Technical Study

Clarenza URA Sewerage Infrastructure Report, de Groot & Benson. 25/03/2025

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Clarenza URA SEWERAGE INFRASTRUCTURE REPORT

for Clarence Valley Council

25/03/2025 | Revision A

de Groot & Benson Pty Ltd
Consulting Engineers & Planners

236 Harbour Drive Coffs Harbour NSW 2450 | 02 6652 1700 | email@dgb.com.au

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1. Introduction

de Groot & Benson Pty Ltd has been engaged by Clarence Valley Council to prepare a Sewerage Infrastructure Report for proposed development of land comprising the Clarenza URA (the "subject site"). This report also considers the possible rezoning of the Alipou Creek site to E4 General Industrial, south of the URA on the opposite side of Big River Way.

An existing Water Supply and Sewer Strategy was prepared by Hunter Water Australia in January 2013 (the "HWA Sewer Strategy"). This previous study investigated the existing sewage within the study area (at the time) and proposed various future infrastructure options.

This report will address the following items:

- The future sewage demands of the Clarenza Urban Release Area assuming ultimate full development potential.
- The sewerage demands of the existing developed areas east of Centenary Drive.
- Approximate capacity and location of pumping stations and rising mains in the Clarenza Urban Release Area.
- Approximate capacity and location of trunk sewer main network in the Clarenza Urban Release Area.
- Integration with existing sewer reticulation systems.
- Service corridor requirements through the Clarenza Urban Release Area for possible future growth east of Centenary Drive.

This report will provide commentary on sewer servicing strategies associated with the proposed structure plan shown in **Appendix B**. The concepts described in this report are related to the ultimate development of the proposed structure plan which involves numerous existing land parcels within the Urban Release Area (URA) not currently under the ownership of a single entity or person.

As the proposed structure plan is conceptual, the strategies in this report may require refinement if the ultimate development of the URA is significantly different to what is shown in Appendix B.

2. Existing Conditions

2.1.1 Location and Description

The study area is the Clarenza Urban Release Area comprising numerous existing land parcels as shown in **Figure 2-1.** The study area is bounded by Big River Way to the south, Alipou Creek to the west, Hennesy Drive & Duncans Road to the north and Centenary Drive to the East.

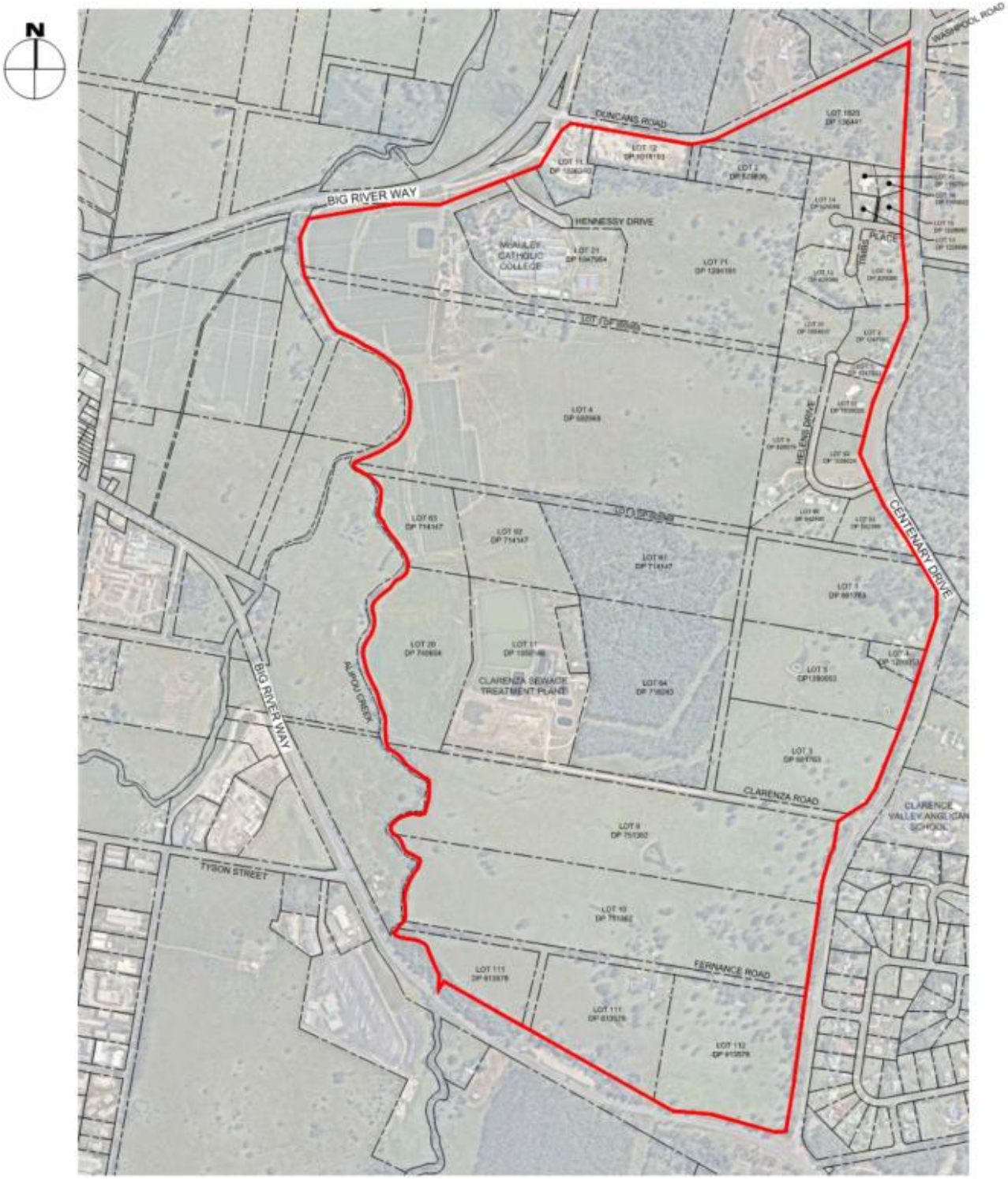


Figure 2-1 - Study Area Locality

The existing land use consists of predominantly rural landscape with existing scattered vegetation. The existing topography within the study area is undulating with several mapped first and second order streams discharging into Alipou Creek. However, aerial imagery indicates that many of these streams appear to be cleared of vegetation, possibly due to historical rural use.

Existing large lot residential areas exist towards the north-east corner of the site. There is one school within the site and two more in the vicinity.

The Clarenza Sewage Treatment Plant (STP) is located on the western side of the Clarenza URA.

3. Proposed Development

The proposed development comprises predominantly low density residential development with minor medium density areas in the vicinity of McAuley College. The proposed structure plan also includes environmental areas that typically consist of existing vegetated areas and streams to be retained and possibly enhanced.

The general arrangement of the proposed development is illustrated in **Figure 2-3**.

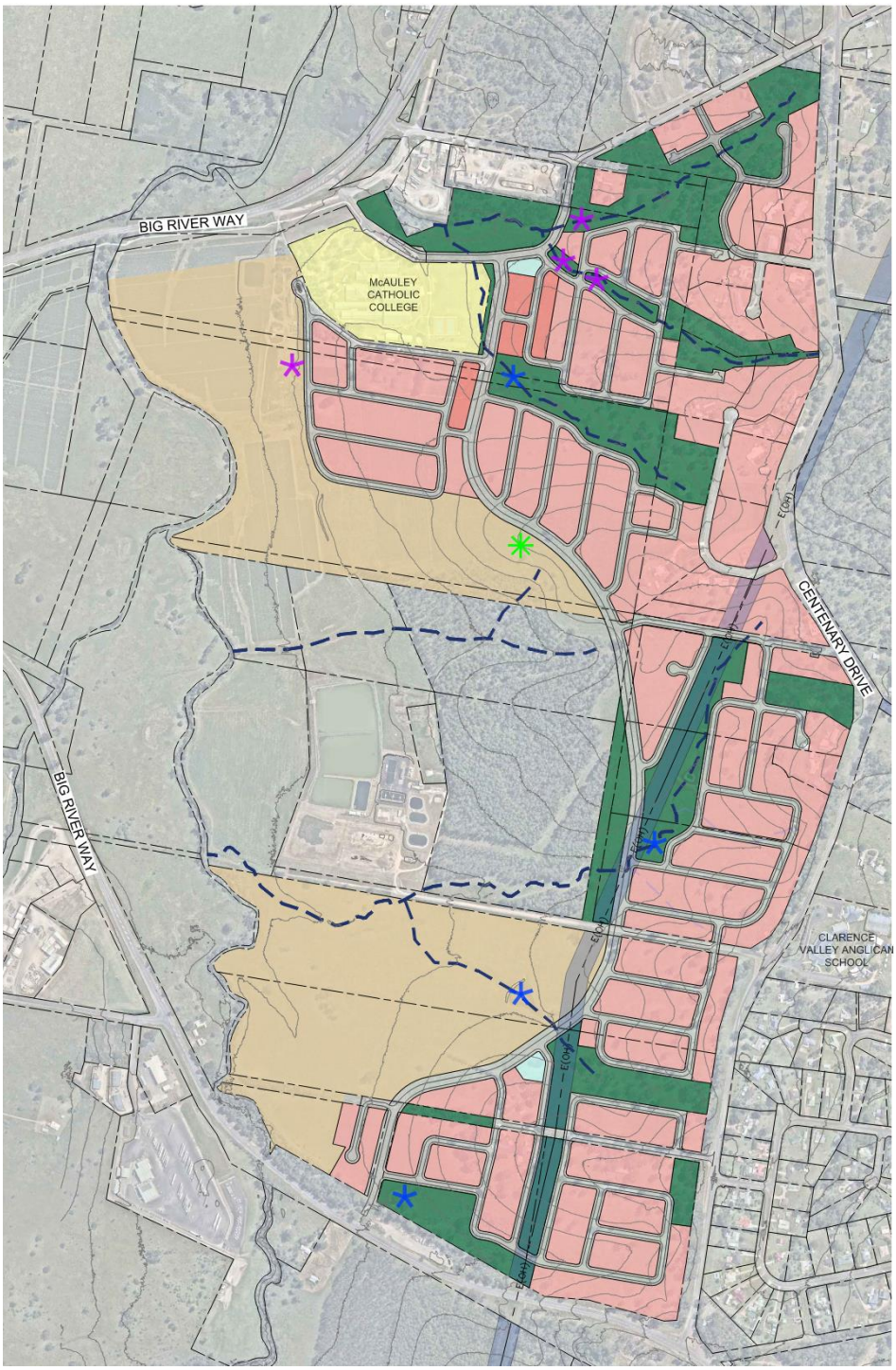


Figure 3-1 - Proposed Development Layout

4. Sewer Loadings

The theoretical sewer loadings have been calculated using the methodology outlined in the Water Services Association of Australia (WSAA) Sewerage Code of Australia. The following theoretical sewer loadings have been assessed:

Average Dry Weather Flow, ADWF = 0.0028 L/s/EP

Peak Dry Weather Flow, PDWF = d x ADWF

Design Flow = PDWF + GWI + IIF

The Northern Rivers Local Government Design Specification D12 "Sewerage Systems" specifies that for all domestic and commercial flows, designers shall adopt an average dry weather flow contribution of 240L/EP/day. The required EP/ET ratio is specified as 3.2. Note, the current Australian Bureau of Statistics (ABS) Census data for Grafton is approximately 2.3 people per household.

Table 1 - Sewer loading design parameters

Parameter	Value	Reference / Comment
$Portion_{wet}$	0.25	Portion of pipe network below groundwater table. Groundwater information not available, assumed value only
S_{aspect}	0.5	Soil aspect of leakage severity coefficient. Value range 0.2 to 0.8, mid-range adopted.
N_{aspect}	0.5	Network defects aspect of leakage severity coefficient. Value range 0.2 to 0.8, mid-range adopted.
C	1.0	$S_{aspect} + N_{aspect}$
$I_{1,2}$	38.3	1 hour duration 2 year ARI rainfall intensity (BOM)
$Factor_{containment}$	1	Corresponds to 1 in 2 year containment of sewage overflow (WSAA), assumed value.
EP/ET ratio	3.2	Design Specification D12
ADWF	0.0028 x EP	Design Specification D12
d	$0.01(\log_{10}EP)^4 - 0.259(\log_{10}EP)^3 - 2.56(\log_{10}EP)^2 - 11.37(\log_{10}EP) + 20.78$	Gravity Sewerage Code of Australia, Regional NSW Edition, Version 1 (WSAA)
PDWF	d x ADWF	
GWI	0.025 x A x $Portion_{wet}$	Ground Water Infiltration (WSAA)
Aeff	A x $(Density/150)^{0.5}$	Effective Area for residential developments (WSAA)
IIF	0.028 x Aeff x C x I	Inflow and Infiltration Flow (WSAA)
Design Flow	PDWF + GWI + IIF	Flow rate adopted for design of the system

4.1 Existing Sewer Loadings

The existing sewer loadings within the Clarenza URA consist of sewage from two existing sewage pumping stations (CL2 and CL5) and sewage from Clarence Valley Anglican School. The existing school is estimated to consist of an existing school population of 350. The NSW Water Directorate "Section 64 Determination of Equivalent Tenements Guidelines" provides a suggested value of 0.05 ET per person (Table 2 – Education – School (primary & secondary). The equivalent ET from the school is estimated to be 17.5 ET and drains to an existing gravity sewer main in Centenary Drive.

The existing sewage pumping station (SPS) CL5 is located on Rosewood Drive adjacent to Lot 79 DP1271628, within an existing large lot residential subdivision east of Centenary Drive. This SPS services 90 ET and discharges to an existing gravity sewer at Centenary Drive, eventually combining with the sewage from Clarence Valley Anglican School.

Existing SPS CL1 is located near the south-east corner of the Clarenza STP and receives flows from CL5 and Clarence Valley Anglican School. SPS CL1 pumps flows directly into the Clarenza STP inlet works. Council have advised that there is no spare capacity in CL1.

Existing SPS CL4 is an existing SPS located on the western side of McAuley Catholic College. The existing school population is estimated to be 600 which equates to 30 ET. SPS CL4 pumps to an existing inlet to the Clarenza STP.

These school loadings are potentially conservative (high) as water meter readings suggest substantially lower water usage. Although, it is not known if this is supplemented with rainwater reuse.

The existing sewer loadings are summarised in the following table.

Table 2 - Existing sewer loadings

Catchment	ET	ADWF (L/s)	PDWF (L/s)	Design Flow (L/s)
EX1	17.5	0.157	1.166	3.510
SPS CL5	90	0.806	3.882	13.81
SPS CL1	107.5	1.541	6.288	17.454
SPS CL4	30	0.269	1.730	4.979

There are various other existing sewer rising mains approaching from South Grafton that discharge into Clarenza STP. However, these existing rising mains are not impacted by the proposed development and are therefore not considered further in this assessment.

4.2 Future Sewer Loadings

4.2.1 Clarenza URA

The anticipated future development of the Clarenza URA as shown in **Appendix B** has been subdivided into various sewer catchments dictated by existing topography. Whilst some reshaping of the land may occur during future development of the URA via bulk earthworks, it is expected that the post-development catchment will generally follow the existing topography due to practical limitations of bulk earthworks reshaping.

The future residential and commercial sewer loading have been estimated from the assumed yields shown on the proposed Structure Plan. The final sewer loadings may vary as the proposed development/s are further refined during subsequent Development Application and Subdivision Works Certificate applications.

Table 3 - Future sewer loadings

Catchment	Catchment Area	Development Area (ha)	ET	EP	ADWF	PDWF	Design Flow (L/s)
CL1	106.37	101.82	594	1900.8	5.322	16.219	56.304
CL4	71.46	56.80	542	1732.8	4.852	15.089	41.782

5. Sewer Servicing Strategy

5.1 Design Criteria

The sewerage system design criteria for this study has been developed in accordance with WSAA Gravity Sewerage Code of Australia and Northern Rivers – Local Government Development Design Specification D12 "Sewerage System" Version 3.

- The following criteria have been adopted in the proposed sewer servicing for Clarenza URA:
- ADWF contribution for all domestic and commercial flows is 240L/EP/day.
- Pipes and fittings shall be unplasticised PVC (uPVC) and ductile iron (DICL).
- All sewage pumping stations are to be of a single wet-well submersible pump style with a minimum of two pumps in a duty/standby arrangement.
- Each pump shall have a minimum capacity equal to the Design Flow at maximum head.
- Each pump should be designed for maximum 10 starts per hour.
- Sewer rising mains shall be unplasticised PVC (uPVC) Series 2.
- Minimum sewer rising main velocity of 0.6m/s and maximum velocity of 3.0m/s.
- Maximum sewage detention time of 4 hours in rising main, otherwise oxygen injection must be provided and stipulated.
- Council shall generally not accept the use of pumping stations servicing less than 50 lots. Where a load of less than 50 lots is proposed, evidence must be provided to support a case for the proposed pumping station and approved by Council.
- At least 8 hours of ADWF total emergency storage shall be provided within the system. Overflow management shall not allow discharge to natural watercourse under any circumstances.

5.2 Existing Sewer System

There is an existing DA approval for a proposed 80 lot residential subdivision in the south east corner of the Clarenza URA (Lot 112 DP613578). The previous sewer strategy by HWA advised that an additional 30 lots could be accommodated if both duty and standby pumps were operated simultaneously at CL1. Council have advised that the existing sewage pumping station in Clarenza Road (CL1) has no spare capacity and it is therefore assumed that the proposal to allow the early release of 30 lots was not adopted by Council. As Council have advised there is no spare capacity at CL1, no further analysis of this existing SPS has been undertaken.

The existing SPS next to McAuley Catholic College (CL4) has a 65mm dia uPVC sewer rising main according to Council's GIS information. The small size of the rising main, combined with the position of the wet-well in school land would likely make it impractical to add any additional sewage to the existing SPS. Therefore, no further analysis of this existing SPS has been undertaken.

In summary, it is assumed that both CL1 and CL4 have no spare capacity to service proposed development within the Clarenza URA.

5.3 Future Sewer System Development

The overall Clarenza URA is topographically divided into two main sewer catchments, separated generally in the middle of the URA area. The Southern Precinct generally drains west to CL1 and includes the existing flows from CL5 and Clarence Valley Anglican School. The Southern Precinct also includes the possible rezoning of the land south of Big River Way to E4 General Industrial.

The Northern Precinct generally drains west and north west to CL4.

The following table summarises the sewer loadings from the various catchments and sub-catchments.

Table 4 - Ultimate sewer loadings

Catchment	Development Area (ha)	ET	EP	ADWF	PDWF	Design Flow (L/s)
Southern Precinct						
1	8.26	82	262.4	0.735	3.624	8.602
2	9.09	75	240.0	0.672	3.393	8.566
3	11.70	94	300.8	0.842	4.009	10.325
4	26.28	233	745.6	2.088	7.902	20.870
5	3.50	20	64.0	0.179	1.286	3.457
6	42.99	90	288.0	0.806	3.882	20.275
7 [2]	36.00	540	1728.0	4.838	15.056	31.662
Total	**137.82**	**1134**	**3628.8**	**10.16**	**39.152** [1]	**103.76** [1]
Northern Precinct						
8	6.80	33	104.0	0.291	1.835	5.619
9	8.21	73	233.6	0.654	3.326	7.806
10	41.79	436	1395.2	3.907	12.753	32.120
Total	**56.8**	**542**	**1732.8**	**4.852**	**17.914** [1]	**45.545** [1]

1. The PDWF and Design Flows are proportional to the size of the catchment and not simply a cumulative value. This is primarily due to the varying peaking factor (d) used in the calculation for the PDWF as the catchment area changes. Therefore, the PDWF and Design Flows are not the sum of their contributing catchments.
2. Catchment 7 consists of the possible future industrial area south of Big River Way and is only applicable to the Southern Precinct Scenario 2.

The proposed sewer servicing strategy considered two scenarios for the Southern precinct. Scenario 1 consists of the ultimate development of the Clarenza URA with wastewater draining via gravity mains to SPS CL1. SPS CL1 is to be upgraded to be capable of accommodating the ultimate flows from the developed URA and existing upstream catchment.

The Scenario 2 considers all elements of Scenario 1 but also includes estimated sewage flows from the possible rezoning and development of the future industrial land south of Big River Way.

The proposed sewer servicing strategy considered two scenarios for the Northern Precinct. Both scenarios are similar and involve wastewater from the Northern Precinct draining via gravity mains to an upgraded

SPS CL4. Scenario 1 involves the upgrade of CL4 at generally the same location. This scenario will require a new deep gravity sewer across the northern undeveloped portion of the McAuley Catholic College.

It is understood that there may be issues with consent from the school to accommodate a new gravity sewer main in the school site and it is unknown if there are plans to further expand the school within the school site. Scenario 2 was developed to provide an alternative location for CL4 that avoids new infrastructure within the school site. Scenario 2 involves upgrading CL4 to accommodate flows from McAuley Catholic College and the Clarenza URA and relocates the SPS to the northern side of the school adjacent to Hennesey Drive. The proposed alternative location of CL4 appears to be flood free according to Council's current flood mapping.

5.4 Southern Precinct Sewer Servicing Strategy

5.4.1 Scenario 1

Scenario 1 involves draining the Clarenza URA and existing upstream sewer catchment via a series of DN150 and DN225 gravity sewer mains depending on flow and anticipated longitudinal grade. The smaller DN150 gravity mains are generally located in the steeper grades draining west and the larger gravity main is along the western edge of the Southern Precinct.

The increase in wastewater inflows necessitates the upgrade of CL1 to accommodate the wastewater for the ultimate catchment. It is typically more cost effective to install "package pump stations" rather than constructing in-situ pump stations. Package pump stations are usually manufactured off-site and transported to site via truck which limits the wet-well size due to width limitations on roads. Therefore, we have assumed that the wet-well of the new pump station will be 3m diameter and should be sufficiently wide to accommodate the required pumps and other mechanical elements.

Scenario 1 proposes the construction of a new SPS at CL1 that has a pumping capacity of 51L @ 19m head. The depth of the new wet-well is estimated to be 4.5m but will need to eventually be confirmed by undertaking detailed design. The following table summarises the ultimate sewer loadings and sewer rising main calculations.

Table 5 - Southern Precinct Scenario 1 SPS Parameters

Parameter	Value	Reference / Comment
Sewer loading calculations		
Catchment Area (ha)	101.82	
ET	594	
EP	1900.8	
ADWF (L/s)	5.322	
PDWF (L/s)	16.219	
Design Flow (L/s)	51.291	
Sewer rising main		
Assumed pipe	150mm uPVC	
Static head, H_s (m)	10.3	
Duty flow (L/s)	51.291	Calculated Design Flow
Length (m)	230	
Calculated velocity (m/s)	2.317	
Friction head loss (HP) (m)	7.52	Darcy - Weisbach Formula (WSAA)
Fitting head loss, H_f (m)	1.37	$H_f = kf\ (v^2 / 2g)$ (k_f assumed to be 5.0)
Total mean head	19.2	$H_s + HP + H_f$
SRM detention time (Hrs)	0.03	t = (Length / Velocity) / 3600

The SPS will require emergency storage of at least 8 hours of ADWF. Therefore, under Scenario 1 ultimate sewer loadings, CL1 will require 153,274L of emergency storage. The emergency storage is typically available in the wet-well itself, upstream gravity infrastructure and, if required, supplemented by additional offline emergency storage. A cost-effective way of providing additional offline emergency storage is via a series of large diameter Reinforced Concrete Pipes (RCP). The RCP's can be installed either in a single stage or incrementally staged as required during the staging of the development.

The calculated emergency storage in the wet-well and upstream 225mm diameter gravity sewer is 71,900L. Therefore, an additional 81,400L of additional emergency storage is required. It is proposed to construct an offline emergency storage consisting of 14 x 2.4m long x 1800mm diameter RCP pipes at a higher invert level compared with the bottom of the wet-well so that the emergency storage drains back to the wet-well.

The estimated detention time is less than 4 hours so oxygen injection is not required.

5.4.2 Scenario 2

Scenario 2 involves the same sewer servicing strategy as Scenario 1 except there is an allowance for the possible future industrial land south of Big River Way. Council has advised that approximately 36ha of land is available for possible rezoning and development into industrial. Using suggested values "Light Industrial" in the NSW Water Directorate "Section 64 Determination of Equivalent Tenements Guidelines", this equates to an equivalent increase of 1,728 EP (540 equivalent ET) compared with Scenario 1.

Under this scenario, the DN225 gravity sewer from the south-west corner of the Clarenza URA is required to be increased in size to a DN3000 gravity sewer due to anticipated grade limitations (0.5% longitudinal fall).

Also under this scenario, the upgraded SPS CL1 will require pumps capable of pumping 78L @ 16m head. The sewer rising main will also need to be increased from 150mm diameter to 200mm diameter.

Table 6 - Southern Precinct Scenario 2 SPS Parameters

Parameter	Value	Reference / Comment
Sewer loading calculations		
Catchment Area (ha)	137.82	
ET	1134	
EP	3628.8	
ADWF (L/s)	10.161	
PDWF (L/s)	27.110	
Design Flow (L/s)	77.943	
Sewer rising main		
Assumed pipe	200mm uPVC	
Static head, H_s (m)	10.3	
Duty flow (L/s)	77.943	Calculated Design Flow
Length (m)	230	
Calculated velocity (m/s)	2.067	
Friction head loss (HP) (m)	4.33	Darcy - Weisbach Formula (WSAA)
Fitting head loss, H_f (m)	1.09	$H_f = kf\ (v^2 / 2g)$ (k_f assumed to be 5.0)
Total mean head	15.72	$H_s + HP + H_f$
SRM detention time (Hrs)	0.03	t = (Length / Velocity) / 3600

The SPS will require emergency storage of at least 8 hours of ADWF. Therefore, under Scenario 2 ultimate sewer loadings, CL1 will require 292,637L of emergency storage. The calculated emergency storage in the wet-well and upstream 300mm diameter gravity sewer is 91,700L. Therefore, an additional 201,000L of additional emergency storage is required. It is proposed to construct an offline emergency storage

consisting of 33 x 2.4m long x 1800mm diameter RCP pipes at a higher invert level compared with the bottom of the wet-well so that the emergency storage drains back to the wet-well.

The estimated detention time is less than 4 hours so oxygen injection is not required.

Considering the possible future industrial area is unrelated to development of the Clarenza URA, there is no obvious nexus to the Clarenza URA. Therefore, any additional costs associated with the possible future industrial area should be attributed to that development and not the wider Clarenza URA.

5.5 Northern Precinct Sewer Servicing Strategy

There is an existing SPS (CL4) at the western edge of the McAuley Catholic College that currently only services the school itself. The topography of the Northern Precinct generally drains west and north-west to the general location of the existing SPS. There are two scenarios proposed for the Northern Precinct, both involving the upgrade of SPS CL4 with the difference between the scenarios being the location of SPS CL4.

5.5.1 Scenario 1

Scenario 1 involves draining the northern portion of Clarenza URA via a series of DN150 and DN225 gravity sewer mains depending on flow and anticipated longitudinal grade. The smaller DN150 gravity mains are generally located in the steeper grades and upper reaches of the catchment and larger gravity main is near the bottom of the catchment.

The increase in wastewater inflows necessitates the upgrade of CL4 to accommodate the wastewater for the ultimate catchment including the McAuley Catholic College. We have assumed that SPS CL4 will be to a 3m diameter wet-well “package pump station” and will be located generally at the same location as the existing SPS. Scenario 1 proposes the construction of a new SPS at CL4 that has a pumping capacity of 42L @ 42m head. The depth of the new wet-well is estimated to be 4m but will need to eventually be confirmed by undertaking detailed design.

The following table summarises the ultimate sewer loadings and sewer rising main calculations.

Table 7 - Northern Precinct Scenario 1 SPS Parameters

Parameter	Value	Reference / Comment
Sewer loading calculations		
Catchment Area (ha)	56.80	
ET	542	
EP	1734.4	
ADWF (L/s)	4.856	
PDWF (L/s)	15.099	
Design Flow (L/s)	41.805	
Sewer rising main		
Assumed pipe	150mm uPVC	
Static head, H_s (m)	9.3	
Duty flow (L/s)	41.805	Calculated Design Flow
Length (m)	1200	
Calculated velocity (m/s)	1.89	
Friction head loss (HP) (m)	30.51	Darcy - Weisbach Formula (WSAA)
Fitting head loss, H_f (m)	1.82	$H_f = kf\ (v^2 / 2g)$ (k_f assumed to be 10.0)
Total mean head	41.63	$H_s + HP + H_f$
SRM detention time (Hrs)	0.18	t = (Length / Velocity) / 3600

A 200mm diameter sewer rising main would also be sufficient for Scenario 1 with the total head reduced to 18.9m. However, the velocities in the sewer rising main would likely be less than 1m/s until the catchment is fully developed. Therefore, a 150mm diameter sewer rising main was selected to better cater for a staged release of the Northern Precinct.

The SPS will require emergency storage of at least 8 hours of ADWF. Therefore, under Scenario 1 ultimate sewer loadings, CL4 will require 139,853LL of emergency storage. The calculated emergency storage in the wet-well and upstream 225mm diameter gravity sewer is 59,650L. Therefore, an additional 80,200L of additional emergency storage is required. It is proposed to construct an offline emergency storage consisting of 14 x 2.4m long x 1800mm diameter RCP pipes at a higher invert level compared with the bottom of the wet-well so that the emergency storage drains back to the wet-well.

The estimated detention time is less than 4 hours so oxygen injection is not required.

5.5.2 Scenario 2

Scenario 2 for the Northern Precinct involves generally the same sewer servicing strategy as Scenario 1 except that the location of SPS CL4 has been moved to a location north of McAuley Catholic College to avoid new sewer mains required through the school site.

The depth of the SPS is generally similar to Scenario 1 but the length of sewer rising main is extended by approximately 200m compared with Scenario 1, increasing the friction head loss. The catchment, sewer loadings, depth and emergency storage requirements remain the same as Scenario 1.

Scenario 2 proposes the construction of a new SPS at CL4 that has a pumping capacity of 42L @ 47m head. The following table summarises the ultimate sewer loadings and sewer rising main calculations.

Table 8 - Northern Precinct Scenario 2 SPS Parameters

Parameter	Value	Reference / Comment
Sewer rising main		
Assumed pipe	150mm uPVC	
Static head, H_s (m)	9.3	
Duty flow (L/s)	41.805	Calculated Design Flow
Length (m)	1400	
Calculated velocity (m/s)	1.89	
Friction head loss (HP) (m)	35.6	Darcy - Weisbach Formula (WSAA)
Fitting head loss, H_f (m)	1.82	$H_f = kf (v^2 / 2g)$ (k_f assumed to be 10.0)
Total mean head	46.72	$H_s + HP + H_f$
SRM detention time (Hrs)	0.21	t = (Length / Velocity) / 3600

The estimated detention time is less than 4 hours so oxygen injection is not required.

Considering the possible future industrial area is unrelated to development of the Clarenza URA, there is no obvious nexus of additional upgrades required to cater for the possible future industrial area. Therefore, any additional costs associated with the possible future industrial area should be attributed to that development and not the wider Clarenza URA.

6. Conclusion

There are two existing Sewage Pumping Stations within the Clarenza Urban Release Area (URA). CL1 is an existing SPS that currently services an existing large lot residential subdivision (SPS CL5) and Clarence Valley Anglican School, east of Centenary Drive. CL1 is located immediately south of the Clarenza Sewage Treatment Plant (STP) and discharges directly into the STP inlet works, approaching from the south. Council have advised that there is no spare capacity in the existing CL1 system.

CL4 is an existing SPS that is located on the western side of McAuley Catholic College and services the school itself. CL4 has an existing 65mm diameter sewer rising main that discharges directly into the STP inlet works, approaching from the north. The small size of the rising main, combined with the position of the wet-well in school land would likely make it impractical to add any additional sewage to the existing SPS. Therefore, this SPS is assumed to be at capacity and no further analysis of this existing SPS has been undertaken.

An existing Water Supply and Sewer Strategy was prepared by Hunter Water Australia in January 2013 (the "HWA Sewer Strategy"). This previous study investigated the existing sewage within the study area (at the time) and proposed various future infrastructure options.

The Clarenza URA is a planned residential urban release area with pockets of commercial areas as shown in Appendix B. There is a possible rezoning of the Alipou Creek site to E4 General Industrial, south of the URA on the opposite side of Big River Way.

The existing and ultimate sewer loadings have been calculated using the methods outlined in WSAA and using design parameters recommended in WSAA and the Northern Rivers Local Government Design Specification D12 "Sewerage Systems". The requirements of Design Specification D12 prevails over recommended parameters in WSAA.

The overall Clarenza URA is topographically divided into two main sewer catchments, separated generally in the middle of the URA area. The Southern Precinct generally drains west to CL1 and includes the existing flows from CL5 and Clarence Valley Anglican School. The Southern Precinct also includes the possible rezoning of the land south of Big River Way to E4 General Industrial. The Northern Precinct generally drains west and north-west to CL4.

The proposed sewer strategy for the Southern Precinct investigated two scenarios. Scenario 1 draining the Clarenza URA catchment (including existing upstream catchment) via gravity sewer mains to an upgraded SPS CL1. Scenario 1 proposes the construction of a new SPS at CL1 that has a pumping capacity of 51L @ 19m head. The depth of the new wet-well is estimated to be 4.5m but will need to eventually be confirmed by undertaking detailed design. A new 150mm diameter sewer rising main is proposed to replace the existing 100mm diameter rising main and connect directly to the STP inlet works.

A second scenario (Scenario 2) was investigated for the Southern Precinct which is similar to Scenario 1 but allows for the additional sewer loadings from a possible future industrial area at the Alipou Creek site. Scenario 2 proposes the construction of a new SPS at CL1 that has a pumping capacity of 78L @ 16m head. The diameter of the wet-well is assumed to be 3m and depth estimated to be 4.5m but will need to eventually be confirmed by undertaking detailed design. The additional sewer loadings from the possible future industrial area require the sewer rising main to be increased to a 200mm diameter pipe and will connect directly to the STP inlet works. The gravity sewer from the south-west corner of the URA will need to be increased in size from 225mm diameter to 300mm diameter to accommodate the additional sewer loadings from the possible future industrial site.

Considering the possible future industrial area is unrelated to development of the Clarenza URA, there is no obvious nexus to the Clarenza URA. Therefore, any additional costs associated with the possible future industrial area should be attributed to that development and not the wider Clarenza URA.

The proposed sewer strategy for the Northern Precinct also investigated two options that are essentially the same, however involve different locations for SPS CL4. Under both scenarios, the wastewater from the northern catchment of Clarenza URA will drain to a new CL4 via gravity sewer mains and require the SPS and sewer rising main to be upgraded to accommodate the additional flow. Under both scenarios, the diameter of the wet-well is assumed to be 3m and depth estimated to be 4m but will need to eventually be confirmed by undertaking detailed design.

Scenario 1 involves an upgrade of CL4 generally at its existing location. A new 225mm diameter gravity sewer will be required through the currently vacant area of the McAuley Catholic College School site. The new SPS at CL4 will require pumping capacity of 42L @ 42m head and will require a 150mm diameter sewer rising main. It is assumed that the new sewer rising main will generally follow the alignment of the existing sewer rising main and connect directly into the STP inlet works.

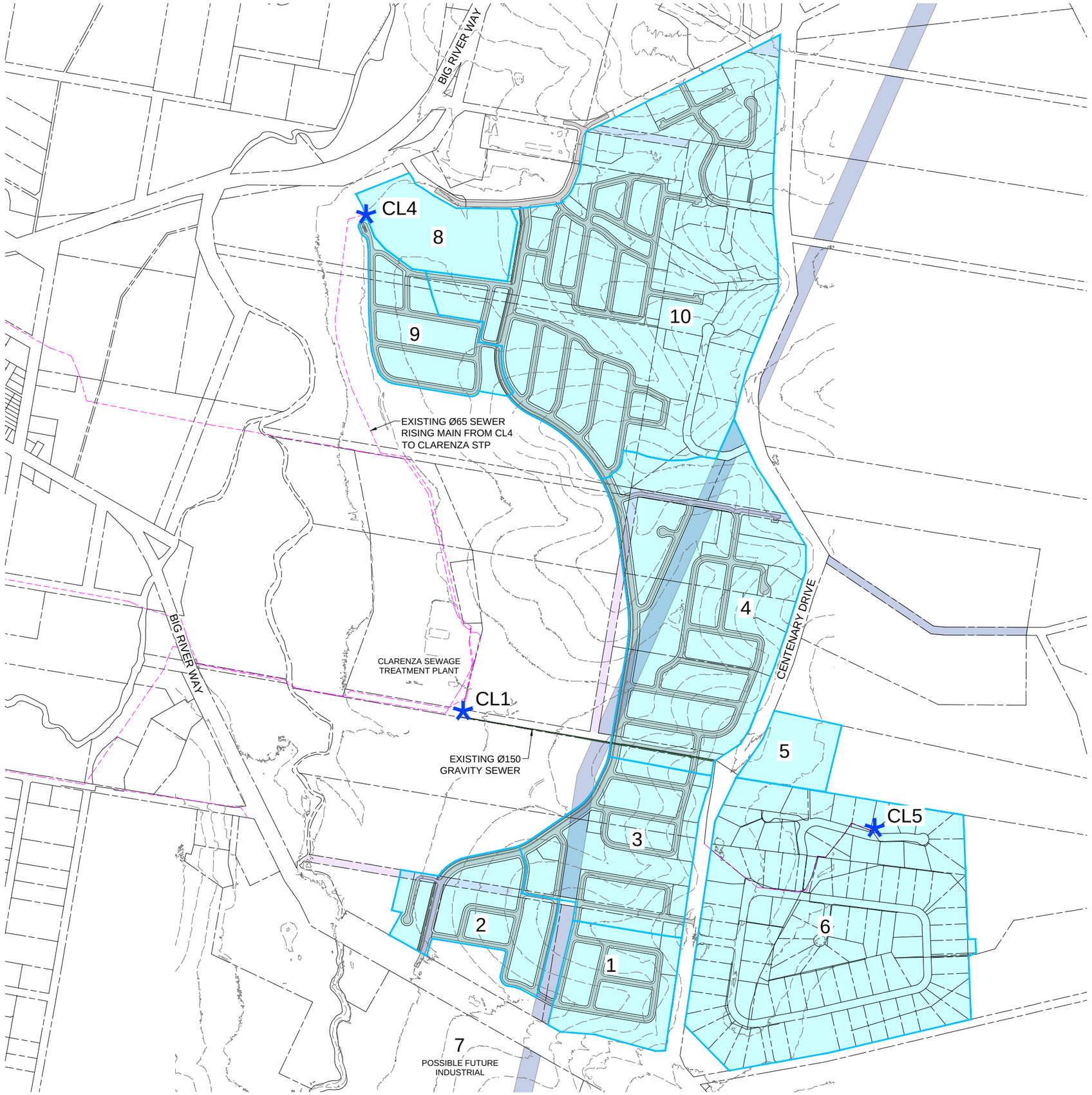
A second scenario (Scenario 2) was investigated for the Northern Precinct which is the same as Scenario 1 but involves the relocation of CL4 to the northern boundary of McAuley Catholic College (adjacent to Hennesey Drive) in an area that appears to be flood free based on Council's flood mapping. This removes the SPS and gravity mains from the school property. The depth of the SPS is generally similar to Scenario 1 but the length of sewer rising main is extended by approximately 200m compared with Scenario 1, increasing the friction head loss. The catchment, sewer loadings, depth and emergency storage requirements remain the same as Scenario 1.

Scenario 2 proposes the construction of a new SPS at CL4 that has a pumping capacity of 42L @ 47m head. The following table summarises the ultimate sewer loadings and sewer rising main calculations.

The minimum emergency storage required for each SPS is 8 hours of Average Dry Weather Flow (ADWF). The amount of emergency storage required for each SPS in each scenario varies, however exceeds the available storage in the wet-well and upstream gravity sewer network. Therefore, supplementary emergency storage is required. It is proposed to provide this additional emergency storage via a series of large Reinforced Concrete Pipes (RCP). Using RCP's is cost-effective compared with an equivalent underground tank and can be staged if necessary.

The sewer strategies outlined in this report generally align with the original concepts proposed in the HWA Sewer Strategy in 2013 for the ultimate case. All of the strategies in this study propose upgrades to existing sewage pumping stations so, if adopted, there would be no increase in the number of pumping stations as a result of development of the URA.

Appendix A Sewer Concept Plans



100 0 100 200 300 400 500

SCALE OF METRES 1:5000 (A1) 1:10000(A3)

de Groot & Benson
Consulting Engineers & Planners

A.C.N. 052 300 571
236 Harbour Drive,
Coffs Harbour NSW 2450

Phone (02) 6652 1700
Fax (02) 6652 7418
Email: email@dgb.com.au

Client: clarence VALLEY COUNCIL

Project: CLARENZA URBAN RELEASE AREA

Title: SEWER CATCHMENTS

Scale:	Datum:	Checked:	Approved:
AS SHOWN	MGA/AHD	GJK	AWM
Project No.	Drawing No.		Revision:
24146	S001		A

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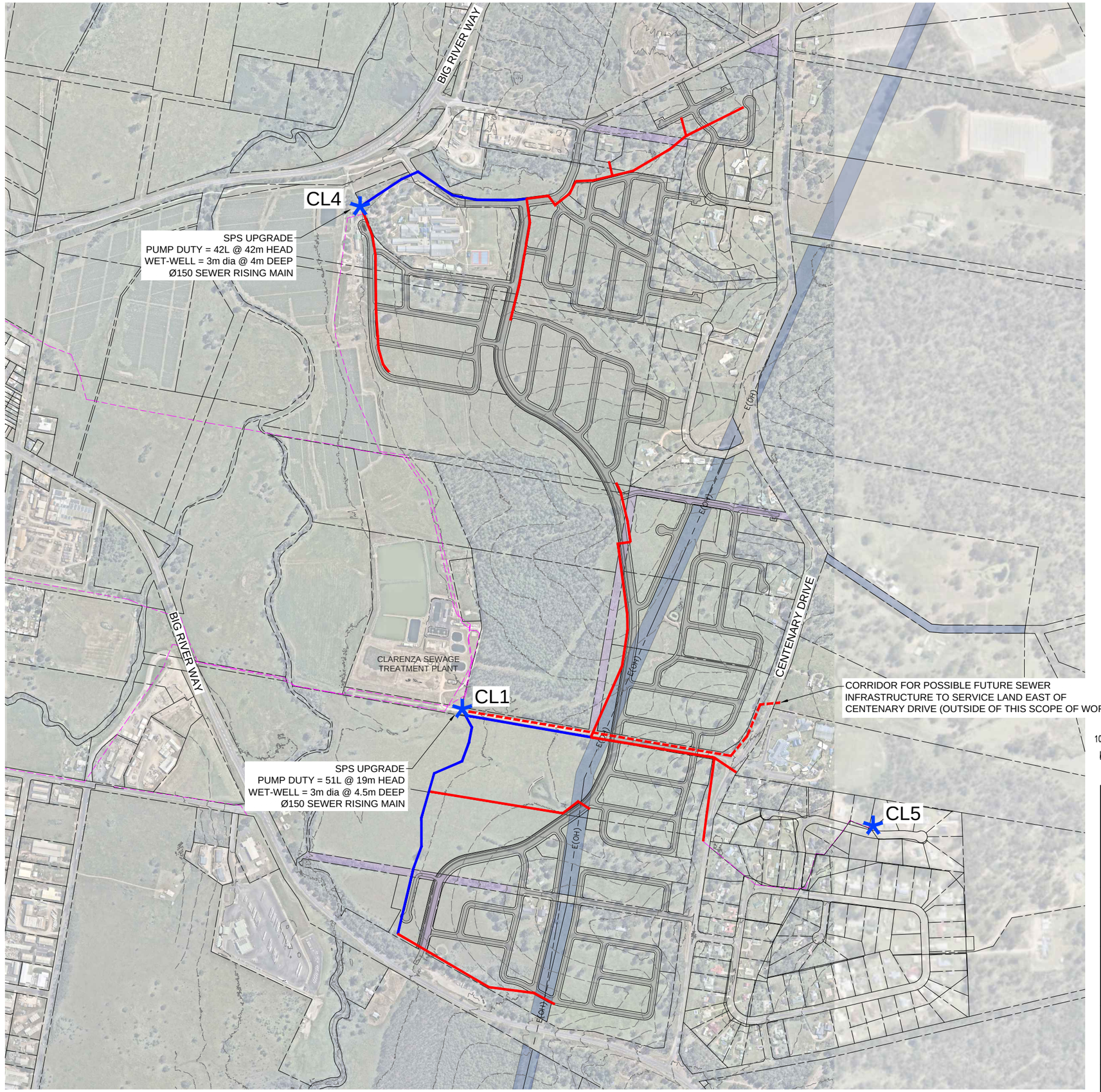

LEGEND:

INDICATIVE KEY Ø150 SEWER

INDICATIVE KEY Ø225 SEWER

100 0 100 200 300 400 500

SCALE OF METRES 1:5000 (A1) 1:10000(A3)

de Groot & Benson

Consulting Engineers & Planners

A.C.N. 052 300 571
236 Harbour Drive,
Coffs Harbour NSW 2450

Phone (02) 6652 1700
Fax (02) 6652 7418
Email: email@dgb.com.au

Client: clarence VALLEY COUNCIL

Project: CLARENZA URBAN RELEASE AREA

Title: SEWER STRATEGY - SCENARIO 1

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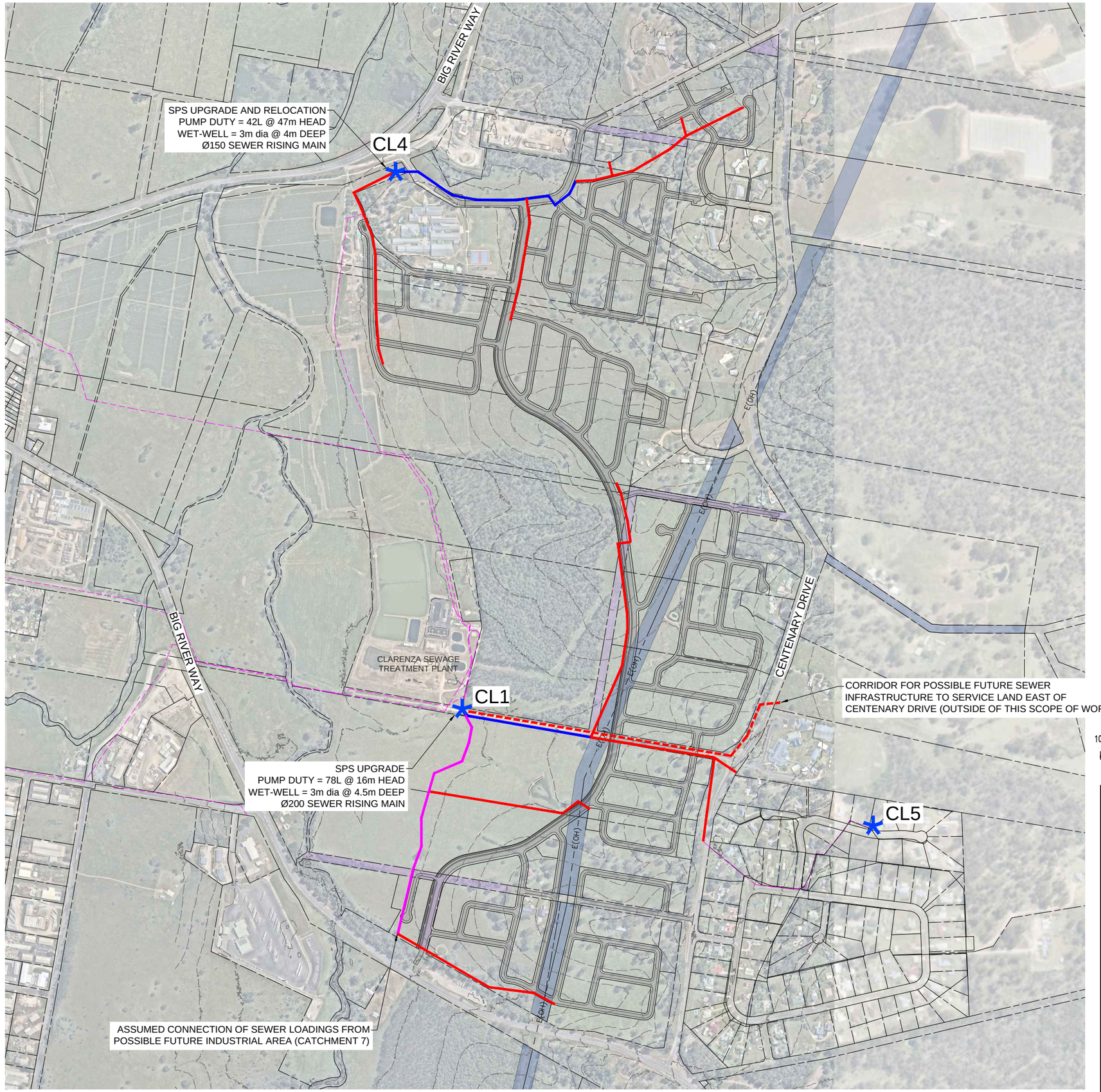

LEGEND:

- INDICATIVE KEY Ø150 SEWER
- INDICATIVE KEY Ø225 SEWER
- INDICATIVE KEY Ø300 SEWER

100 0 100 200 300 400 500

SCALE OF METRES 1:5000 (A1) 1:10000(A3)

de Groot & Benson
Consulting Engineers & Planners

A.C.N. 052 300 571
236 Harbour Drive,
Coffs Harbour NSW 2450

Phone (02) 6652 1700
Fax (02) 6652 7418
Email: email@dgb.com.au

Client: clarence VALLEY COUNCIL

Project: CLARENZA URBAN RELEASE AREA

Title: SEWER STRATEGY - SCENARIO 2

Scale:	Datum:	Checked:	Approved:
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Project No.	Drawing No.		Revision:
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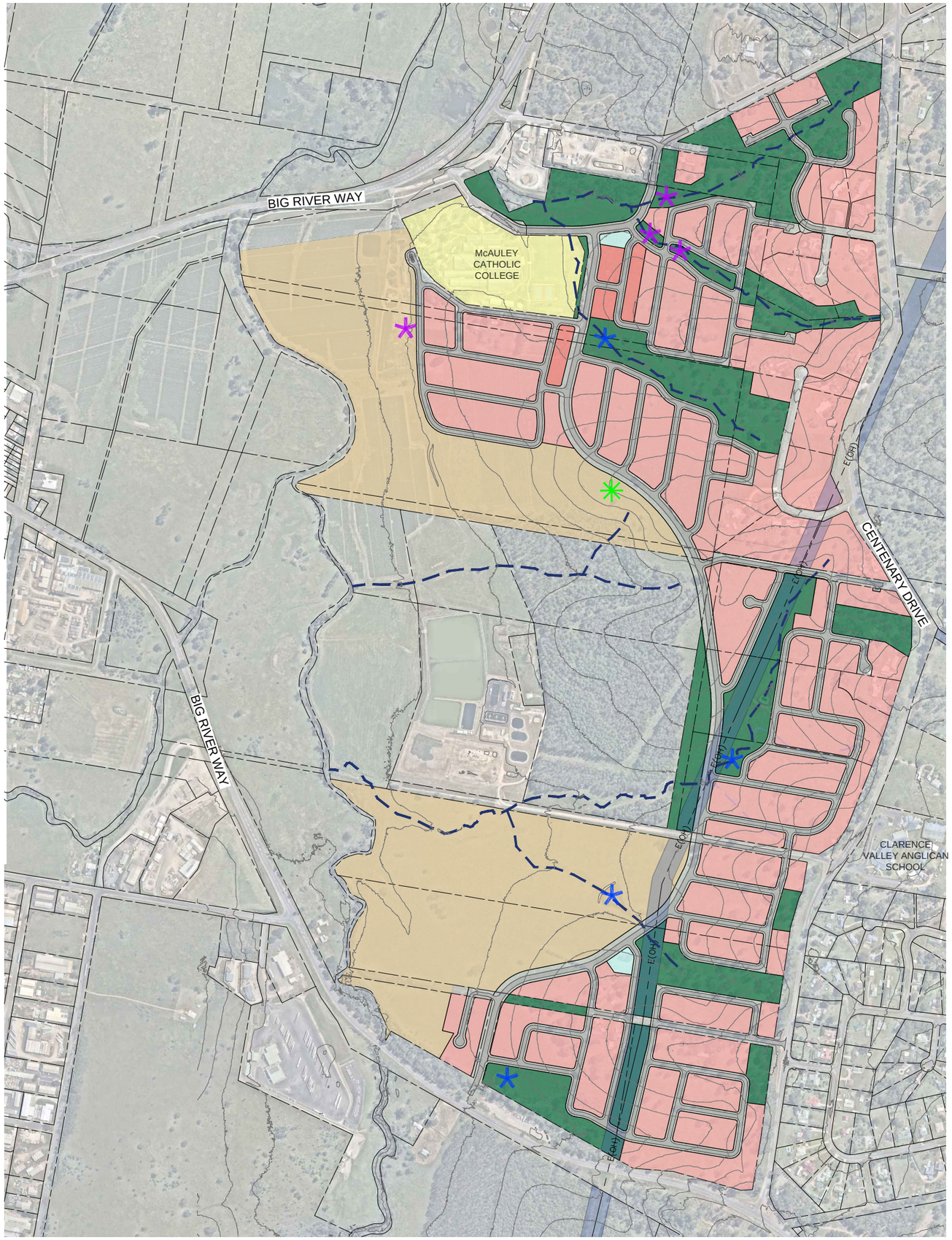
Appendix B Structure Plans



LEGEND:

- RESIDENTIAL 10 du/ha
- VILLAGE RESIDENTIAL 15 du/ha
- RURAL RESIDENTIAL
- LOCAL CENTRE
- SCHOOL
- ENVIRONMENTAL
- EXISTING STREAM (TO REMAIN)
- PROPOSED PARK
- INDICATIVE DETENTION/WSUD
- INDICATIVE WSUD TREATMENT

Indicative Residential Yield Breakdown

Residential Type	Indicative Density [1]	Indicative Area (ha) [1]	Overall	
			Indicative Yield	% Area
Village Residential	30–33 du/ha	1.74	52 – 57	2.4%
Residential	13–15 du/ha	70.3	914 – 1055	97.6%
Total		72.04	966 – 1112	100%

1. Excludes road reserve areas.

100 0 100 200 300 400 500

SCALE OF METRES 1:5000 (A1) 1:10000(A3)

de Groot & Benson
Consulting Engineers & Planners

A.C.N. 052 300 571
236 Harbour Drive,
Coffs Harbour NSW 2450

Phone (02) 6652 1700
Fax (02) 6652 7418
Email: email@dgb.com.au

Client: clarence VALLEY COUNCIL

Project: CLARENZA URBAN RELEASE AREA

Title: STRUCTURE PLAN

Scale:	Datum:	Checked:	Approved:
1:5000 (A1)	MGA/AHD	GJK	AWM

Project No.	Drawing No.	Revision:
24146	SP04	A

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