Supply – Residential Precinct

Main Size	Length	Rate	Cost
100mm	25,446m	$102/m	$2,595,492
150mm	2,783m	$140/m	$389,620
200mm	0m	$162/m	$0
250mm	0m	$203/m	$0
300mm	6,137m	$216/m	$1,325,592
Water Pump Station	(10L/s	@25m	$85,000
High Level Tank	120kL		$240,000
		CONSTRUCTION TOTAL:	**$4,635,704**
		Survey, Investigation & Design at 15%	$695,356
		Contingencies at 10%	$463,570
		COST ESTIMATE (ROUNDED)	**$5,794,630**

Table 9: Cost Estimate for Sewer Services – Residential Precinct

Catchment	WWPS	Rising Main	Gravity Mains	Total
Catchment RES 1	$320,000	$56,500	$435,575	$812,075
Catchment RES 2	$320,000	$20,000	$280,497	$620,497
Catchment RES 3	$380,000	$142,500	$1,481,880	$2,004,380
Catchment RES 4	$320,000	$11,500	$422,870	$754,370
Catchment RES 5	$320,000	$83,500	$259,945	$663,445
Catchment RES 6	$745,000	$676,500	$1,239,285	$2,660,785
Catchment RES 7	$320,000	$20,000	$157,900	$497,900
Catchment RES 8	$745,000	$676,500	$392,476	$1,813,976
Catchment RES 9	$320,000	$31,000	$353,191	$704,191
Catchment RES 10	$320,000	$83,500	$515,071	$918,571
Catchment RES 11	$320,000	$35,800	$566,130	$921,930
Catchment RES 12	$380,000	$47,500	$827,911	$1,255,411
Catchment RES 13	$380,000	$5,000	$158,270	$543,270
			CONSTRUCTION TOTAL:	$14,170,801
			Survey, Investigation & Design at 15%	$2,125,620
			Contingencies at 10%	$1,417,080
			COST ESTIMATE (ROUNDED)	$17,710,000

9.2 Industrial Precinct

Table 10: Cost Estimate for Water Supply – Industrial Precinct

Main Size	Length	Rate	Cost
150mm	5,215m	$140/m	$730,100
200mm	555m	$162/m	$89,910
250mm	2,267m	$203/m	$460,201
300mm	704m	$216/m	$152,064
		CONSTRUCTION TOTAL:	**$1,432,275**
		Survey, Investigation & Design at 15%	$214,841
		Contingencies at 10%	$143,228
		COST ESTIMATE (ROUNDED)	**$1,790,000**

Table 11: Cost Estimate for Sewer Services – Industrial Precinct

Catchment	WWPS	Rising Main	Gravity Mains	Total
Catchment IND 1	$380,000	$12,000	$690,650	$1,082,650
Catchment IND 2	$320,000	$5,000	$293,550	$618,550
Catchment IND 3	$980,000	$1,030,000	$1,460,320	$3,470,320
Catchment IND 4	$420,000	$51,000	$409,600	$880,600
			CONSTRUCTION TOTAL:	$6,052,120
			Survey, Investigation & Design at 15%	$907,818
			Contingencies at 10%	$605,212
			COST ESTIMATE (ROUNDED)	$7,570,000

10 Staging Recommendations

Providing essential lead-in infrastructure services and the attached cost will have a substantial impact on the construction staging. It may not always be practical to isolate phases of the development to minimise lead-in main cost. Some stages will carry a disproportionately higher construction cost associated with the delivery of infrastructure due to lead-in requirements.

The planning, design, construction and commissioning of Waste Water Pump Stations are likely to dominate the staging sequence. As the sewer network is largely governed by topography, the staging is therefore presumed to be governed by the sewer catchment boundaries.

10.1 Residential

The entire residential precinct is to drain to Kurri Kurri WWTW due to capacity and access constraints in the Farley WWTW catchment. This results in a staging sequence that finishes in the northern corner of the site adjacent to Gillieston Heights at Cessnock Road. With the convenient location of the southern residential precinct across the Hunter Expressway from the Kurri Kurri WWTW, the most logical place to start the residential development is along McLeod Road and Bowditch Avenue progressing in a north-easterly direction. The commencement of the residential development from the southern end also facilitates the construction of the water mains to provide security of supply to the industrial development.

Continuing the staging the residential development in a northerly direction, the first stages of the northern residential precinct would continue from the adjacent Cliftleigh development where existing underground infrastructure is available. Sewer from the northern residential precinct will be transported to the primary pump station located near the centre of the precinct. Development is expected to progress from the central spine road in both a north and south direction. Water will need to extend to Cessnock Road in the north when the number of lots exceeds 100 to satisfy the requirements for security of supply.

10.2 Industrial

The logical first stages of the industrial precinct are along Hart Road between Government Road and the Hunter Expressway. This first stage will require a single WWPS located adjacent to Swamp Creek and requires only a small length of rising main from the creek up to the elevation of the receiving manhole at Kurri Kurri WWTW. 250mm trunk water mains would need to be extended along Hart Road to provide the minimum main size for industrial development and to ensure security of supply for the following stages. The progressive staging of the industrial development would continue in a northerly direction to suit the topography and the placement of sewer pump stations.

11 Conclusion

Development of the subject land can generally be viewed as being viable from an infrastructure servicing perspective as capacity exists in all of the known network services. The key findings of this strategy are as follows:

Water

Supply of potable water to the development would be instigated at the developer's expense based on a staging that provides security of supply in the short-term and adequate main sizes for the ultimate growth;

On completion of the rezoning process, further investigation will be required through the preparation of a developer funded Water Servicing Strategy to Hunter Water Corporation standards, identifying the means of supplying potable water to the high-level area in the north east corner of the residential precinct and ensuring security of supply for ultimate growth;

Sewer

Supply of sewer will be by means of conventional gravity mains draining to a series of Waste Water Pump Stations, each pumping flows to an adjacent catchment and ultimately to the Kurri Kurri Waste Water Treatment Works;

On completion of the rezoning process, further investigation will be required through the preparation of a developer funded Sewer Servicing Strategy to Hunter Water Corporation standards, identifying the means of supplying sewer to the development, reducing where possible the number of pump stations;

Electricity

Electricity will be delivered to the development through underground cables located in common shared trenching through the road reserves. Underground cabling will extend the Ausgrid feeder network at higher voltages to a series of above-ground kiosk substations that 'distribute' the electricity in the low-voltage network;

On completion of the rezoning process, further investigation will be required through Ausgrid's preparation of a developer funded Identification of Needs Masterplan, identifying the means of supplying electricity to the development, including refined estimates of ultimate demand;

Gas

Connection to the gas network will be determined on a staging basis, with an assessment of the connection methods determined by Jemena Gas Networks once the first application is made;

Communications

Communications connections will be determined by the National Broadband Network (NBN Co) once the first application is made.

Start-up costs for each of the first stages of the Industrial and Residential Precincts can be expected to be high to support the construction of essential lead-in infrastructure.

12 Appendices – Responses from Authorities

12.1 Written Response from Jemena

Natural Gas. The Natural Choice.

09/09/2013

Pulver Cooper & Blackley Pty Ltd
P.O.Box 729 Newcastle
N.S.W. 2300

Attention: Mr. Greg McHarg

Dear Sir,

RE: POTENTIAL REDEVELOPMENT OF HYDRO ALUMINIUM SITE KURRI KURRI, NSW.

Natural Gas is available in the vicinity and could be extended to supply this proposed development, sufficient capacity exists at this point in time to service both the residential and industrial components of this proposal.

In consideration of our shareholders' interests and under NSW regulation, Jemena Gas Networks (NSW) Ltd is required to ensure that any extension of the natural gas distribution system is commercially viable and therefore must assess each request for supply on an individual basis.

In order to fully assess the viability of this proposal the final layout and load configurations would be required and a formal reticulation offer provided based on the outcome. A contribution may be required to assist in the economic viability of the proposal.

If further information or assistance is required, please do not hesitate to contact me on 0402 060 241.

Yours faithfully

Greg Knight

Network Development Manager

12.2 Written Response from Telstra

Telstra Networks
Area Planning & USO

5/317 Hunter Street
Newcastle, NSW 2300.
Locked Bag 6018
Hunter Regional Mail Centre, NSW 2310.
Telephone (02) 49 188 559
Edward.J.Bush@team.telstra.com

27th September, 2013

Greg McHarg
Pulver Cooper & Blackley
98 Lawes Street
East Maitland, NSW 2323.
PO Box 729
Newcastle, NSW 2300.

Re: Hydro Aluminium Redevelopment

Dear Greg,

Based on the information you have provided for the proposed Hydro Aluminium Revelopment plan, a review was undertaken of the area concerned and nearby Telstra telecommunications infrastructure (see my attached schematic.)

Telstra does maintain existing network throughout the land marked ie yellow horizontal line for the industrial zone & blue horizontal line for the residential zone. It is assumed additional network will need to be provided to service this area. Telstra has no objection to the development and the proposed change of land use.

Changes in government policy

You will be aware that there have been recent changes in Government policy and legislation on the provision of telecommunications infrastructure in new developments. The government has determined that from 1 January 2011, NBN Co and Telstra will be responsible for providing infrastructure in developments according to the following policy:

http://www.dbcde.gov.au/broadband/national_broadband_network/fibre_in_new_developments

These changes to policy will have a significant impact on the way infrastructure is provided in your proposed development. It is important to note that Telstra will not necessarily be responsible for installing telecommunications infrastructure in the development.

We note, though, that Telstra's primary obligation in the development will be to ensure that residents have reasonable access to standard telephone services in accordance with the Universal Service Obligation (USO).

As such, Telstra can confirm that where residents do not have access to a standard telephone service provided by another carrier, Telstra will take all reasonable steps to fulfil its USO in relation to the development.

Protection of telecommunications infrastructure

Telstra will require the protection of and/or appropriate relocation of its existing telecommunications infrastructure that may be impacted by activities on this site. To minimise risk of liability due to any damage, the Dial Before You Dig 1100 inquiry number should be contacted to obtain location of Telstra plant before commencement of any construction work.

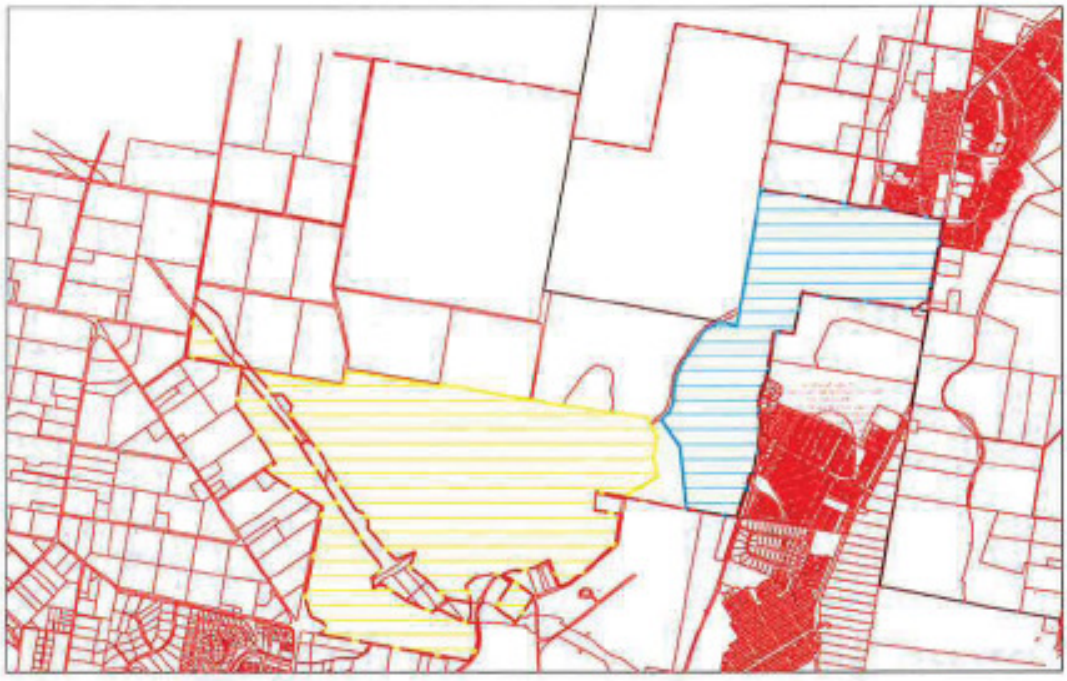
Further discussions regarding details for network expansion are strongly encouraged once detailed planning for the development is in progress. To inform Telstra of likely commencement of this development, you are requested to register this development on the Telstra Smart Community website: http://www.telstrasmartcommunity.com

Please note that Telstra reserves the right to change its decision in relation to network deployment within the development without prior notice.

Telstra is not responsible for, and to the maximum extent permitted by law disclaims all liability for, any expenses, losses, damages or costs incurred by a party as a result of relying on this letter.

Yours faithfully,

Eddie Bush
Area Planner



12.3 Written Response from Ausgrid

145 Newcastle Road
Wallsend NSW 2287
All mail to PO Box 487
Newcastle NSW 2300
T +61 2131 525
www.ausgrid.com.au

1 October 2013

Greg McHarg
Pulver Cooper and Blackley
PO Box 729
Newcastle
NSW 2300

Dear Greg

Preliminary Servicing Advice – Proposed Redevelopment of Hydro Aluminium Site – Kurri Kurri.

I refer to your email dated 5 September 2013, to Ausgrid's Mr Nigel Goodwin, regarding preliminary servicing advice for the proposed redevelopment of the former Hydro Aluminium site at Kurri Kurri and provide the following information.

Supply Options

Residential Development Area

The proposed residential development area 'A' near Gillieston Heights is supplied from Telarah Zone Substation – Feeder 48010. Feeder 48010 has approximately 0 to 0.7MVA of available capacity to supply the proposed residential development, this would allow for a maximum of 200 residential lots (assuming 3.5kVA/lot). To supply the complete residential development network upgrades are likely to be required.

The proposed residential development area 'B' near Cliftleigh is supplied from Kurri Kurri Zone Substation – Feeder 80923. Feeder 80923 has approximately 0.5 to 2MVA of available capacity to supply the proposed residential development, this would allow for a maximum of 550 residential lots. To supply the complete residential development network upgrades are likely to be required.

The load figures above assume the completion of a new 11kV feeder to Cliftleigh. This project will provide additional 11kV capacity and is expected to be complete by June 2014.

Industrial Development Area

The proposed industrial development area is currently supplied by Kurri Kurri Zone Substation Feeders 80922 and 80923, in addition the Hunter Expressway 11kV cable also traverses the proposed development area. The proposed industrial development is approximately 2km from the existing Kurri Kurri Zone Substation.

After completion of the new 11kV feeder to Cliftleigh, the available capacity on the existing Kurri Kurri 11kV feeders may provide approximately 1 to 2.3MVA of available capacity to supply initial stages of an industrial development. Further stages of the development may be supplied with network upgrades.

The existing 11kV network to the industrial development area consists of two separate 11kV tee offs with no alternate supply. The industrial development will require supply security and network upgrades will be required.

Planning Considerations

There are many influencing factors that could affect the available supply capacity including, but not limited to, other developments, future network augmentation, load growth and policy changes. This preliminary response is based on information available at the time and may change into the future. It is expected that a connection application will be submitted by the customer. Upon receipt of the application a more detailed planning study will be undertaken to enable a Design Information Package to be produced outlining the connection requirements.

The need for and scope of the network upgrade including apportionment of costs would be determined upon application through the Contestable (National Energy Customer Framework) process.

It is envisaged the development will be supplied via underground 11000 volt cables to kiosk substations at multiple locations. Each new kiosk substation will require protection by a registered easement as per Ausgrid's Network Standard 141. Further, underground low voltage (415 volt) distribution network would then be reticulated throughout the development providing connection points to each lot. The underground cables are generally installed in the council road reserve or covered by an easement if located on private land. This distribution work is Contestable and would be developer funded. Information regarding Contestability and connection to the Ausgrid network can be found in our Electrical Supply Standards, in particular ES10, and Network Standards on our website, www.ausgrid.com.au

If existing Ausgrid assets are found to be located within the development boundaries and located in areas other than council road reserve, the asset will need to be covered by an easement or relocated at the developers cost. Identification of these assets may require survey identification, or from Dial Before You Dig plans. A property search is advised to be undertaken to identify any easement or property issues.

Please do not hesitate to contact me if you require any further information or assistance.

Yours sincerely

Peter Keith
Engineering Officer
Customer Supply – Planning & Reliability
Ausgrid

(02) 4910 1662
pkeith@ausgrid.com.au
(02) 4933 0814
www.ausgrid.com.au

Ausgrid Reference: 1900040352 **Your Reference:**

12.4 Consultation with Ausgrid

A meeting was held with Ausgrid representatives on 9th July 2014 for the purposes of discussing the next phase of the Hydro re-development. Present at this meeting were members of various teams, representing the range of Ausgrid interests in the further development of the Hydro land holdings. Some of the items discussed include:

- The existing Sub-station servicing the aluminium smelter would not be to current Ausgrid specifications and could cost in the range $5M-10M to upgrade to Ausgrid Specifications before Ausgrid could commit to accepting this asset in their network;
- The existing Sub-station, if upgraded, may be over-capacity for the expected industrial purposes of the surrounding area:
    - Most customers in the proposed employment land would require LV connections (415V underground distribution network);
    - A minority of customers may require HV connections (11kV), but not necessarily a high load (low kVA);
- 132kV overhead transmission wires positioned across the site from North West and from the south east feeding the existing substation adjacent to the Hydro operations area were installed primarily to service the former smelting operations. Prior to closure of the site, the smelter was the single biggest power user in the Ausgrid network;
- With the closure of the Aluminium smelting operations on site, some existing high-voltage overhead transmission wires may no longer be necessary to supply Ausgrid's existing electrical network and therefore some of the visible impediments to development may be able to be removed;

- Initial advice suggest that there is adequate capacity in the existing Ausgrid Zone substation, located between Kurri Kurri and Heddon Greta, to service the first stages of development on the employment land;
- The staged development of the employment land progressively away from the Hunter Expressway may provide the funding for a new zone substation, should this be required, which would probably be approximately centrally located within the employment land;
- Further discussion should be held with developers adjoining the residential land for the shared cost of relocating existing 33kV overhead transmission wires to a more appropriate location that is sensitive to the proposed residential zoning.

A clearer understanding of both the developer and Ausgrid's expectations on timing, funding, contestability, security of supply and decisions on the need for a new zone substation can be outlined in an 'Identification of Needs' (IoN) Masterplan. This plan would be prepared by Ausgrid with an estimated cost to the developer to $10,000. Such a plan would typically take between 6 and 12 weeks and would be prepared based on preliminary development/staging plans. The scope of this IoN Masterplan should include clarity on the above points, as well discussion on the following options:

- Potential upgrading of the existing sub-station to Ausgrid specifications;
- Implications of using the existing sub-station in a community title scheme;
- Decommission the existing sub-station and remove redundant overhead high-voltage transmission wires across the employment land.

-- End of Report --