

DM & RD DOSSOR



**COASTAL GROVE, LENNOX HEAD
INFRASTRUCTURE STRATEGY**

**Issue No. 1
SEPTEMBER 2006**



**Patterson Britton
& Partners Pty Ltd**
consulting engineers

DM & RD DOSSOR

Coastal Grove, Lennox Head Infrastructure Strategy

Issue No. 1 SEPTEMBER 2006

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1 INTRODUCTION

Patterson Britton & Partners (PBP) have been engaged to develop a servicing strategy to accompany the Project Application and Environmental Assessment for the proposed 45 residential lot development of Coastal Grove at Lennox Heads as required under Part 3A of the EP & A Act. This report should be read in conjunction with the Water Cycle Management and Construction Environmental and Waste Management Plan reports prepared by Patterson Britton & Partners dated September 2006.

The issues addressed in this report include those raised in the Department of Planning Director General's requirements dated 15 May 2006 and those raised by various stakeholders during consultation meetings.

In accordance with the Director Generals requirements, the following agencies have been consulted in development of the infrastructure strategy for the site:-

- Department of Natural Resources (DNR);
- Department of Primary Industries (DPI);
- Northern Rivers Catchment Management Authority (NRCMA);
- Ballina Council.

Additionally, the initiative and recommendations contained within the Integrated Water Cycle Management Guidelines for NSW Local Water Utilities (*October 2004*) published by the Department of Energy, Utilities and Sustainability (*DEUS*) were considered in development of the servicing strategy for this development.

Furthermore, in addition to consulting government agencies and relevant guidelines, the local community was consulted at a community information night.

The proposed development has been presented to the abovementioned group/agencies and comments from them have been considered in the formulation of the proposed development.

1.1 EXISTING CONDITIONS

The site is located approximately 1km south east of the Lennox Head town centre, as shown in **Figure 1.1**.

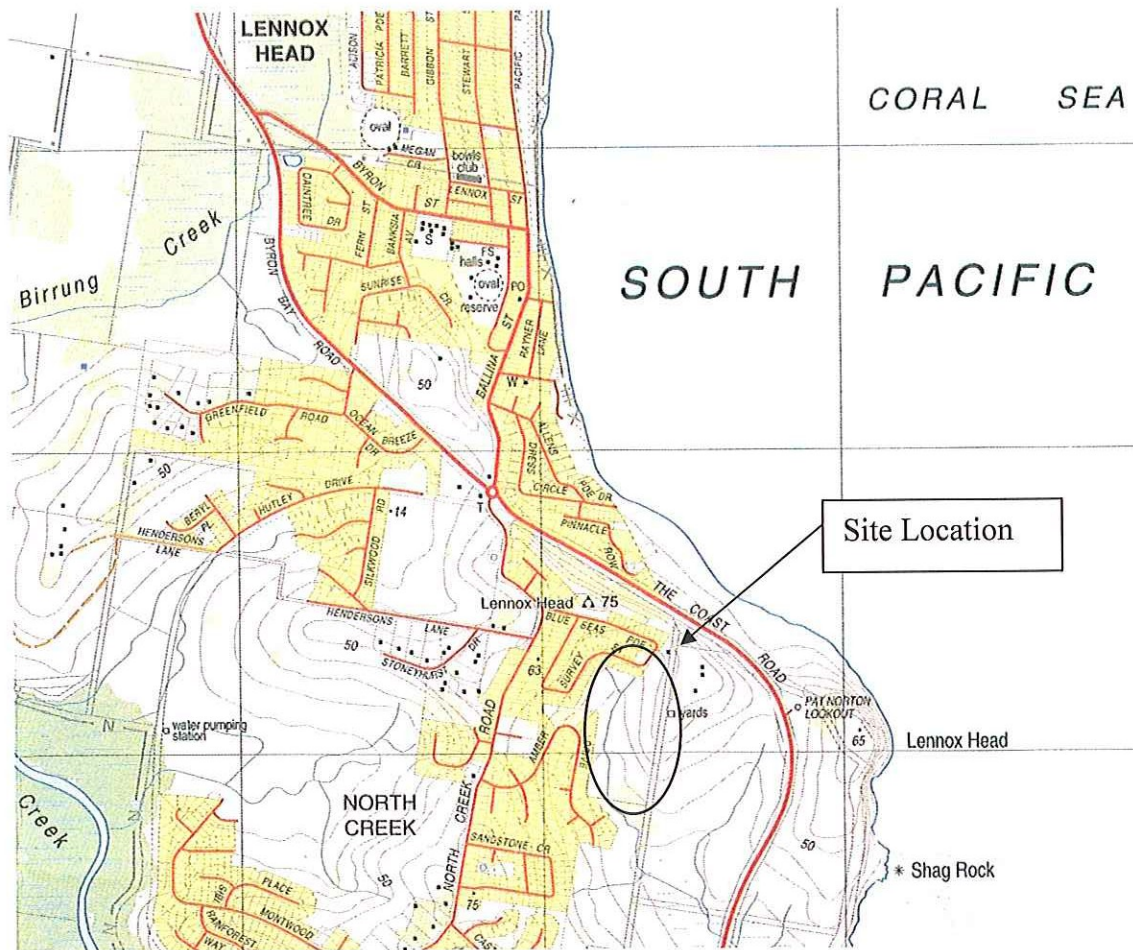


Figure 1.1 – Locality Plan

The total site area is approximately 14.7ha, comprising 10ha of developable land with the remaining portion containing the escarpment to the Coast Road, retained vegetation and areas of open space.

The site is located east of existing residential development.

1.2 PROPOSED DEVELOPMENT

The proposed development would include the construction of internal access roads, water and sewer infrastructure, power and telecommunications facilities to service the site.

The proposed development is presented on **Figure 1**.

1.3 CONSULTATION

Consultation with various service providers and Ballina Council was undertaken to assess existing infrastructure surrounding the site and new infrastructure required to service the site.

2 SEWER SERVICING

2.1 SCOPE OF INVESTIGATIONS

The scope of works for the sewer component of this investigation includes:

- Identify sewer alignments to service new development and transfer to existing pump station SP3107.
- Preliminary sizing of sewers along selected alignments.
- Review of existing pump station SP3107 and its associated rising main to determine upgrade requirements.

2.2 COUNCIL'S PLANS FOR INFRASTRUCTURE UPGRADES

Council has prepared a sewerage strategy for the region (*Ballina Shire Council (BSC) Sewerage Infrastructure Development Servicing Plan (DSP) May 2004*) which covers the proposed development area. Modifications to the existing infrastructure proposed in the strategy include:

- Decommissioning of SP3108 and transfer existing flows to SP3107.
- Existing pumping station SP3107 to be upgraded to cater for flows from the new development and redirected flows from the old SP3108 catchment. In addition, Council has advised that SP3106, to which SP3107 pumps, is to be decommissioned and its catchment flows will also drain to SP3107. Therefore the pumping station upgrade needs to cater for SP3106 catchment flows as well (*refer Appendix 1 for details*).

2.3 EXISTING INFRASTRUCTURE

2.3.1 Introduction

There is existing sewerage infrastructure surrounding the development area consisting of gravity collection mains, sewage pumping stations and associated rising mains to transfer collected sewage to downstream catchments.

Infrastructure surrounding the development area is described below.

2.3.2 Gravity Sewer

Sewerage reticulation currently exists in the surrounding residential area. The existing sewer areas include:

- Blue Seas Estate is to the north of the site and consists of development in Survey Street and Blue Seas Parade. These houses drain to SP3108.

- Seaview Estate is to the south and west of the site and consists of development in Amber Drive, Seamist, Seaview and Seabreeze Places. These houses drain to SP3107.

These are primarily DN150 sewer mains (*refer Appendix 2 for details*).

2.3.3 Sewage Pumping Stations

There are three pumping stations surrounding the proposed development. Future works associated with pumping stations affected by the development are listed below, and are as specified in the DSP:

- SP3106 (*Located at the end of Amber Drive*):

This pumping station currently receives flows from the gravity catchments of Boulder Beach Estate (these flows unknown), and pumped flows from SP3107. SP3106 is to be decommissioned.

- SP3107 (*Located in Seamist Place*):

The pumping station is to be retained and augmented to service the proposed development, as well as existing development after the decommissioning of SP3106 and SP3108.

This pumping station currently receives flows from a gravity catchment of approximately 53 ET's in Seaview Estate.

- SP3108 (*Located in Survey Street*):

This pumping station currently receives flows from a gravity catchment of approximately 111 ET's in Blue Seas Estate. It is to be decommissioned.

Details of the existing pumping station to be augmented, SP3107, are presented in **Table 2.1**. A drawing of the existing SP3107 pumping station is attached at **Appendix 3** (*drawing provided by BSC*).

Table 2.1 - SP3107 Existing Technical Specification

Pumps	2 pumps (<i>1 duty, 1 standby</i>) Duty: 7 L/s @ 21 m head	
Existing Load on SP3107	53 ET's	
Wet Well	Ground RL:	13.60 m AHD
	Pump Well Inlet:	10.40 m AHD
	TWL Standby Pump:	10.25 m AHD
	TWL Duty Pump:	10.10 m AHD
	BWL:	9.10 m AHD
	Floor RL:	8.80 m AHD
	Well Diameter:	1.77 m
	Well Area:	2.46 m ²
	Storage Above TWL	7.38 m ³
Inlet Pipe	Invert Level:	10.4 m AHD
	Diameter:	DN150 mm
Rising Main	Diameter:	DN100 mm
	Length:	230 m
	Material:	PVC Class 12
	Invert Level at outlet to PS:	Approx 9.10 m AHD <i>(assumed to be at BWL)</i>
	Discharge Level:	26.5 m AHD <i>(approx)</i>

2.3.4 Rising Mains

Existing rising mains associated with the pumping stations described in **Section 2.3.3** include:

- From SP3108 to SP3107:

The rising main from SP3108 pumping station currently delivers sewage from Blue Seas Estate into an existing gravity main which feeds pumping station SP3110 (*located in Montwood Drive external to the development*), which then pumps to Lennox Sewage Treatment Works (*STW*).

The existing rising main size is DN150 and is approximately 430 metres in length. This main will be decommissioned.

- From SP3107 to SP3106:

The SP3107 rising main currently delivers sewage from Seaview Estate to pumping station SP3106. Details of rising main SP3107 are included in **Table 2.1**.

The existing rising main size is DN100 and is approximately 230 metres in length. This main is proposed for upgrade to DN200 in the Council's DSP.

- From SP3106 to Lennox STW:

The SP3106 rising main from Boulder Beach Estate to Lennox STW is a common rising main which accepts loads from other pumping stations (*SP3103 and SP3201*) along its route to a gravity main which discharges to Lennox STW. It follows an

undulating profile and does not consistently rise to its discharge point, and as such sections of the rising main act as a variable grade sewer (*refer Appendix 4 for details*).

The existing rising main size is DN250 and is approximately 2400 metres in length.

With the decommissioning of the SP3106 pumping station a new gravity main will transfer the existing loads from the pumping station catchment to SP3107. It is yet to be determined if the existing rising main will be connected to a new rising main from SP3107 or if an upgrade of the existing main is required.

2.4 PROPOSED SEWER SERVICING

2.4.1 Gravity Sewer

A sewer layout has been formulated to service the lots associated with the proposed development, collect existing flows discharged to SP3108 and transfer these flows to SP3107. The sewer layout is shown on **Figure 1**. All sewers are DN150 except for the main DN225 carrier sewer between the existing Access Chamber A/21 and proposed Access Chamber A4.

The proposed sewer alignment has been designed to take into account the grade of the site. This allows the sewer reticulation to primarily be constructed within road reserves, in public open space and traversing the rear of properties at the eastern boundary of the site.

The sewer alignment avoids threatened vegetation in the southern portion of the site as identified by Peter Parker. The sewer main would follow the proposed pedestrian link to Seamist Place. Earthworks for the sewer across the drainage corridor would be located downstream of the threatened hairy-joint grass and as such runoff from these works would not impact on this species.

The sewer grading is also controlled by the existing pumping station invert levels. The longsection of the sewer main between SP3108 and SP3107 is presented in **Figure 2**.

Lot 11 will discharge to the existing DN150 mm sewer main at the end of Blue Seas Parade. All other lots will discharge into the proposed sewer reticulation.

2.4.2 Pumping Station and Rising Main Upgrade

SP3107 and its associated rising main require upgrading to cater for existing and new flows from the proposed development.

The loads from SP3107 gravity catchment are discharged to Access Chamber A/21 adjacent to the pumping station. The new development will also discharge into Access Chamber A/21 (*labelled on Figure 1*).

The existing and future loads on SP3107 are described below:

Existing	<input type="checkbox"/> Seaview Estate	53 Lots
Future	<input type="checkbox"/> Blue Seas Estate ⁽¹⁾	111 Lots
	<input type="checkbox"/> Boulder Beach Estate ⁽²⁾	Council to provide
	<input type="checkbox"/> Coastal Grove Development ⁽³⁾	45 Lots
	TOTAL:	<u>209 Lots +</u> ⁽⁴⁾

(1) Due to decommissioning of SP3108

(2) Due to decommissioning of SP3106

(3) New development

(4) This total does not include Boulder Beach Estate flows.

It is noted that loads from existing pumping station SP3106 (*Boulder Beach Estate*), to be transferred to SP3107 are unknown as advice from Council is still pending.

The DSP specifies that the augmentation of SP3107 should include upgrade to a pumping capacity of 37 L/s @ 35 metres, upgrade of the rising main and construction of emergency storage. The costings in the DSP provide for an upgrade of pumps and rising main only. Preliminary calculations show that the stated pumping station capacity will not be sufficient for the new and redirected loads proposed for the station. The physical size of the new pumps required is expected to be greater than the existing station can accommodate, and therefore it is anticipated that the pumping station will require rebuilding.

2.4.3 Development Servicing Plan Contributions

The Ballina Council Development Servicing Plan (DSP) incorporates the subject site in its future servicing strategy. The contribution rate per lot for 2005-2006 is \$6077.

3 WATER SERVICING

3.1 SCOPE OF INVESTIGATIONS

The scope of work for the water component of this investigation includes:

- Identify water main layout.
- Sizing of water mains.
- Review of supply and determine if new water booster pump is required.

3.2 WATER SUPPLY SERVICE STANDARDS

As a design standard for water supply investigations BSC requires a minimum pressure of 20 metres be maintained at the property boundary.

3.3 EXISTING INFRASTRUCTURE

The closest existing water supply infrastructure is located in Survey Street and Blue Seas Parade.

A water pressure enquiry prepared by BSC (*refer Appendix 5*) for 73 Survey Street (*connection point*) provided the information listed in **Table 3.1**.

Table 3.1: Water Supply Pressure at 73 Survey Street, Lennox Head

Reduced Level (RL AHD)	39 m
Maximum Pressure	43.2 m
Minimum Pressure ⁽¹⁾	36.7 m

(1) Minimum pressure calculated with a demand of 0.06 L/s and does not include fire flows.

3.4 PROPOSED WATER SUPPLY SERVICING

The water supply reticulation in the development would consist of a DN100 mm loop main for the 35 lots east of Road No. 2, with connection to the existing system at Survey Street and Blue Seas Parade. The water supply layout is presented in **Figure 3**.

The 10 western lots adjoining Road No.3 would be serviced by a DN100mm branch off this loop main.

A loop would be created at the end of the cul-de-sac with the main coming back and connecting in on itself to avoid a dead end line.

Council requires that there be a minimum pressure of 20 metres in watermains at the property boundary. There are three lots in the proposed development (lots 39, 40 and 11) that would not achieve this minimum pressure.

The ground level at the boundary of lots 39 and 40 is 56 metres AHD and the minimum pressure available at the connection point is 36.7m AHD. The available pressure of 19.3m does not account for friction losses in the watermain and hence does not meet the minimum required 20m pressure. However, the new water supply main adjacent to lots 39 and 40 is higher than the natural ground level on the lots, that is, the ground level falls away from the street. Due to the steep nature of these blocks and the minimum building line setback of 10 metres from the property boundary, these lots will have greater than 20 metres pressure where the building would be situated on the lot (*refer Figure 3*). Preliminary consultation with Council has confirmed that this will be acceptable.

Lot 11 is higher than the road where the water supply pipe is located and does not meet the minimum pressure requirements. Council has specified that this deficiency will require the development to be connected to the booster pumping station at the reservoir. A separate household sized booster pumping station would be preferable for servicing this single lot as it would provide a more cost effective solution.

3.5 DEVELOPMENT SERVICING PLANS CONTRIBUTIONS

The Ballina Council DSP incorporates the subject site in its future servicing strategy. The contribution rate per lot for 2005-2006 is \$2805.

The Rous Water contribution rate for the bulk water supply infrastructure is \$3,375 per lot.

4 BASIX REQUIREMENTS

The State government policy BASIX requires a 40% reduction in potable water use compared with traditional households. This can be achieved through the provision of low water use devices, conservation practices and recycling such as:

- Landscaping with plant species that require minimal water and irrigating with appropriate systems to minimise water loss and evaporation;
- Using water-efficient taps, shower roses or flow restricting devices;
- Providing water efficient dishwashers and toilets (*dual flush*) etc; and
- Using recycled water for irrigation and toilet flushing.

The main uses of potable water in a traditional household (*refer Table 4.1*) are garden irrigation (27%), shower (25%), toilet (16%) and washing machine (19%).

Table 4.1 Typical Household Water Use

Area/Use	Traditional Household		With Water Saving Devices	
	Usage l/person/day	Percentage of Total Use	Usage l/person/day	Reduction (%)
Internal				
Shower	56.9	22%	37.1	35%
Toilet	35.2	14%	20.0	43%
Washing Machine	46.1	18%	32.0	31%
Kitchen Sink	12	5%	8.6	28%
Bathroom Basin	5.9	2%	4.2	28%
Dishwasher	3	1%	1.1	62%
Bath	8.7	3%	8.7	0%
Laundry Trough	4.9	2%	4.9	0%
Leaks	10	4%	10.0	0%
<i>Sub Total</i>	<i>182.7</i>	<i>70%</i>	<i>126.8</i>	<i>31%</i>
External				
Garden Irrigation	61	23%	45.75	25%
Pool and Spa	10.5	4%	7.35	30%
Car Washing	6.4	2%	6.4	0%
<i>Sub Total</i>	<i>77.9</i>	<i>30%</i>	<i>59.5</i>	<i>24%</i>
TOTALS	260.6	100%	186.3	29%

The typical household water use figures in **Table 4.1** were taken from studies used to develop the recent BASIX legislation. It is recommended that the development incorporate flow restrictors in the kitchen, laundry and bathroom, low water usage taps, AAA rated shower heads, dual flush toilets and AAAA rated dishwashers. These alone would directly reduce total potable water usage by approximately 29%.

Ballina Council propose to deliver recycled water (*treated effluent*) to the development for use in toilet flushing, irrigation and car washing. Discussions with the Department of Planning have

confirmed that the development would receive the potable water reduction credits associated with use of recycled water even through Council's present program would supply the recycled water after the dwellings were constructed.

The combination of water saving devices and use of recycled water would reduce the potable water usage to approximately 114.2 l/p/day. This would represent a 55% reduction in potable water use compared to a traditional household water use of 260.6 l/p/day. It is understood that use of recycled water in washing machines is being considered. This additional use of recycled water would reduce potable water use to approximately 82.2 l/p/day representing a 68% reduction compared to a traditional household.

The significant reduction in potable water use in this development beyond the BASIX requirement would contribute to the improved sustainability of the potable water resources and to increases in the environmental flows in the source rivers. This would have the associated benefits of improved ecological conditions in the rivers.

The quantity of sewage produced in a traditional household is approximately 172.7 l/p/day. This would reduce to approximately 116.8 l/p/day with the inclusion of water saving devices. The recycled water usage in households of approximately 72.2 l/p/day would reduce the quantity of effluent discharged to receiving waters from the Council STP from this development to approximately 44.6 l/p/day. This represents a 74% reduction in the volume of effluent discharged to receiving waters compared to a traditional household. The recycled water usage in a household would increase to approximately 104.2 l/p/day when it is approved for use in washing machines. This would reduce the quantity of effluent discharged to receiving waters from the Council STP from this development to approximately 12.6 l/p/day. This represents a 93% reduction in the volume of effluent discharged to receiving waters from this development compared to a traditional household.

The considerable reduction in pollutant load discharged to receiving waters in effluent (*74% increasing to 93% reduction*) from this development would contribute substantially to the long term improvement in receiving water quality as well as the ecological and recreational value of the waterways.

5 RECYCLED WATER SERVICING

5.1 EXISTING INFRASTRUCTURE

There is currently no recycled water supplied to the area around the proposed development, however Council has programmed its provision in the near future.

5.2 PROPOSED WORKS

Ballina Council have proposed to construct a common effluent treatment and reuse system. As such, Council has requested that all new residential subdivisions include a recycled water pipe to allow reticulation of recycled water once it becomes available.

Council has indicated that they have made a commitment to provide a common effluent treatment system and that they expect the system to be implemented within the next five to ten years. As such, it has been assumed that the associated additional potable water savings would be achievable once the recycled water system was in place.

Recycled water reticulation will be installed within the development in preparation for future provision of a recycled water trunk main to the area. The reticulation will consist of a DN100 pipe placed in the trench alongside the potable water supply pipe. The recycled water supply pipe will be 100 mm lower than the potable water pipe to avoid contamination of the potable water supply.

Connection points to the future recycled water network will be determined when the layout of supply mains is known.

It is understood that for the development application for dwellings on the proposed lots Department of Planning may require an undertaking from Council to confirm their commitment to providing a common effluent reuse system. This undertaking would give assurance to the BASIX assessment that the minimum reduction in potable water would be able to be achieved.

6 OTHER UTILITIES

6.1 POWER

Country Energy has confirmed that power is available to service the site. A connection would be made to the high voltage line that exists in Survey Street on the property frontage. High voltage would run from the existing line in Survey Street to a kiosk substation located on site from where internal reticulation would commence. The internal reticulation would follow the road layout and be located underground in the road reserve.

6.2 TELECOMMUNICATIONS

Telstra would extend standard communications services into and throughout the development. This service would be reticulated throughout the development in shared trenching accommodating pits and 100mm conduits.

6.3 GAS

It is understood that gas is not readily available to the site.

7 ROADS

7.1 EXISTING CONDITIONS

The site is located at the eastern end of Blue Seas Parade and Survey Street Lennox Head. Both these roads give access to existing residential development from North Creek Road.

Blue Seas Parade and Survey Street have 9m wide asphalt carriageways with concrete kerb and guttering.

7.2 PROPOSED CONDITIONS

The proposed internal access roads have been designed in accordance with the following road design guidelines:-

- Northern Rivers Local Government, Development and Design Manual, Version 2;
- AUSTRROADS road design guidelines;
- Australian Standards where relevant; and
- Roads and Traffic Authority Road Design Guide where relevant.

In addition, consultation with Ballina Council has been undertaken so that the road design provides practical outcomes for the development and Council. A meeting was held with the Civil Services Group Asset Manager of Ballina Council on 25 July 2006 to present the road design. Issues discussed included long section grades, cross falls, carriageway widths, verge widths and treatments, footpath/cycleways details, driveways, retaining walls and traffic control.

Council was generally in agreement with the road design but from the meeting it was decided to make two modifications based on Council's recommendations, viz:

- incorporate two traffic calming devices with one located near to the footpath crossing of Road 2 opposite Lots 22 & 23 (the other traffic calming device would be located on Road 1 between Lots 41 and 40); and
- relocate the proposed driveways on Road 2 due to the presence of the retaining wall on the property boundary.

The proposed conceptual road design is presented on **Drawings 6324-01-01, 6324-01-02 and 6324-02-01 to 6324-02-13.**

The proposed roads have been designated Road 1, Road 2 and Road 3. Road 1 (*approximately 510m*) would run along the existing crown road reserve on the eastern side of the site. Road 2 (*approximately 550m*) would run on the eastern side of the existing drainage line and Road 3 (*approximately 170m*) would cross the existing drainage line to give access to the western side of the site.

Roads 1 and 2 have been designed with a 9m wide carriageway, 3.5m wide verge on both sides and roll kerb within a 16m road reserve. The roll kerb and gutter would be replaced with a concrete edge strip on the western side of Road 2 adjacent to the vegetated swale adjoining the open space area. Road 2 would have a one way cross fall to the swale over its length adjacent to the open space area. Elsewhere Road 1 and 2 would have a central crown with 3% cross fall in either direction. Road 3 has been designed with a 7m wide carriageway with one way cross fall within a 14m road reserve. Roll kerb is proposed on the high side and a concrete edge restraint proposed for the low side of Road 3. Typical details are included on **Drawing 6324-02-03**.

The topography of the site requires that several retaining walls be constructed along the proposed road alignment. These retaining walls are necessary in order for the geometric design of the roads to meet the abovementioned standards. **Drawings 6324-02-01** and **6324-02-02** show the proposed location and length of each of the retaining wall sections. As the retaining walls extend across numerous residential lots, driveway access has been given consideration. **Drawings 6324-02-12** and **6324-02-13** provide detail, in accordance with AS 2890.1:2004 of the worst case grade scenario in terms of access through the retaining wall at Lot 19. Grades on other driveways would be less than for Lot 19. The proposed location of driveways through the retaining wall is shown on **Drawings 6324-02-01** and **6324-02-02**. The proposed footpath location is depicted on the same drawings.

The existing Newton property to the north east of the proposed development would have vehicular access from Road 1. An example driveway plan and long section is presented on **Drawing 6324-02-13** to indicate a feasible means of vehicular access to the Newton property from the proposed Road 1.

7.3 SECTION 94 CONTRIBUTIONS

The Section 94 contributions required to support infrastructure external to the development include roads, public open space, community facilities and the administration / planning costs for the Section 94 system. The contribution rates applicable to the proposed development in 2005 – 2006 are:

- Ballina Roads \$1956/lot
- public open space \$ 635/lot
- community facilities \$1015/lot
- administration \$ 180/lot

The Ballina CBD Carparking and Lennox Head Village Centre Car Parking Contributions Plans are not applicable to the proposed development.

8 DIRECTOR GENERAL'S REQUIREMENTS

8.1 DIRECTOR-GENERAL'S REQUIREMENTS

The Director-General Requirements relating to infrastructure are:-

- Key Issues - 1.1 - conform to the Northern Rivers Local Government Development and Design Manual – Version 2;
- Key Issues - 6.1 - adequate erosion and sediment control measures during construction of the subdivision;
- Key Issues - 8.2 - the traffic and the road system is to conform to the Northern Rivers Local Government Development and Design Manual – Version 2;
- Key Issues – 14.1 - identify existing infrastructure capacity and development requirements including staging of infrastructure if necessary;
- Key Issues - 14.2 - conformance to Council's Section 94 Contribution Plans; and
- Technical & Policy Guidelines - Integrated Water Cycle Management Guidelines for NSW Local Utilities, Oct. 2004

The stormwater related issues have been addressed in the PBP report Water Cycle Management, dated September 2006. This report also addresses the integration and consideration of all elements of the water cycle when considering water and sewerage infrastructure as recommended by the Integrated Water Cycle Management Guidelines for NSW Local Utilities, October 2004.

The infrastructure for the proposed development has been designed in accordance with the Northern Rivers Local Government Development and Design Manual – Version 2. Adequate erosion and sediment control measures have been formulated for the sub division construction and these are detailed in the PBP report Construction Environmental and Waste Management Plan dated September 2006.

The existing infrastructure capacity has been determined by consultation with the service authorities. The proposed sewer will require upgrades to downstream infrastructure in accord with Council's Development Servicing Plan (*DSP – Contributions Plan*). No upgrades of external infrastructure would be required to provide potable water to the development except for a booster pump to Lot 11. There will be the need for DSP contributions to Council for use of the external trunk water and sewer infrastructure.

9 CONCLUSIONS

The proposed 45 lot residential sub division known as Coastal Grove can be serviced with infrastructure. The infrastructure details are presented in **Figures 1 to 3** and **Drawings 6324-01-01, 6324-01-02 and 6324-02-01 to 6324-02-13**.

9.1 WATER

The proposed development can be serviced by extension of the existing potable water supply system. Lot 11 would require a pressure booster system to provide water above Council's minimum pressure standard.

9.2 BASIX

The incorporation of water saving devices in the residences and use of recycled water for toilet flushing, car washing and irrigation would reduce the potable water use by approximately 55%. This readily exceeds the BASIX requirement for a 40% reduction in potable water use.

9.3 SEWER

SP3107 will require rebuilding to accommodate flows from the new development, and the catchments of SP3108 and SP3106.

The development would be serviced by sewer through upgrade of the SP3107 pumping station and rising main to the Lennox STW. These upgrades are in accordance with Council's DSP to upgrade infrastructure for the surrounding area and would therefore attract Section 94 credits if implemented by the developer.

9.4 POWER

Country Energy have confirmed that power is available to service the site. A connection would be made to the high voltage line that exists in Survey Street on the property frontage.

9.5 TELECOMMUNICATIONS

Telstra would extend standard communications services into and throughout the development. This service would be reticulated throughout the development in shared trenching accommodating pits and 100mm conduits.

9.6 GAS

It is understood that gas is not readily available to the site.

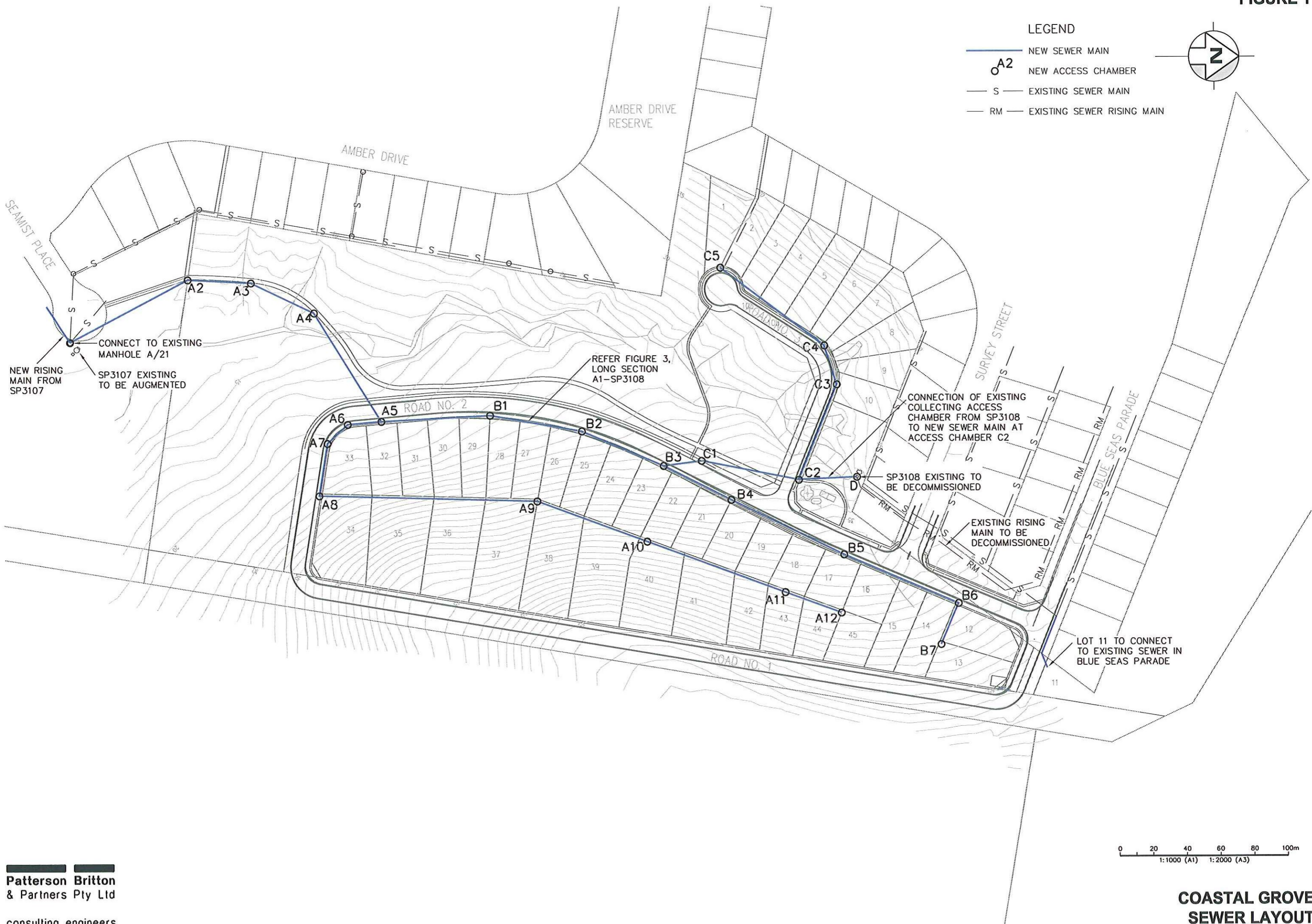
9.7 ROADS

A preliminary design of the proposed internal roads has been prepared in consultation with Ballina Council and the following documents:

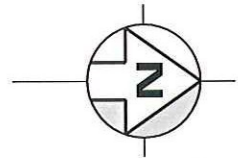
- Northern Rivers Local Government, Development and Design Manual, Version 2;
- AUSTRROADS road design guidelines;
- Australian Standards where relevant; and
- Roads and Traffic Authority Road Design Guide, where relevant.

FIGURES

FIGURE 1



- LEGEND
- NEW SEWER MAIN
 - A2 NEW ACCESS CHAMBER
 - S — EXISTING SEWER MAIN
 - RM — EXISTING SEWER RISING MAIN



NEW RISING MAIN FROM SP3107
 CONNECT TO EXISTING MANHOLE A/21
 SP3107 EXISTING TO BE AUGMENTED

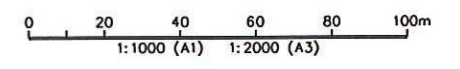
REFER FIGURE 3, LONG SECTION A1-SP3108

CONNECTION OF EXISTING COLLECTING ACCESS CHAMBER FROM SP3108 TO NEW SEWER MAIN AT ACCESS CHAMBER C2

SP3108 EXISTING TO BE DECOMMISSIONED

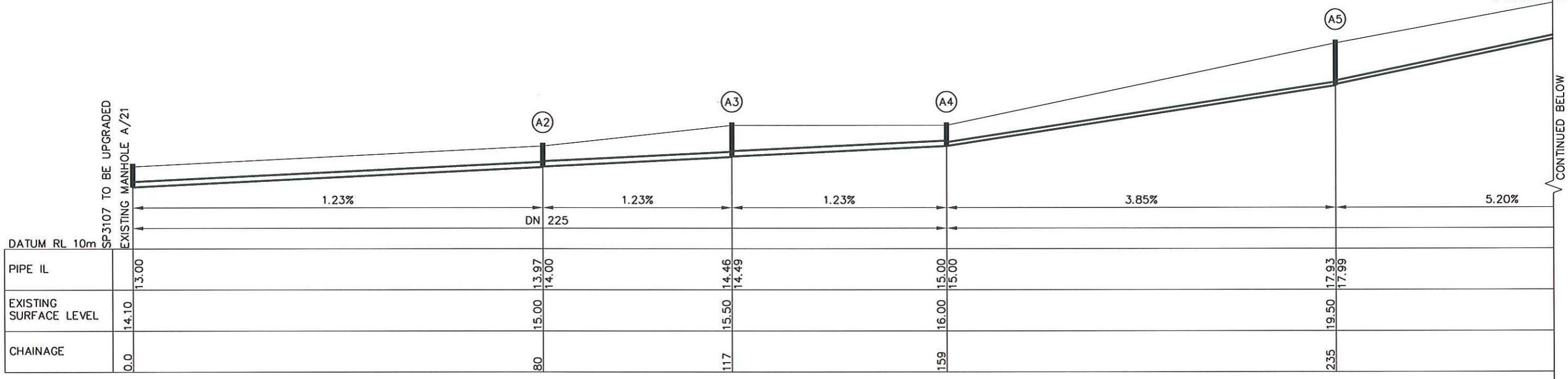
EXISTING RISING MAIN TO BE DECOMMISSIONED

LOT 11 TO CONNECT TO EXISTING SEWER IN BLUE SEAS PARADE

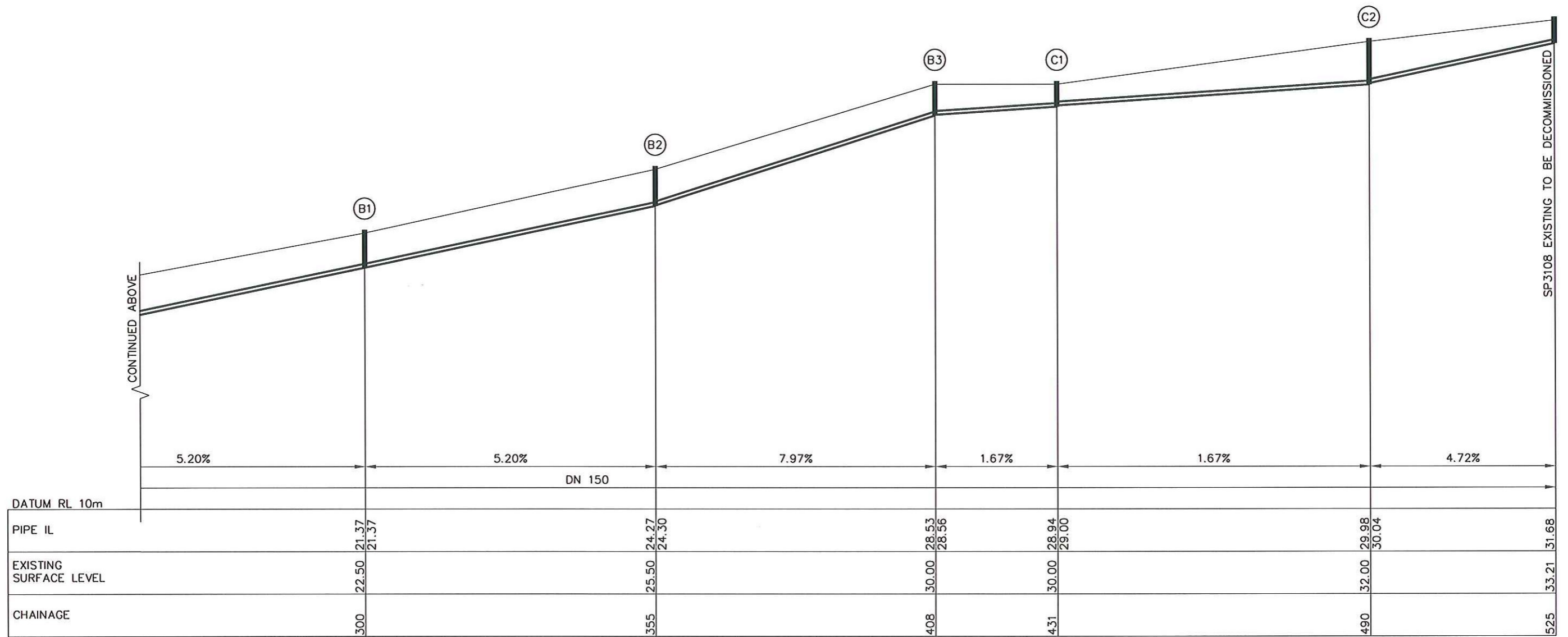


N:\6324-02 Linnnox Head Sewer & Water\DWG\6324-02-Base.dwg, 7/09/2006 5:04:01 PM, vaughanp

FIGURE 2

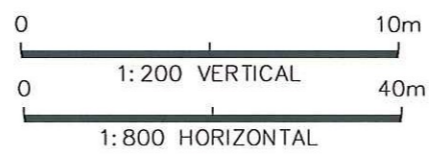


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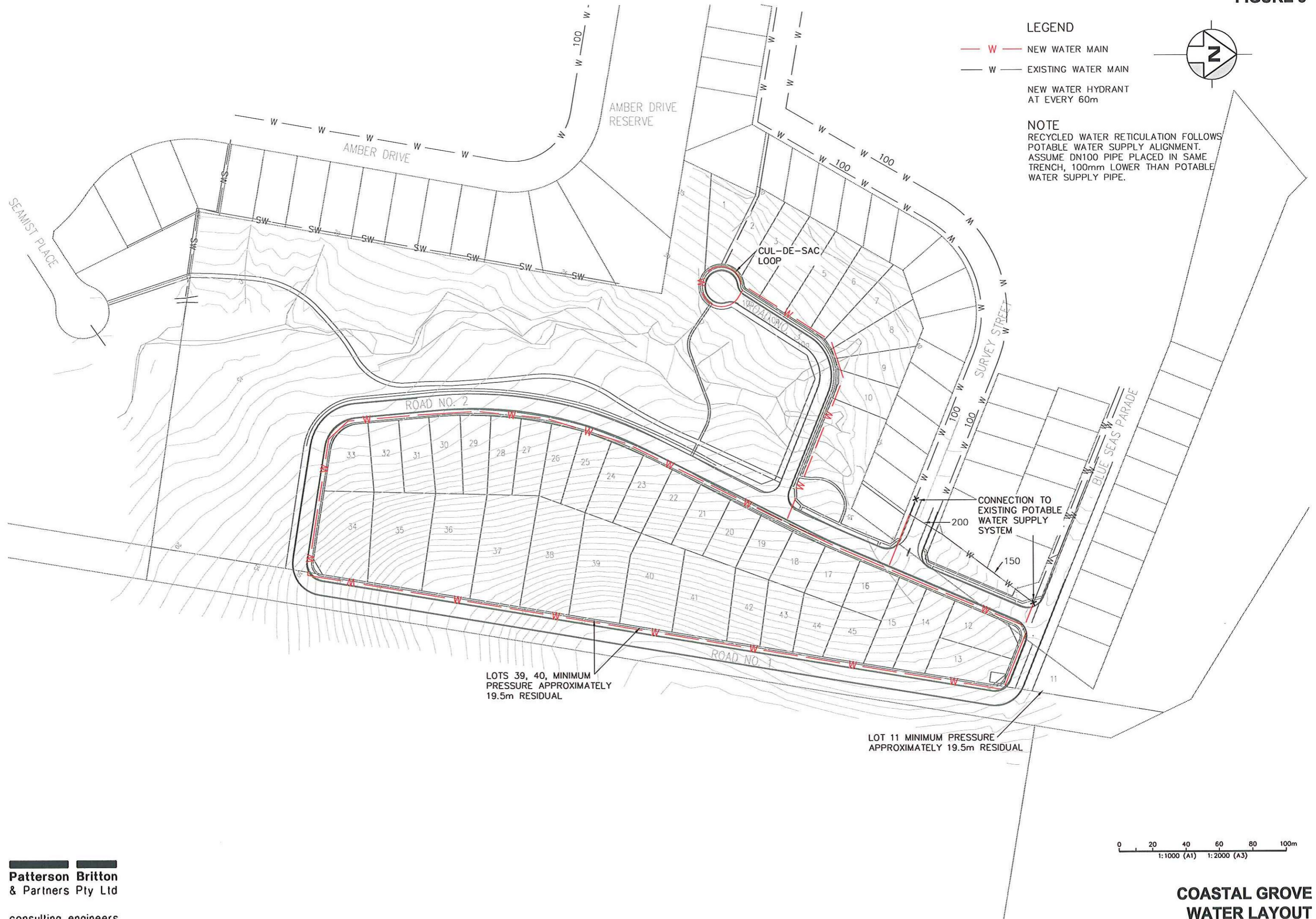
CONTINUED ABOVE

SP3108 EXISTING TO BE DECOMMISSIONED



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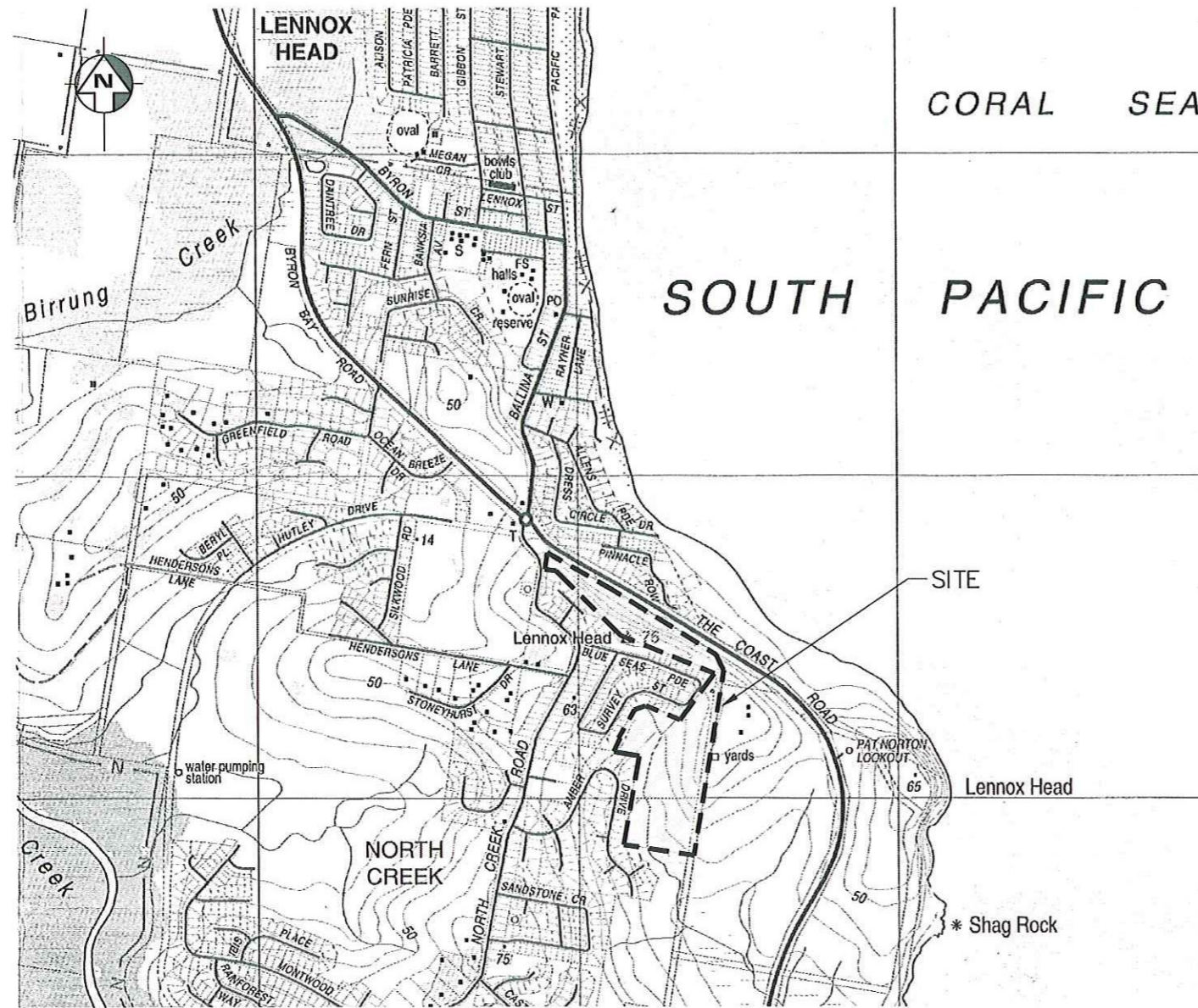
FIGURE 3



N:\6324-02_Lemnox Head Sewer & Water\DWG\6324-02_Base.dwg, 7/09/2006 5:03:42 PM, vaughtarp

DRAWINGS

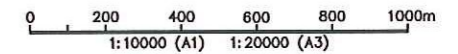
COASTAL GROVE, LENNOX HEAD RESIDENTIAL DEVELOPMENT, SERVICING STRATEGY



LOCALITY PLAN
SCALE 1:10000

CONCEPTUAL DESIGN DRAWING LIST:

- 6324-01-01 TITLE SHEET, LOCALITY PLAN AND DRAWING LIST
- 6324-01-02 EXISTING SURVEY
- 6324-02-01 ROAD PLAN SHEET 1 OF 2
- 6324-02-02 ROAD PLAN SHEET 2 OF 2
- 6324-02-03 TYPICAL CROSS SECTIONS AND DETAILS
- 6324-02-04 ROAD 1 LONG SECTION
- 6324-02-05 ROAD 1 DESIGN CROSS SECTIONS CH 0.00 - CH 280.00 SHEET 1 OF 2
- 6324-02-06 ROAD 1 DESIGN CROSS SECTIONS CH 280.00 - CH 509.45 SHEET 2 OF 2
- 6324-02-07 ROAD 2 LONG SECTION
- 6324-02-08 ROAD 2 DESIGN CROSS SECTIONS CH 0.00 - CH 300.00 SHEET 1 OF 3
- 6324-02-09 ROAD 2 DESIGN CROSS SECTIONS CH 320.00 - CH 554.65 SHEET 2 OF 2
- 6324-02-10 ROAD 3 LONG SECTION
- 6324-02-11 ROAD 3 DESIGN CROSS SECTIONS CH 0.00 - CH 169.02
- 6324-02-12 TYPICAL ROAD 2 PROPERTY ACCESS THROUGH RETAINING WALL
- 6324-02-13 NEWTON'S PROPERTY ACCESS THROUGH RETAINING WALL



DRG STATUS : **PRELIMINARY, NOT FOR CONSTRUCTION**

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
B	ISSUED FOR EA	RB	PBC			15.08.06
A	ISSUED FOR EA	RB	PBC			21.07.06

INITIALS SHOWN IN THE ADJACENT ISSUE RECORDS INDICATE THE STAGES UNDERTAKEN IN THE DRAWING APPROVAL PROCESS. DRAWINGS ARE ONLY TO BE USED WHEN APPROVED BY PATTERSON BRITTON & PARTNERS AND THEN ONLY AS NOTED FOR DRG STATUS. THE ORIGINAL SIGNATURES CAN BE FOUND ON THE REVERSE SIDE OF THE ORIGINAL OF THE DRG REGISTER/TRANSMITTAL FORM No.5.2.2. HELD BY PATTERSON BRITTON & PARTNERS

level 4
104 Mount Street
North Sydney 2060
telephone (02) 9957 1619
facsimile (02) 9957 1291
email reception @ patbrt.com.au
A.C.N. 003 220 228

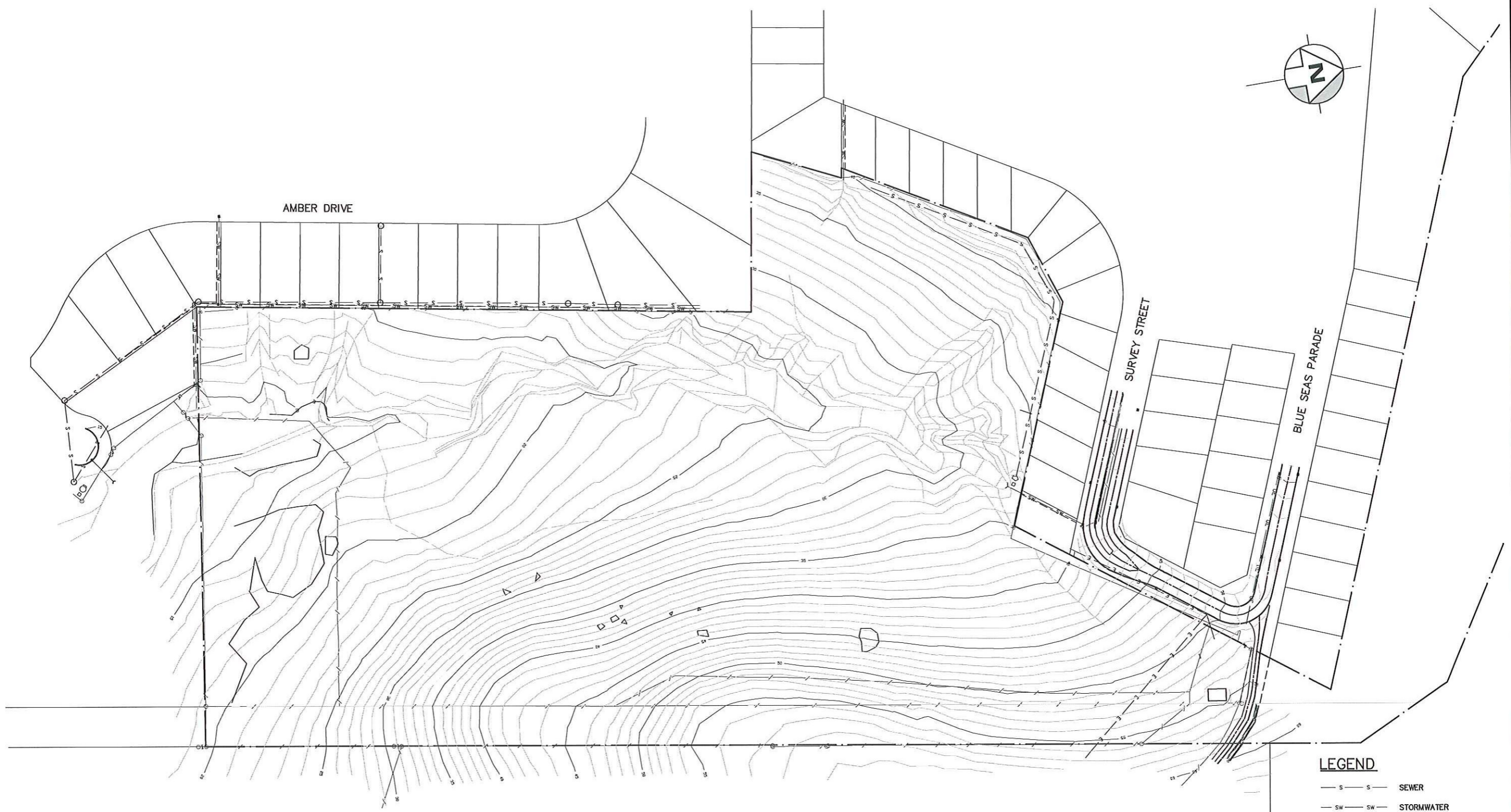
Patterson Britton & Partners Pty Ltd
consulting engineers

Client	SAKE DEVELOPMENT PTY LTD
Project	COASTAL GROVE 1 SURVEY STREET, LENNOX HEAD

Title	TITLE SHEET, LOCALITY PLAN AND DRAWING LIST
-------	---

Drawing No.	6324-01-01
Issue	B
Cad File No.	6324-01-01
Xref.(s)	

N:\6324-01\Lennox Head\DRAWINGS\6324-01-02.dwg, 6324-01-02, 2/10/2006 12:15:46 PM



LEGEND

- S — S — SEWER
- SW — SW — STORMWATER
- E — E — ELECTRICITY
- UE — UE — UNDERGROUND ELECTRICITY
- SS — — EXISTING SURFACE LEVEL (1.0m INTERVAL)
- · — — SITE BOUNDARY
- / — / — FENCE

0 20 40 60 80 100m
1:1000 (A1) 1:2000 (A3)

DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION

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B	ISSUED FOR EA	RB	PBC			15.08.06
A	ISSUED FOR EA	RB	PBC			21.06.07

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email reception@patorb.com.au
A.C.N. 005 220 228

Patterson Britton & Partners Pty Ltd
consulting engineers

Client
SAKE DEVELOPMENT PTY LTD

Project
**COASTAL GROVE
1 SURVEY STREET, LENNOX HEAD**

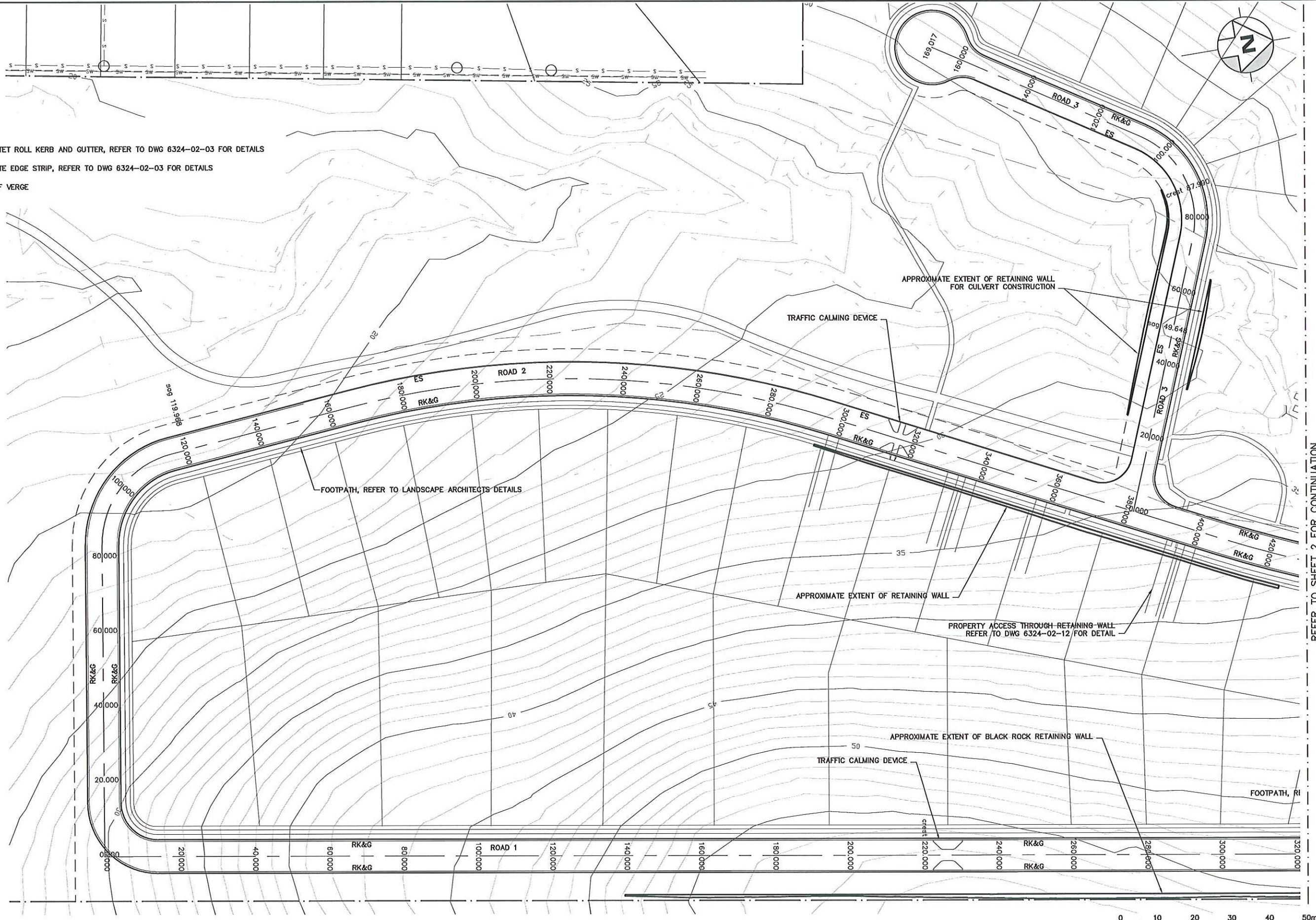
Title
EXISTING SURVEY

Drawing No.
6324-01-02

Issue
B

Cad File No.
6324-01-02

Xref.(s)
X-BASE SVY 06 07 11



LEGEND

- CONCRETET ROLL KERB AND GUTTER, REFER TO DWG 6324-02-03 FOR DETAILS
- CONCRETE EDGE STRIP, REFER TO DWG 6324-02-03 FOR DETAILS
- BACK OF VERGE

DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
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A.C.N. 003 229 228

Client
SAKE DEVELOPMENT PTY LTD
Project
**COASTAL GROVE
1 SURVEY STREET, LENNOX HEAD**

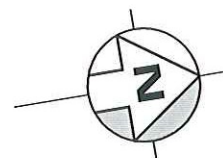
Title
**ROAD PLAN
SHEET 1 OF 2**

Drawing No.
6324-02-01
Issue
A
Cad File No.
6324-02-01
Xref.(s)

N:\6324-01 Lemnox Head\DRAWINGS\6324-02-01.dwg, 6324-02-01, 23/09/2006 1:21:53 PM

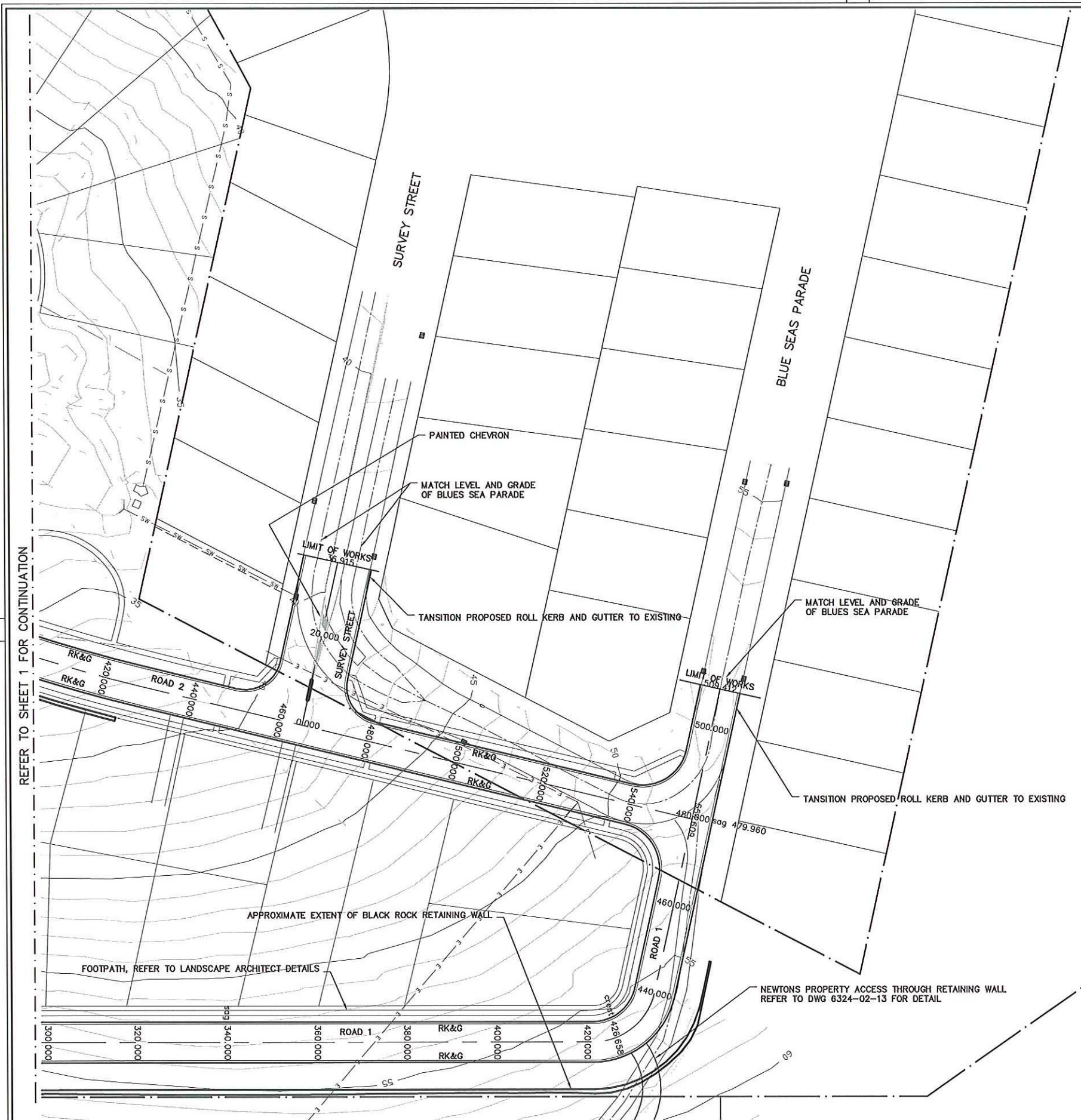
A1

REFER TO SHEET 2 FOR CONTINUATION



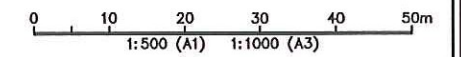
LEGEND

- RK&G CONCRETET ROLL KERB AND GUTTER, REFER TO DWG 6324-02-03 FOR DETAILS
- ES CONCRETE EDGE STRIP, REFER TO DWG 6324-02-03 FOR DETAILS
- BACK OF VERGE



REFER TO SHEET 1 FOR CONTINUATION

DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION



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facsimile (02) 9557 1291
email reception@pabrnt.com.au
A.C.N. 003 220 228

Patterson Britton & Partners Pty Ltd
consulting engineers

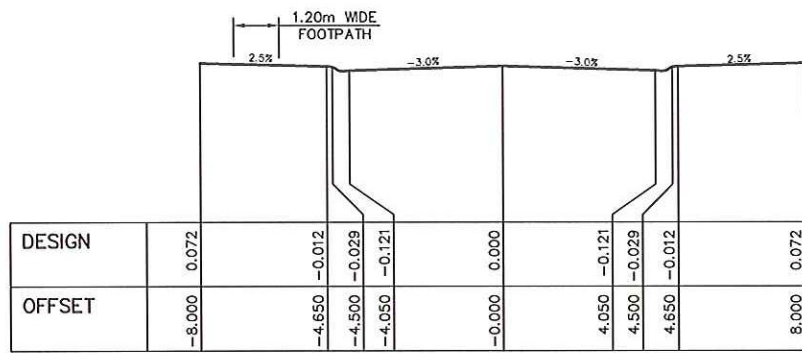
Client
SAKE DEVELOPMENT PTY LTD

Project
**COASTAL GROVE
1 SURVEY STREET, LENNOX HEAD**

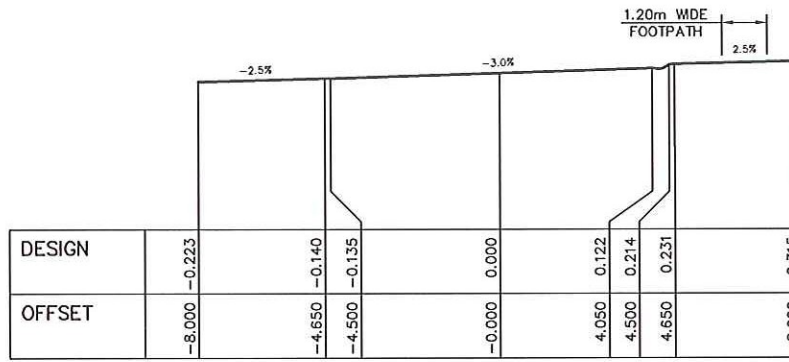
Title
**ROAD PLAN
SHEET 2 OF 2**

Drawing No.
6324-02-02
Issue
A
Cad File No.
6324-02-01
Xref.(s)

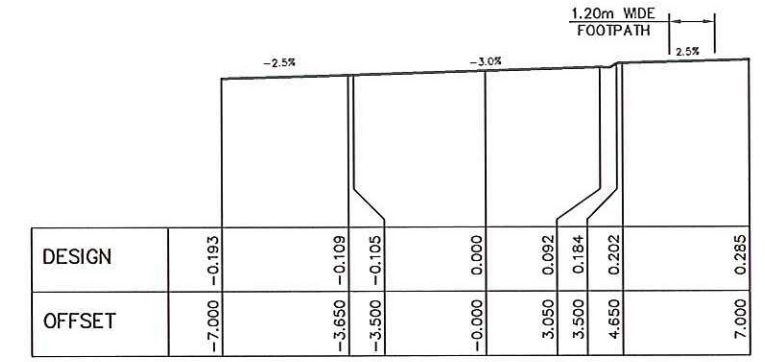
Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
A	ISSUED FOR EA	RB	PBC			21.07.06



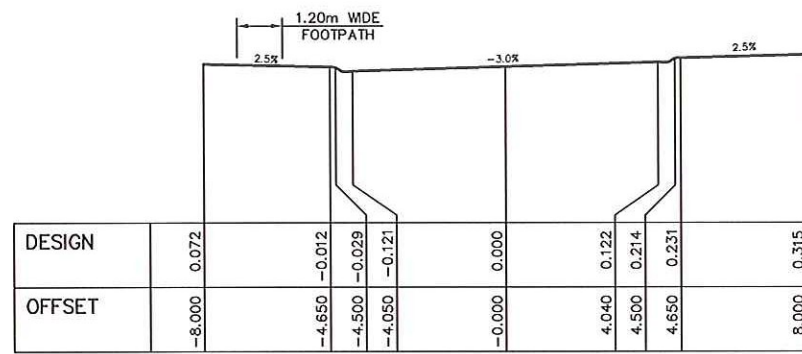
ROAD 1 TYPICAL SECTIONS
CH 470.00 - CH 509.452



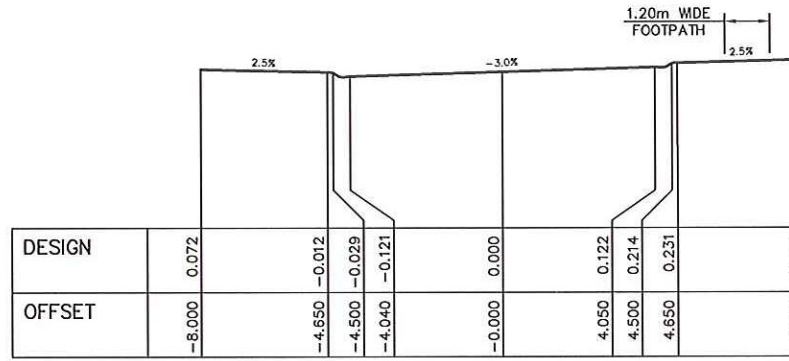
ROAD 2 TYPICAL SECTIONS
CH 135.00 - CH 425.00



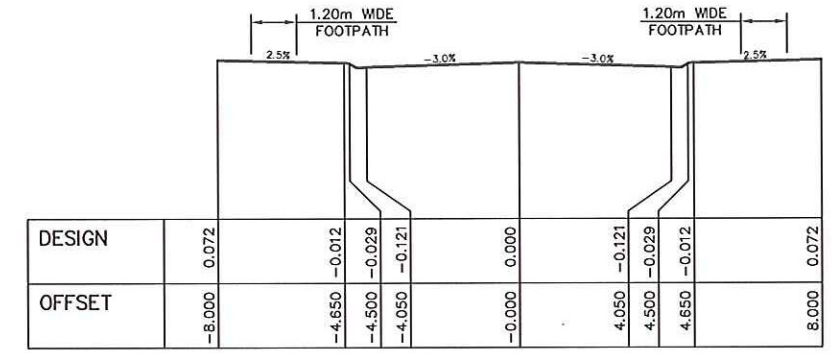
ROAD 3 TYPICAL SECTIONS
CH 0.00 - CH 169.17



ROAD 1 TYPICAL SECTIONS
CH 0.00 - CH 450.00

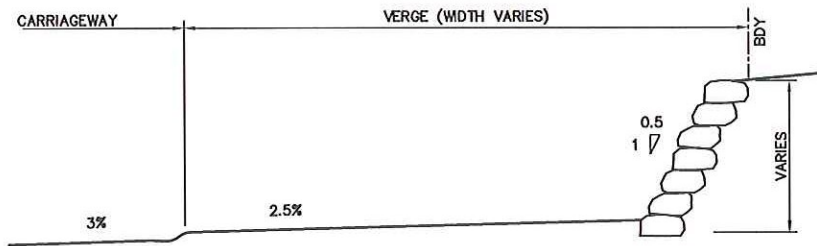


ROAD 2 TYPICAL SECTIONS
CH 0.00 - CH 115.00

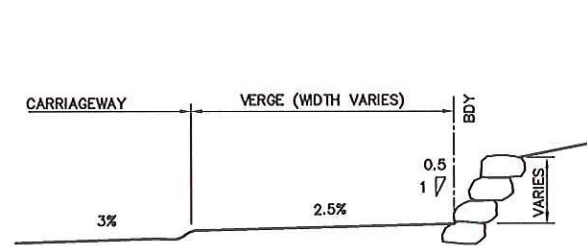


ROAD 2 TYPICAL SECTIONS
CH 445.00 - CH 554.65

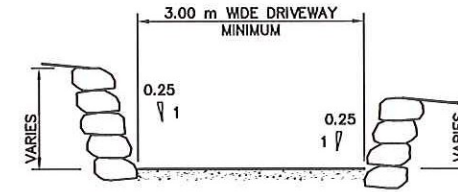
TYPICAL ROAD SECTIONS
SCALE 1:100



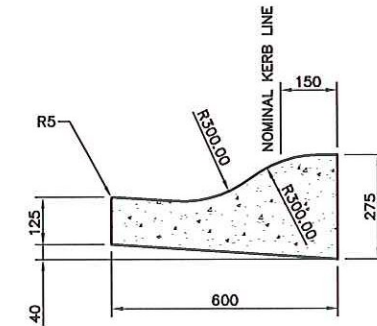
TYPICAL BLACK ROCK
RETAINING WALL - ROAD 1
SCALE 1:50



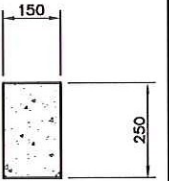
TYPICAL BLACK ROCK
RETAINING WALL - ROAD 2
SCALE 1:50



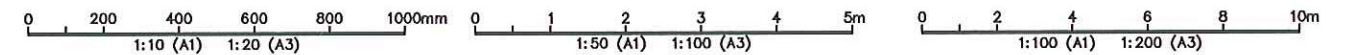
TYPICAL PROPERTY ACCESS SECTION THROUGH
BLACK ROCK RETAINING WALL - ROAD 2
SCALE 1:50



ROLL KERB & GUTTER
SCALE 1:10 (mm)



EDGE RESTRAINT
SCALE 1:10 (mm)



DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
A	ISSUED FOR EA	RB	PBC			21.06.07

INITIALS SHOWN IN THE ADJACENT ISSUE RECORDS INDICATE THE STAGES UNDERTAKEN IN THE DRAWING APPROVAL PROCESS. DRAWINGS ARE ONLY TO BE USED WHEN APPROVED BY PATTERSON BRITTON & PARTNERS AND THEN ONLY AS NOTED FOR DRG STATUS. THE ORIGINAL SIGNATURES CAN BE FOUND ON THE REVERSE SIDE OF THE ORIGINAL OF THE DRG REGISTER/TRANSMITTAL FORM No.5.2.2. HELD BY PATTERSON BRITTON & PARTNERS

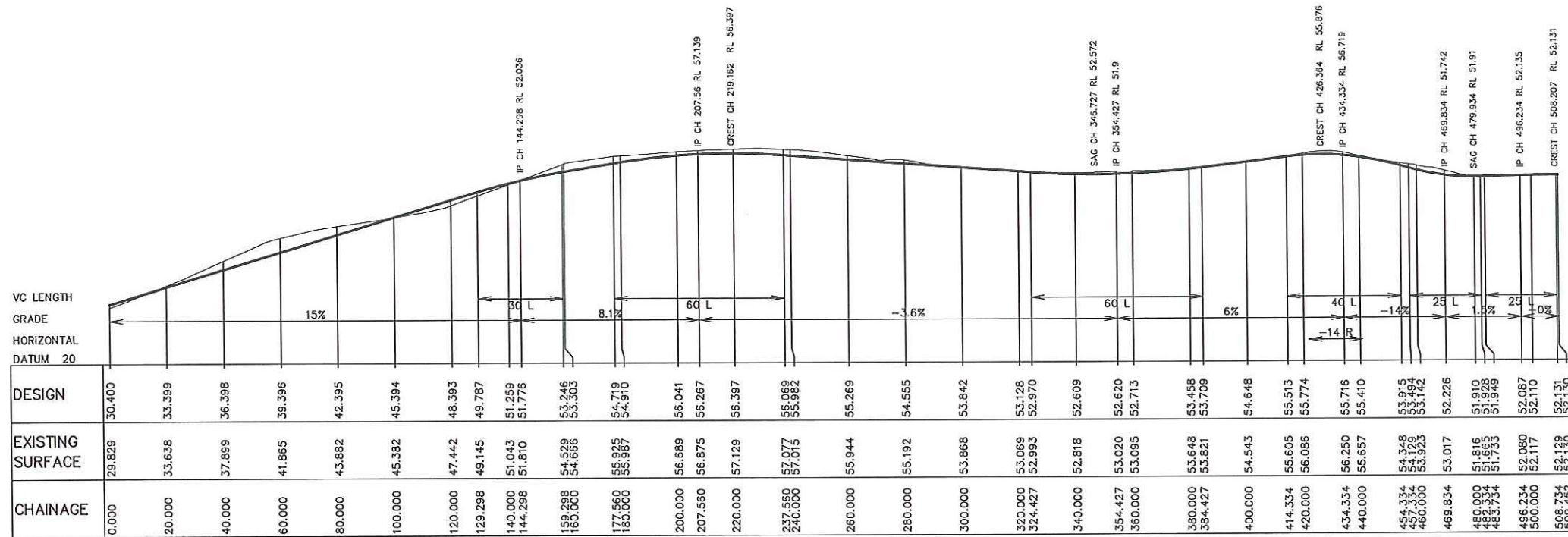
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facsimile (02) 9957 1291
email reception@patbrt.com.au
A.C.N. 003 220 228

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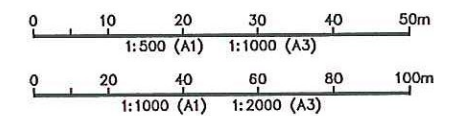
Client
SAKE DEVELOPMENT PTY LTD
Project
**COASTAL GROVE
1 SURVEY STREET, LENNOX HEAD**

**TYPICAL CROSS SECTIONS
AND DETAILS**

Drawing No.
6324-02-03
Issue
A
Cad File No.
6324-02-03
Xref.(s)



ROAD 1 LONGITUDINAL SECTION
 SCALE HORIZONTAL 1:1000
 SCALE VERTICAL 1:500



DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION

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B	ISSUED FOR EA	RB	PBC			15.08.06
A	ISSUED FOR EA	RB	PBC			21.06.07

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 104 Mount Street
 North Sydney 2060
Patterson Britton & Partners Pty Ltd
 consulting engineers
 telephone (02) 9557 1619
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Client
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 Project
**COASTAL GROVE
 1 SURVEY STREET, LENNOX HEAD**

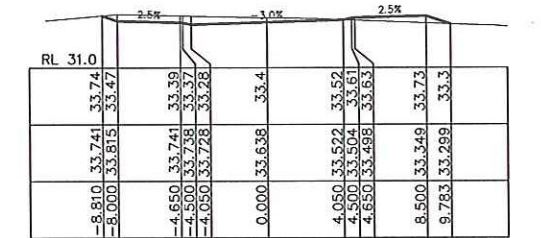
Title
ROAD 1 LONG SECTION

Drawing No.
6324-02-04
 Issue
B
 Cad File No.
 6324-02-04
 Xref.(s)

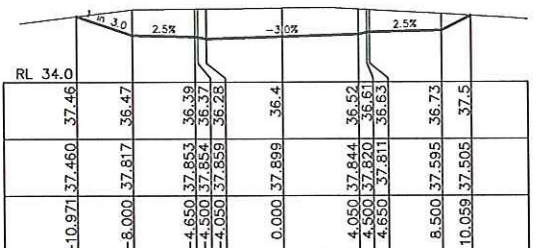
N:\6324-01 Lennox Head\DRAWINGS\6324-02-05.dwg, 6324-02-05, 15/08/2006 4:08:38 PM

	DESIGN	EXISTING	OFFSET
RL 26.0	11.488	29.310	29.31
	-8.000	29.743	30.47
	-4.650	29.831	30.39
	-4.500	29.807	30.61
	-4.050	29.831	30.28
	0.000	29.829	30.4
	4.050	29.813	30.52
	4.500	29.807	30.61
	4.650	29.805	30.63
	8.500	29.733	30.73
	11.718	29.655	29.65

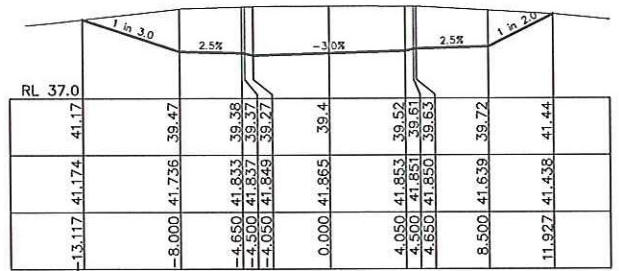
CH 0



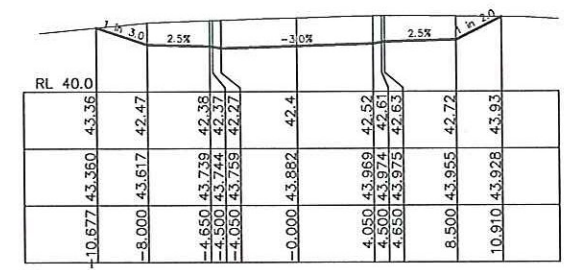
CH 20



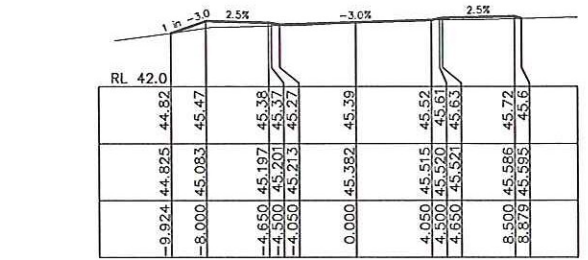
CH 40



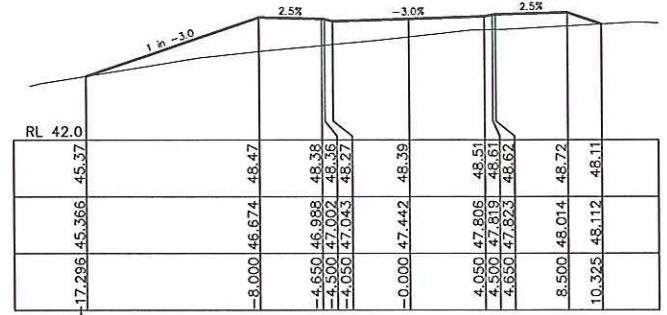
CH 60



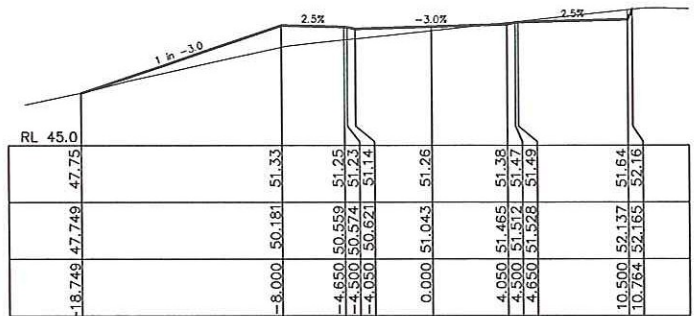
CH 80



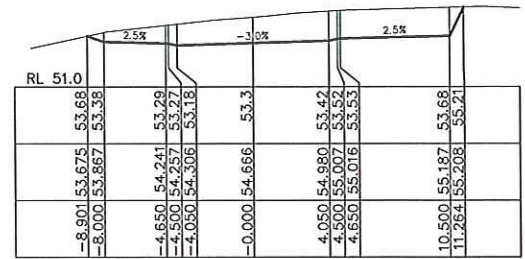
CH 100



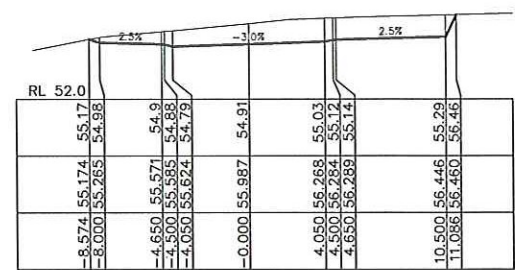
CH 120



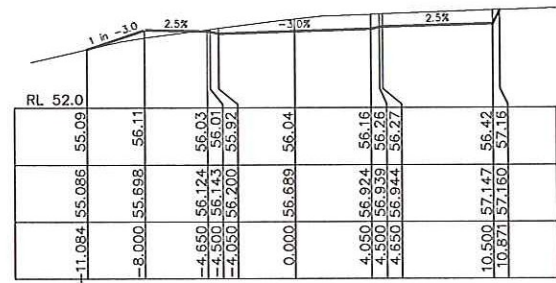
CH 140



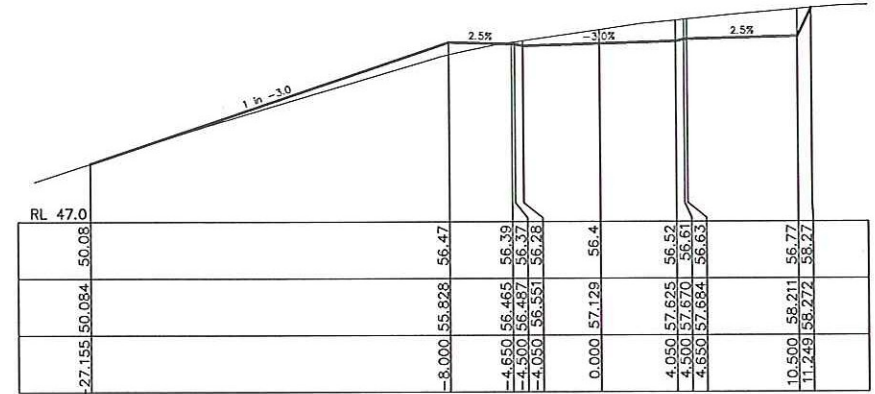
CH 160



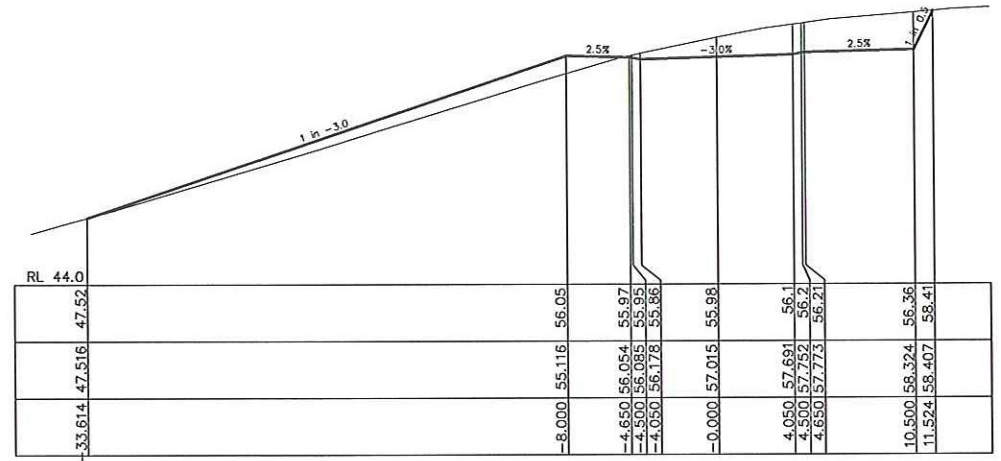
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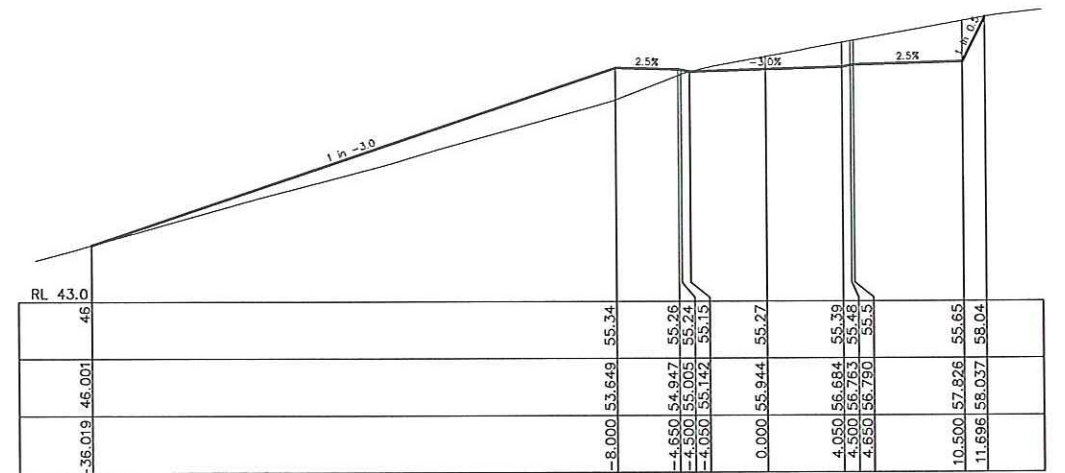
CH 200



CH 220

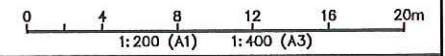


CH 240



CH 260

DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION



Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
B	ISSUED FOR EA	RB	PBC			15.08.06
A	ISSUED FOR EA	RB	PBC			21.06.07

INITIALS SHOWN IN THE ADJACENT ISSUE RECORDS INDICATE THE STAGES UNDERTAKEN IN THE DRAWING APPROVAL PROCESS. DRAWINGS ARE ONLY TO BE USED WHEN APPROVED BY PATTERSON BRITTON & PARTNERS AND THEN ONLY AS NOTED FOR DRG STATUS. THE ORIGINAL SIGNATURES CAN BE FOUND ON THE REVERSE SIDE OF THE ORIGINAL OF THE DRG REGISTER/TRANSMITTAL FORM No.5.2.2. HELD BY PATTERSON BRITTON & PARTNERS

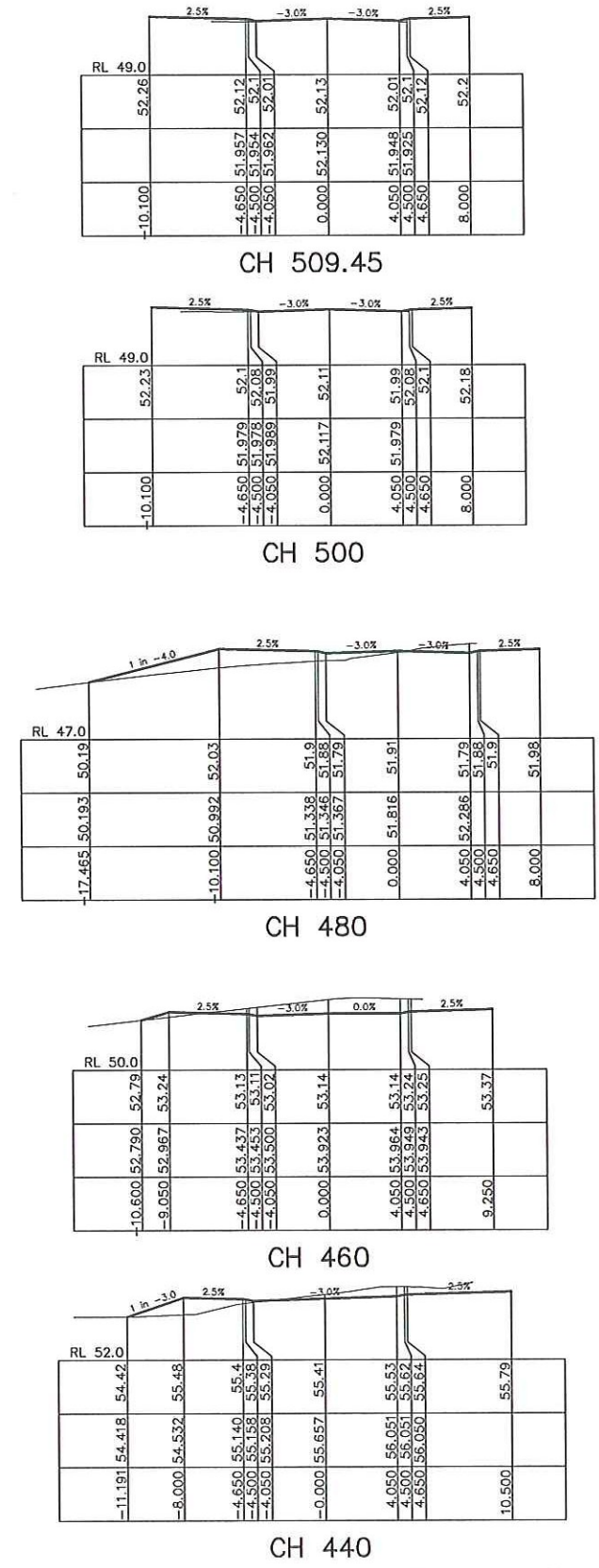
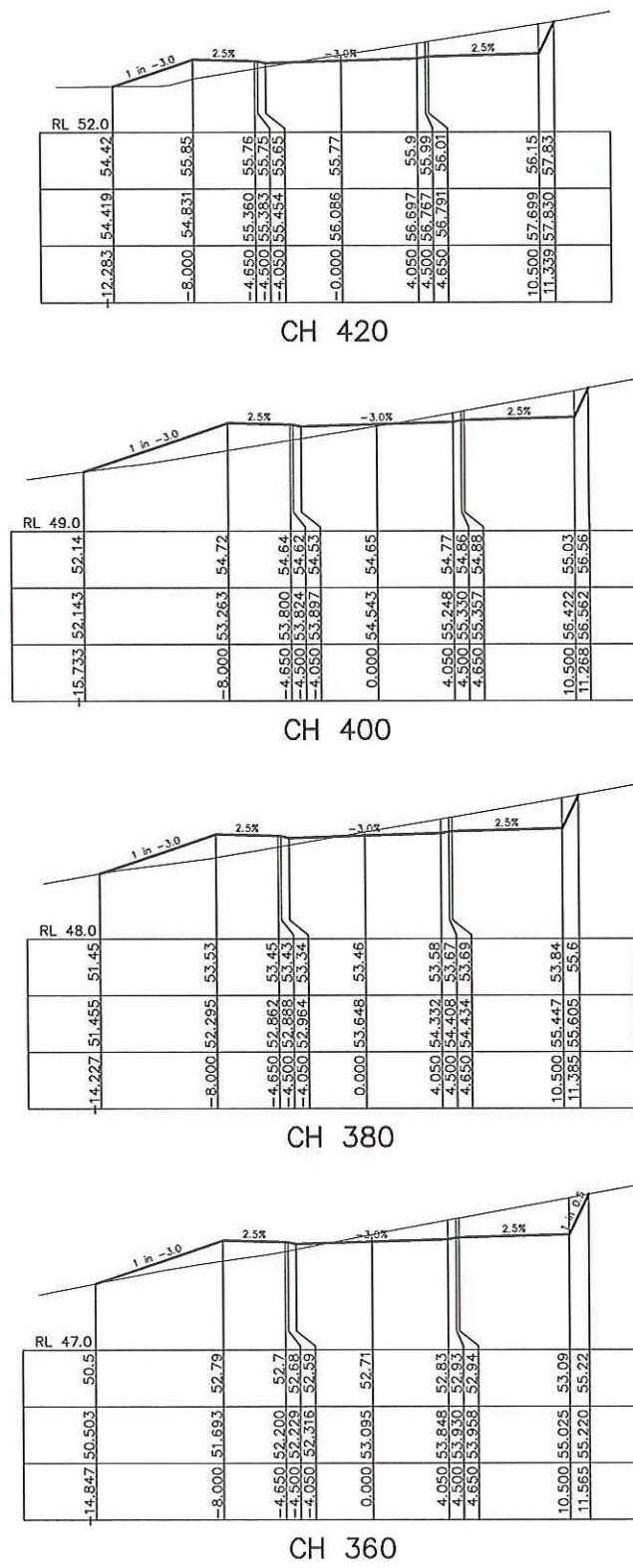
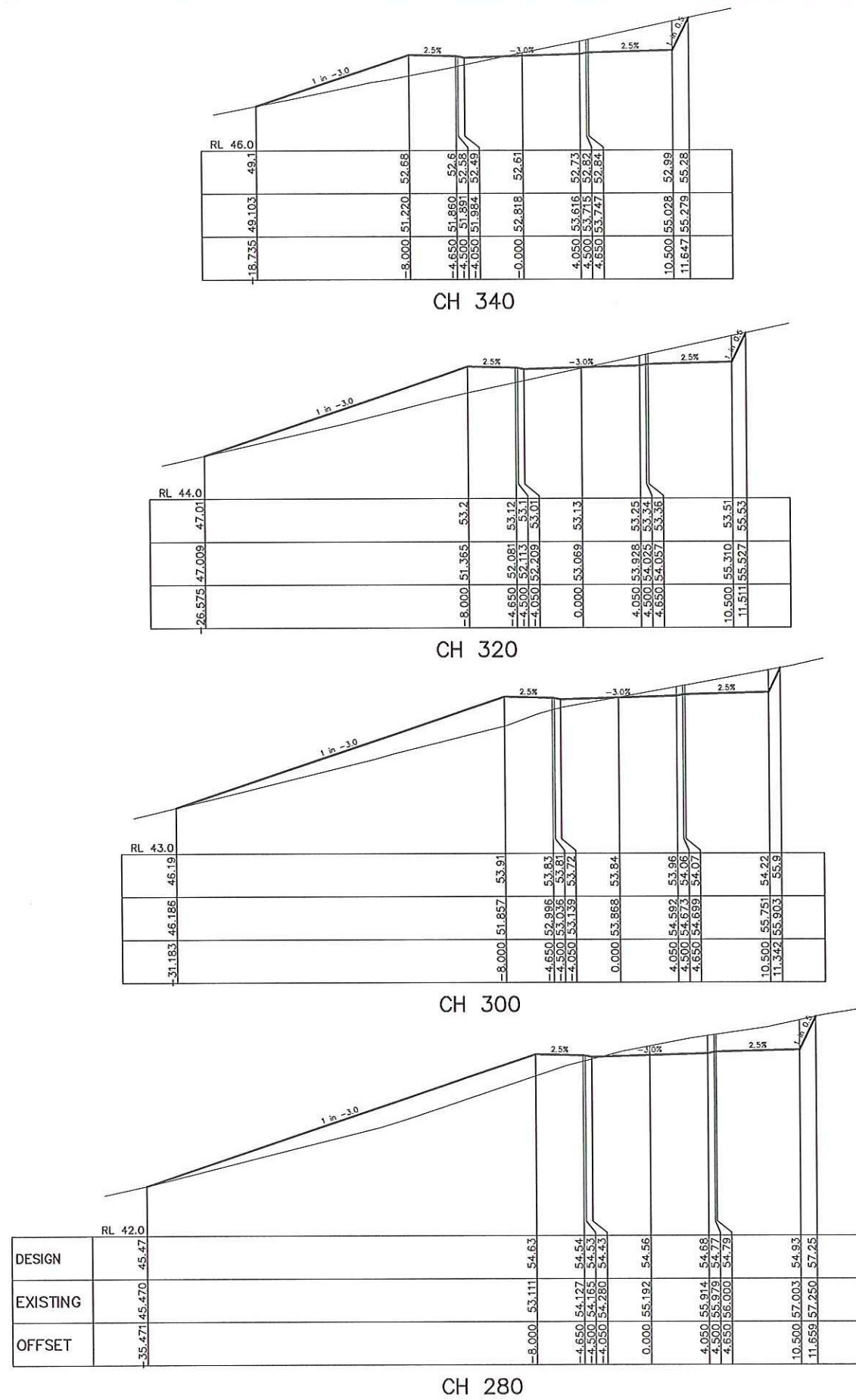
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A.C.N. 003 220 228

Client
SAKE DEVELOPMENT PTY LTD
Project
COASTAL GROVE
1 SURVEY STREET, LENNOX HEAD

Title
ROAD 1 DESIGN CROSS SECTIONS
CH 0.00 - CH 260.00
SHEET 1 OF 2

Drawing No.
6324-02-05
Issue
B
Cad File No.
6324-02-05
Xref.(s)

N:\6324-01 - Lennox Head\DRAWINGS\6324-02-05.dwg, 6324-02-06, 15/09/2006 4:08:42 PM



DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
B	ISSUED FOR EA	RB	PBC			15.08.06
A	ISSUED FOR EA	RB	PBC			21.06.07

INITIALS SHOWN IN THE ADJACENT ISSUE RECORDS INDICATE THE STAGES UNDERTAKEN IN THE DRAWING APPROVAL PROCESS. DRAWINGS ARE ONLY TO BE USED WHEN APPROVED BY PATTERSON BRITTON & PARTNERS AND THEN ONLY AS NOTED FOR DRG STATUS. THE ORIGINAL SIGNATURES CAN BE FOUND ON THE REVERSE SIDE OF THE ORIGINAL OF THE DRG REGISTER/TRANSMITTAL FORM No.5.2.2. HELD BY PATTERSON BRITTON & PARTNERS

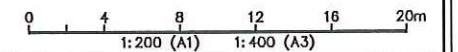
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104 Mount Street
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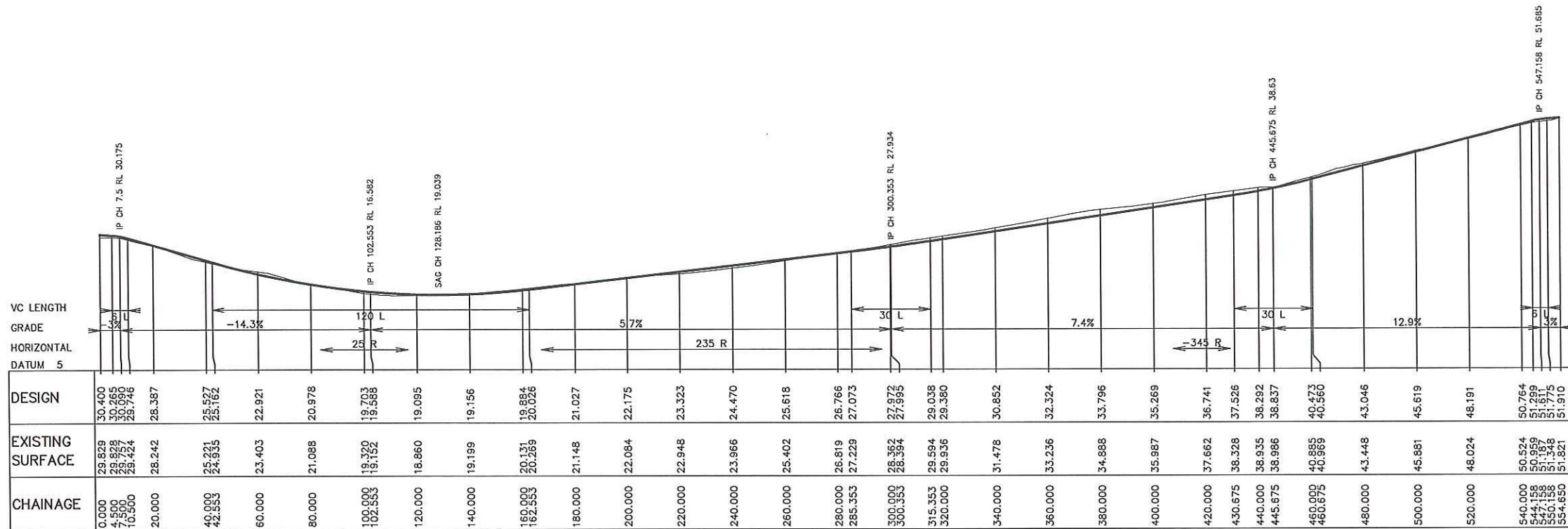
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consulting engineers

Client
SAKE DEVELOPMENT PTY LTD
Project
**COASTAL GROVE
1 SURVEY STREET, LENNOX HEAD**

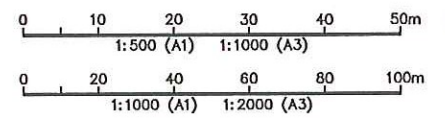
Title
**ROAD 1 DESIGN CROSS SECTIONS
CH 280.00 - CH 509.45
SHEET 2 OF 2**

Drawing No.
6324-02-06
Issue
B
Cad File No.
6324-02-05
Xref.(s)





ROAD 2 LONGITUDINAL SECTION
 SCALE HORIZONTAL 1:1000
 SCALE VERTICAL 1:500



DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
B	ISSUED FOR EA	RB	PBC			15.08.06
A	ISSUED FOR EA	RB	PBC			21.06.07

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Patterson Britton & Partners Pty Ltd
 consulting engineers

Client
SAKE DEVELOPMENT PTY LTD

Project
**COASTAL GROVE
 1 SURVEY STREET, LENNOX HEAD**

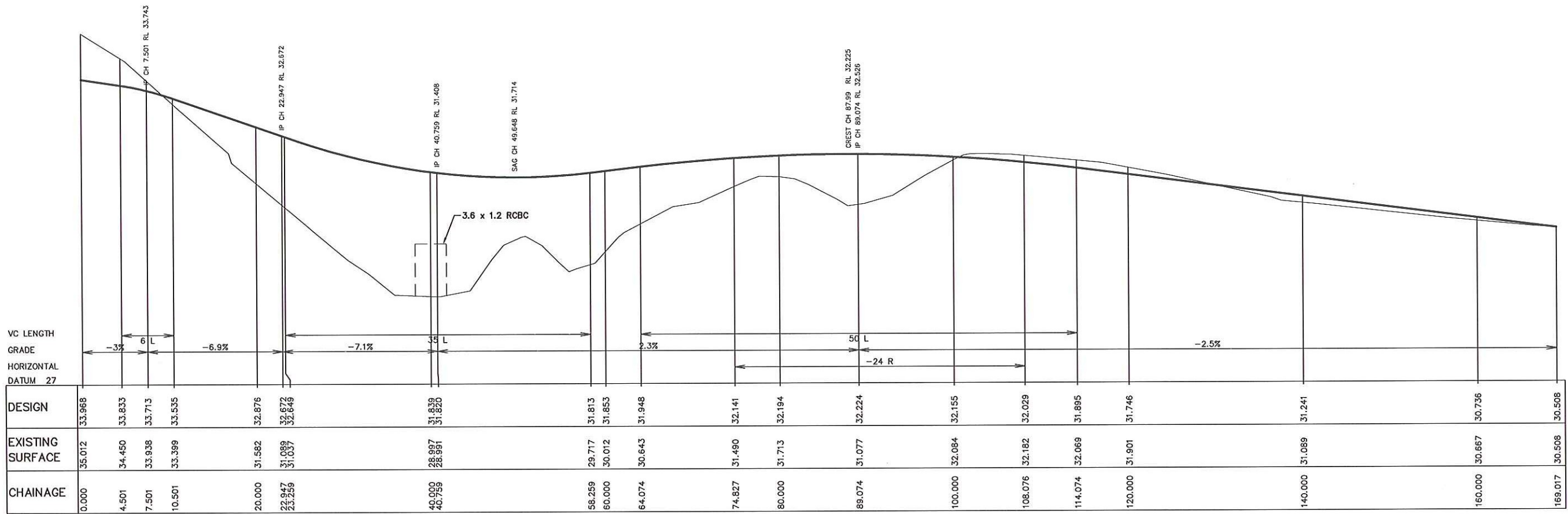
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ROAD 2 LONG SECTION

Drawing No.
6324-02-07

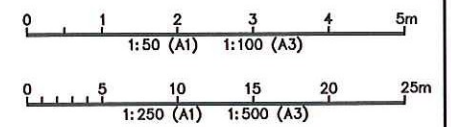
Issue
B

Cad File No.
 6324-02-07

Xref.(s)



ROAD 3 LONGITUDINAL SECTION
SCALE HORIZONTAL 1:250
SCALE VERTICAL 1:50



DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
B	ISSUED FOR EA	RB	PBC			15.08.06
A	ISSUED FOR EA	RB	PBC			21.06.07

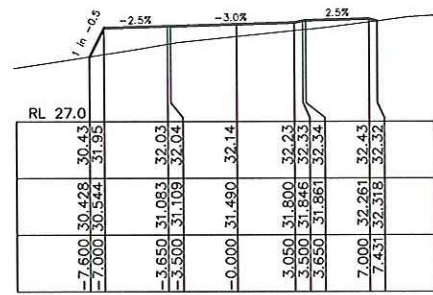
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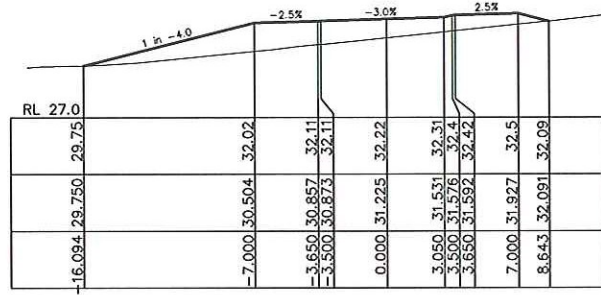
Client
SAKE DEVELOPMENT PTY LTD
Project
COASTAL GROVE
1 SURVEY STREET, LENNOX HEAD

Title
ROAD 3 LONG SECTION

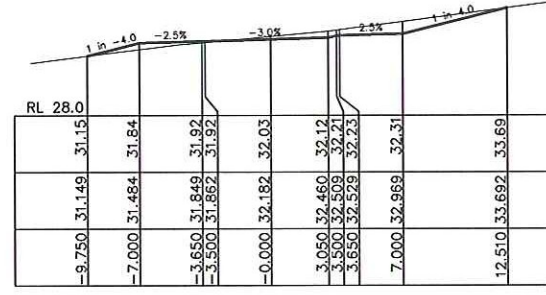
Drawing No.
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Issue
B
Cad File No.
6324-02-10
Xref.(s)



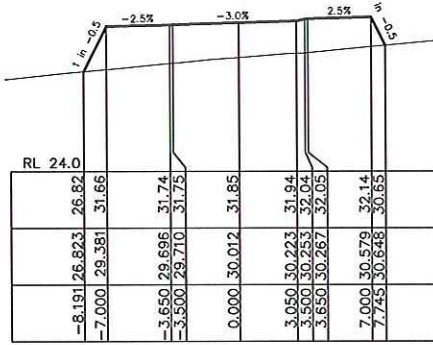
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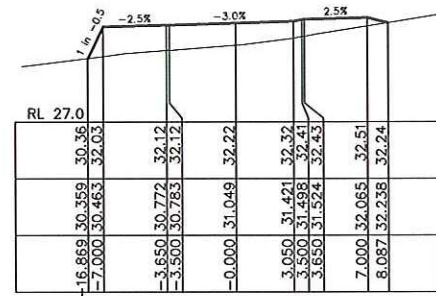
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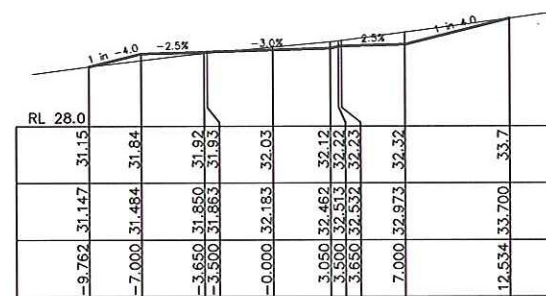
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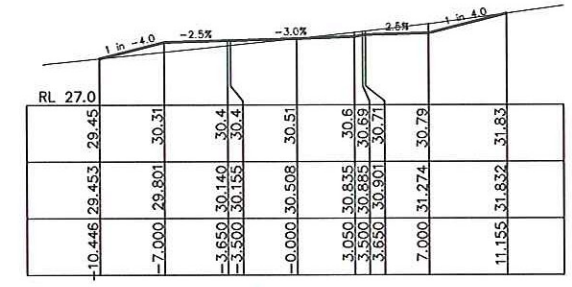
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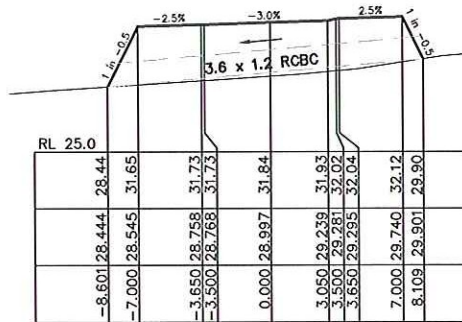
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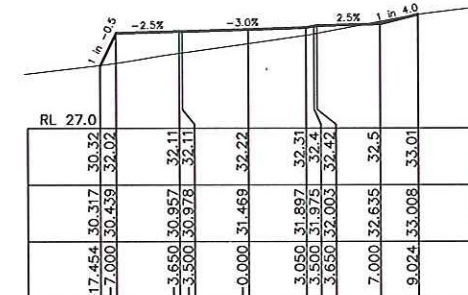
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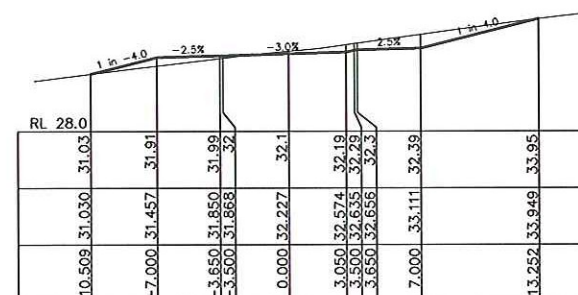
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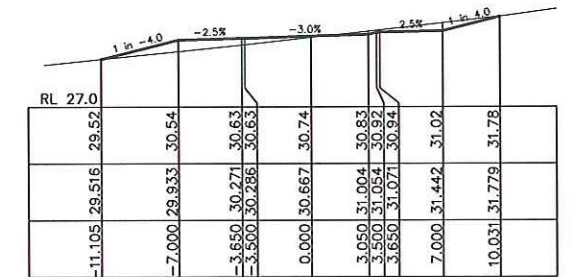
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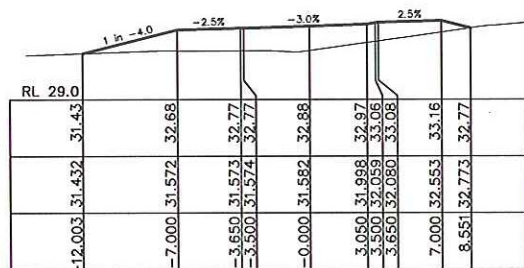
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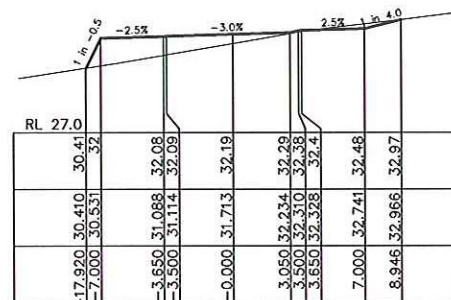
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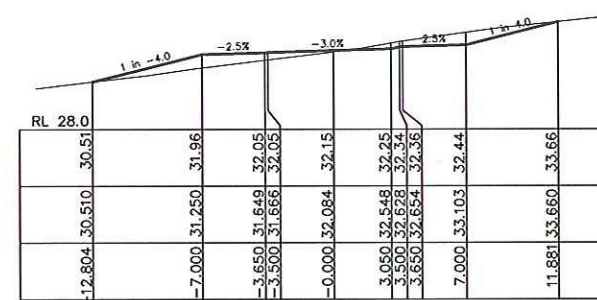
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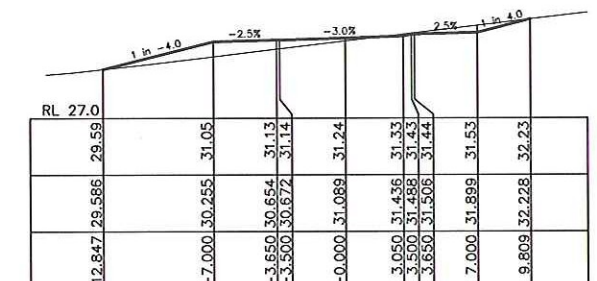
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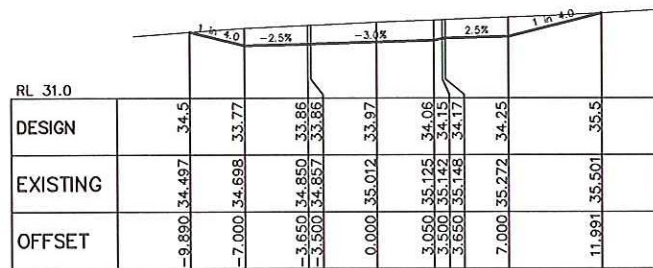
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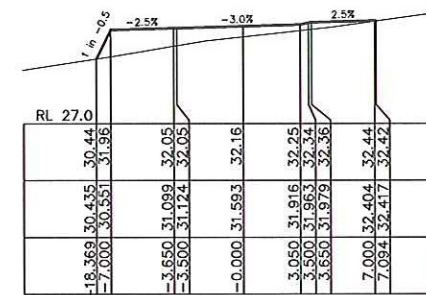
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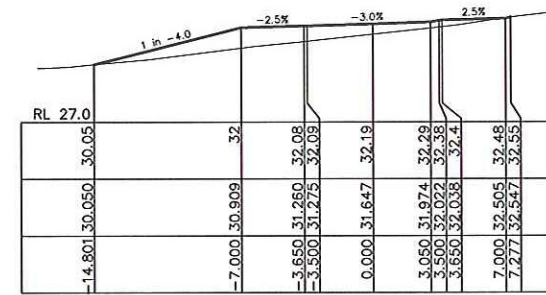
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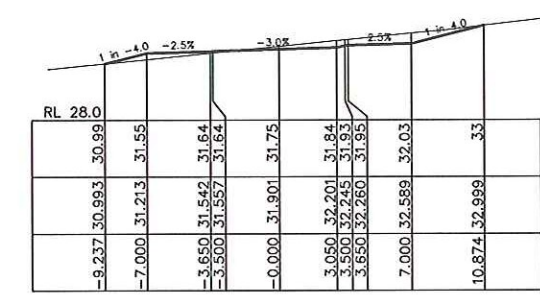
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CH 76

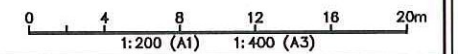


CH 96



CH 120

DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION



Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
B	ISSUED FOR EA		PBC			15.08.06
A	ISSUED FOR EA		PBC			21.06.07

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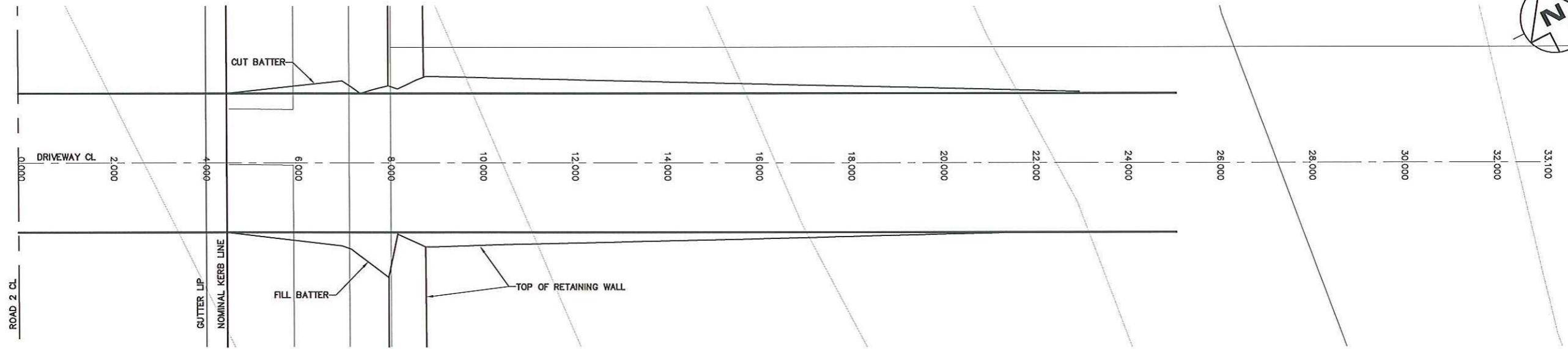
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Client
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Project
**COASTAL GROVE
1 SURVEY STREET, LENNOX HEAD**

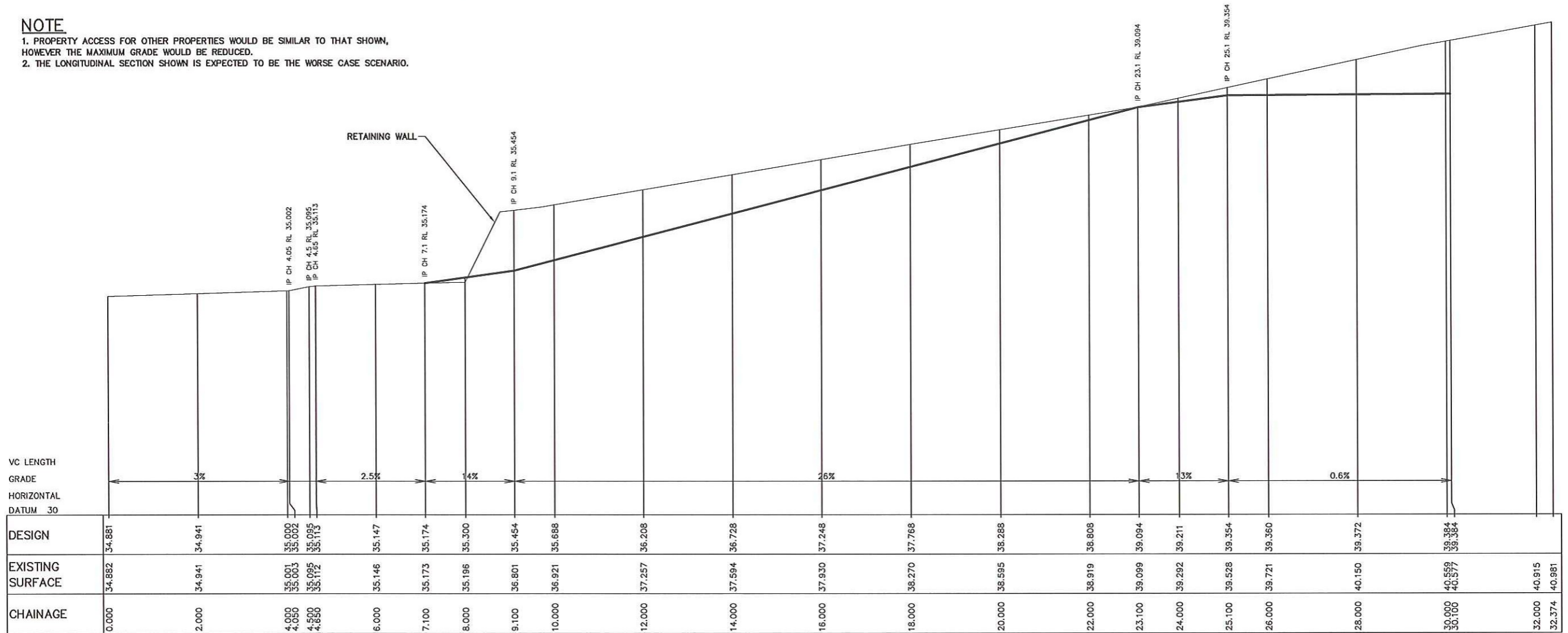
Title
**ROAD 3 DESIGN CROSS SECTIONS
CH 0.00 - CH 169.02**

Drawing No.
6324-02-11
Issue
B
Cod File No.
6324-02-11
Xref.(s)



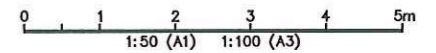
NOTE

1. PROPERTY ACCESS FOR OTHER PROPERTIES WOULD BE SIMILAR TO THAT SHOWN, HOWEVER THE MAXIMUM GRADE WOULD BE REDUCED.
2. THE LONGITUDINAL SECTION SHOWN IS EXPECTED TO BE THE WORSE CASE SCENARIO.



TYPICAL ROAD 2 PROPERTY ACCESS LONGITUDINAL SECTION

SCALE HORIZONTAL 1:50
SCALE VERTICAL 1:50



DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
A	ISSUED FOR EA	RB	PBC			21.07.06

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Client
SAKE DEVELOPMENT PTY LTD

Project
**COASTAL GROVE
1 SURVEY STREET, LENNOX HEAD**

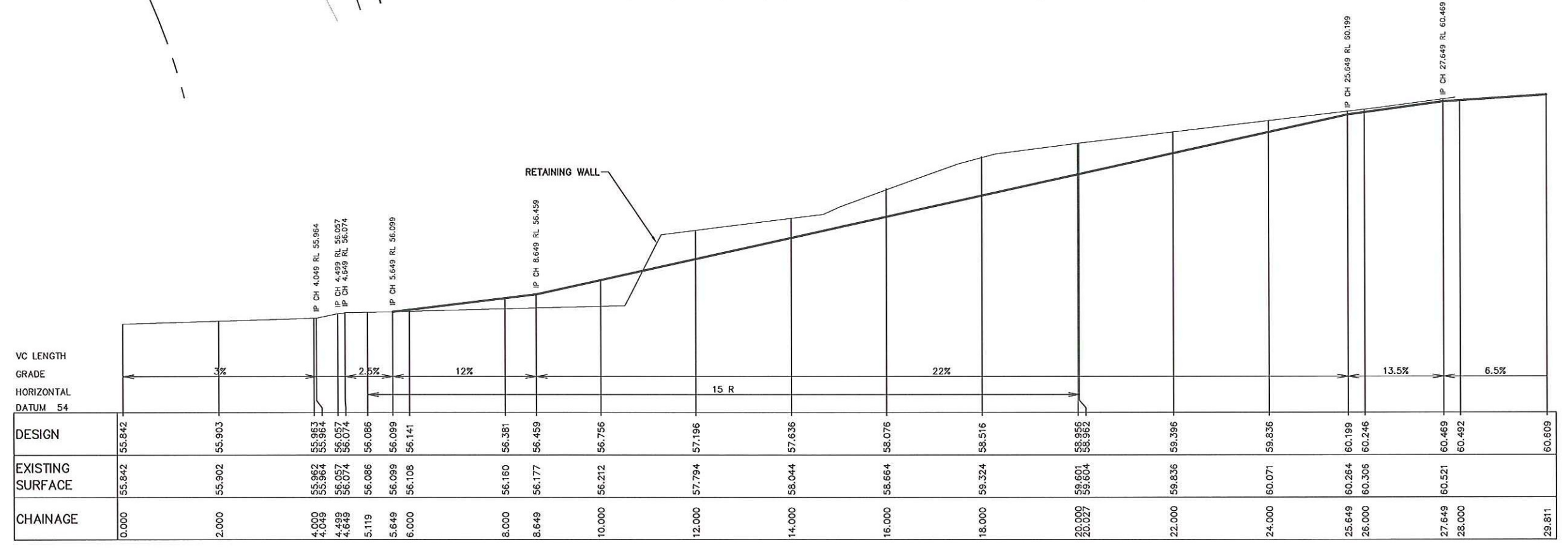
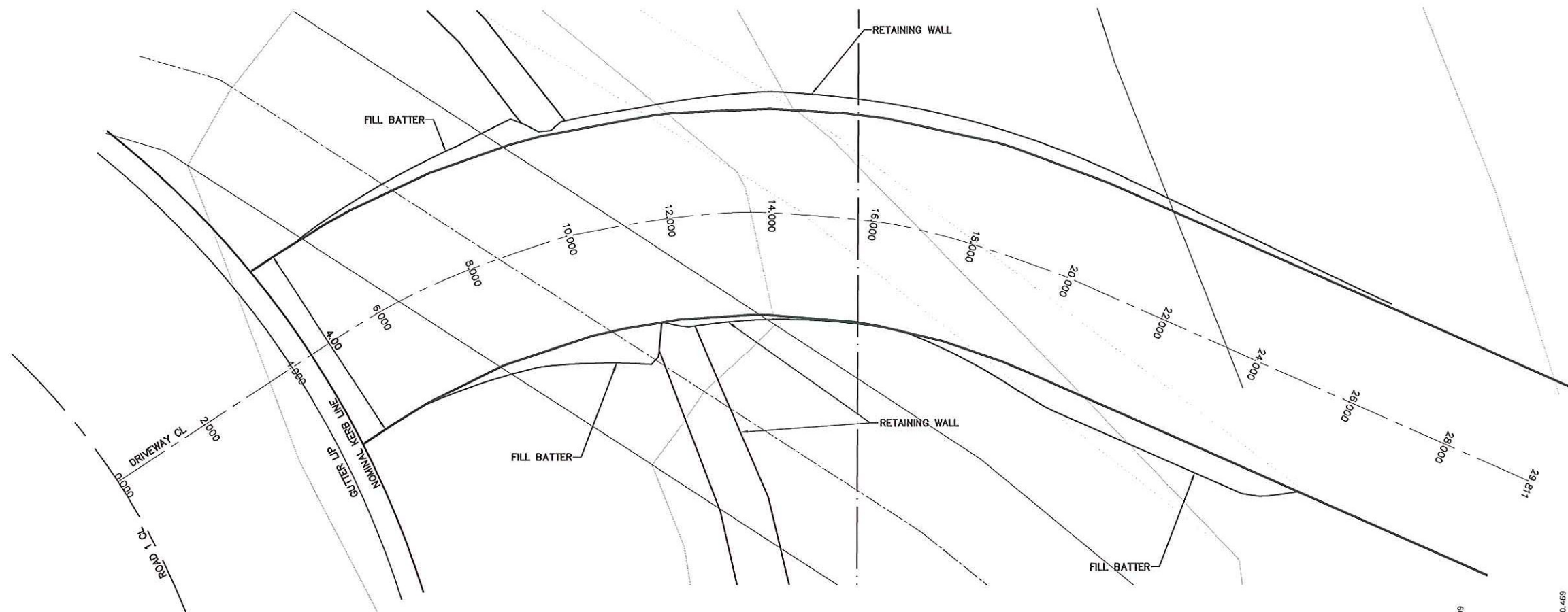
Title
TYPICAL ROAD 2 PROPERTY ACCESS THROUGH RETAINING WALL

Drawing No.
6324-02-12

Issue
A

Cad File No.
6324-02-12

Xref.(s)



NEWTON'S PROPERTY ACCESS LONGITUDINAL SECTION
 SCALE HORIZONTAL 1:50
 SCALE VERTICAL 1:50

DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
A	ISSUED FOR EA	RB	PBC			21.07.06

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Client
SAKE DEVELOPMENT PTY LTD
 Project
**COASTAL GROVE
 1 SURVEY STREET, LENNOX HEAD**

Title
**NEWTON'S PROPERTY ACCESS
 THROUGH RETAINING WALL**

Drawing No.
6324-02-13
 Issue
A
 Cad File No.
 6324-02-12
 Xref.(a)





MANAGEMENT
ENGINEERING
ENVIRONMENT

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G:\4112595\Mapinfo\Workspace\Sewerage DSP\Fig6.WOR

- Legend**
- Existing Pump Station
 - Existing Rising Main
 - Existing Gravity Main
 - Future Pump Station / Upgrade
 - Future Gravity Main / Upgrade
 - Future Rising Main / Upgrade
 - ⊘ DSP Area A
 - ⊘ DSP Area B
 - ⊘ DSP Area C
 - ⊘ DSP Area D
 - ⊘ DSP Area E

North



0 0.25 0.5
kilometres

Source information: GIS supplied by Ballina Shire Council.

Ballina Shire Council
Figure 6
Lennox Head

**APPENDIX 1
BSC SEWER DSP
PROPOSED WORKS**

Existing Pump Stations
DSP Area

Component	Size	Units	Year Commissioned	Pre or Post 1996 Asset	Effective Year of Commissioning	Capital Cost	Adopted Capacity (ET/s)	Cost per ET	Year when Capacity is Taken-Up	Take-up Period (Years)	Pre '1996 ROI Factor (Non-Uniform Lot Take Up)	Post '1996 ROI Factor (Non-Uniform Lot Take Up)	Capital Charge per ET	Total Charges
Ballina STW Catchment Area	152 @	12 L/s @ m	1975	Pre	1995/96	\$ 457,200	6,236	\$ 73	2033/34	39	1.94	1.94	\$ 102	
SP2001 - Swift St	11 @	7 L/s @ m	1975	Pre	1995/96	\$ 127,700	6,236	\$ 20	2033/34	39	1.94	1.94	\$ 28	
Ballina STW Catchment Area	11 @	7 L/s @ m	1975	Pre	1995/96	\$ 124,000	6,236	\$ 20	2033/34	39	1.94	1.94	\$ 28	
SP2006 - Regatta Ave	31 @	6 L/s @ m	1975	Pre	1995/96	\$ 163,400	6,236	\$ 26	2033/34	39	1.94	1.94	\$ 36	
Ballina STW Catchment Area	25 @	8 L/s @ m	1975	Pre	1995/96	\$ 161,000	6,236	\$ 26	2033/34	39	1.94	1.94	\$ 36	
SP2010 - Fox St	36 @	8 L/s @ m	1975	Pre	1995/96	\$ 175,400	6,236	\$ 28	2033/34	39	1.94	1.94	\$ 39	
Ballina STW Catchment Area	12 @	16 L/s @ m	1975	Pre	1995/96	\$ 202,000	6,236	\$ 32	2033/34	39	1.94	1.94	\$ 45	
SP2013 - Skimmer St	53 @	9 L/s @ m	1975	Pre	1995/96	\$ 168,200	6,236	\$ 27	2033/34	39	1.94	1.94	\$ 37	
Ballina STW Catchment Area	13 @	32 L/s @ m	1978	Pre	1995/96	\$ 437,750	6,236	\$ 70	2033/34	39	1.94	1.94	\$ 97	
SP2014 - Webster Ln	110 @	31 L/s @ m	1979	Pre	1995/96	\$ 161,000	6,236	\$ 26	2033/34	39	1.94	1.94	\$ 36	
Ballina STW Catchment Area	24 @	12 L/s @ m	1979	Pre	1995/96	\$ 127,700	6,236	\$ 20	2033/34	39	1.94	1.94	\$ 28	\$ 542
SP2101 - Pacific Hwy	11 @	10 L/s @ m	1982	Pre	1995/96	\$ 437,750	6,839	\$ 64	2033/34	39	1.94	1.94	\$ 88	
SP2105 - Oakland Ave	11 @	25 L/s @ m	1985	Pre	1995/96	\$ 195,200	6,839	\$ 29	2033/34	39	1.94	1.94	\$ 39	
SP2109 - Spinnaker Crs	46 @	18 L/s @ m	1984	Pre	1995/96	\$ 112,900	6,839	\$ 17	2033/34	39	1.94	1.94	\$ 23	
Lennox STW Catchment Area	7 @	8 L/s @ m	1976	Pre	1995/96	\$ 124,000	6,839	\$ 18	2033/34	39	1.94	1.94	\$ 25	
SP2301 - Angus Beach Dr	28 @	17 L/s @ m	1978	Pre	1995/96	\$ 153,600	6,839	\$ 24	2033/34	39	1.94	1.94	\$ 32	
Lennox STW Catchment Area	57 @	16 L/s @ m	1981	Pre	1995/96	\$ 249,200	6,839	\$ 36	2033/34	39	1.94	1.94	\$ 50	
SP2302 - Shelly Beach Rd	21 @	32 L/s @ m	1981	Pre	1995/96	\$ 161,000	6,839	\$ 24	2033/34	39	1.94	1.94	\$ 32	
Lennox STW Catchment Area	8 @	20 L/s @ m	1983	Pre	1995/96	\$ 116,800	6,839	\$ 17	2033/34	39	1.94	1.94	\$ 24	
SP3001 - Byron St	10 @	12 L/s @ m	1980	Pre	1995/96	\$ 124,000	6,839	\$ 18	2033/34	39	1.94	1.94	\$ 24	
Lennox STW Catchment Area	7 @	21 L/s @ m	1988	Pre	1995/96	\$ 469,500	7,919	\$ 59	2033/34	39	1.94	1.94	\$ 82	\$ 475
SP3101 - Skennars Head Rd	120 @	26 L/s @ m	1987	Pre	1995/96	\$ 208,300	440	\$ 473	2033/34	39	1.49	2.26	\$ 703	
SP3105 - Rainforest Wv	41 @	34 L/s @ m	-	Pre	1995/96	\$ 469,500	7,919	\$ 59	2033/34	39	1.94	1.94	\$ 82	
SP3107 - Seamist P1	120 @	26 L/s @ m	-	Pre	1995/96	\$ 208,300	440	\$ 473	2033/34	39	1.49	2.26	\$ 703	
SP3110 - Montwood Dr	120 @	34 L/s @ m	-	Pre	1995/96	\$ 469,500	7,919	\$ 59	2033/34	39	1.94	1.94	\$ 82	
Wardell STW Catchment Area	41 @	34 L/s @ m	-	Pre	1995/96	\$ 208,300	440	\$ 473	2033/34	39	1.49	2.26	\$ 703	
SP5005 - Richmond St	120 @	34 L/s @ m	-	Pre	1995/96	\$ 469,500	7,919	\$ 59	2033/34	39	1.94	1.94	\$ 82	
Lennox STW - Release Area 1														

Future Pump Station Works
Base Year

2003/04

DSP Area	Component	Size	Units	Year of Construction	Total Service ET	New Service ET	NPV of New Service ETs	Capital Cost	Effective Capital Cost	NPV of Capital Cost @ 7%	Capital Charge per ET	Total Charges	Comments
Ballina STW Catchment Area	SP2001 - Upgrade Pump Motors	45 @	kw	2010/11	6,236	1,201	608	\$ 15,000	\$ 2,889	\$ 1,799	\$ 3		
	SP2006 - Upgrade Pumps	12 @	L/s @ m	2020/21	6,236	1,201	608	\$ 56,400	\$ 10,862	\$ 3,439	\$ 6		
	SP2013 - Upgrade Pumps	14 @	L/s @ m	2005/06	6,236	1,201	608	\$ 63,000	\$ 12,287	\$ 10,732	\$ 18		
	North Ballina Pump Station	150 @	L/s @ m	2004/05	8,696	3,661	1,696	\$ 456,500	\$ 192,186	\$ 179,613	\$ 106		
Ballina STW Catchment Area	Miscel Pump Station Upgrades			2003/04	16,492	3,841	1,990	\$ 150,000	\$ 34,935	\$ 34,935	\$ 18		
	Miscel Pump Station Telemetry			2003/04	16,492	3,841	1,990	\$ 250,000	\$ 58,225	\$ 58,225	\$ 29	\$ 179	
Lennox STW Catchment Area	SP2306 - Emergency Storage	19 @	m ³	2005/06	6,839	2,195	1,133	\$ 43,900	\$ 14,050	\$ 12,307	\$ 11		
	SP2306 - Upgrade pumps	7 @	L/s @ m	2015/16	6,839	2,195	1,133	\$ 37,900	\$ 12,164	\$ 5,401	\$ 5		
	SP2308 - Upgrade pumps	10 @	L/s @ m	2015/16	6,839	2,195	1,133	\$ 49,000	\$ 15,727	\$ 6,983	\$ 6		
	SP2309 - Emergency Storage	31 @	m ³	2005/06	6,839	2,195	1,133	\$ 64,300	\$ 20,657	\$ 18,025	\$ 16		
	SP2309 - Upgrade pumps	14 @	L/s @ m	2010/11	6,839	2,195	1,133	\$ 63,000	\$ 20,477	\$ 12,752	\$ 11		
	SP3001 - Upgrade pumps	90 @	L/s @ m	2015/16	6,839	2,195	1,133	\$ 197,500	\$ 63,388	\$ 28,145	\$ 25		
	SP3002 - Emergency Storage	38 @	m ³	2005/06	6,839	2,195	1,133	\$ 73,400	\$ 23,558	\$ 20,576	\$ 18		
	SP3101 - Emergency Storage	56 @	m ³	2005/06	6,839	2,195	1,133	\$ 88,000	\$ 28,244	\$ 24,669	\$ 22		
	SP3101 - Upgrade pumps	15 @	L/s @ m	2010/11	6,839	2,195	1,133	\$ 98,000	\$ 31,453	\$ 19,588	\$ 17		
	SP3105 - Emergency Storage	25 @	m ³	2005/06	6,839	2,195	1,133	\$ 54,500	\$ 17,492	\$ 15,278	\$ 13		
	SP3106 - Decommission			2005/06	6,839	2,195	1,133	\$ 10,000	\$ 3,210	\$ 2,803	\$ 2		
	SP3107 - Upgrade Pumps	37 @	L/s @ m	2005/06	6,839	2,195	1,133	\$ 124,000	\$ 39,798	\$ 34,761	\$ 31		
	SP3107 - Emergency Storage	53 @	m ³	2005/06	6,839	2,195	1,133	\$ 86,500	\$ 27,762	\$ 24,249	\$ 21		
SP3108 - Decommission			2005/06	6,839	2,195	1,133	\$ 10,000	\$ 3,210	\$ 2,803	\$ 2			
Lennox STW Catchment Area	SP3110 - Emergency Storage	53 @	m ³	2015/16	7,919	3,275	1,571	\$ 85,500	\$ 35,773	\$ 15,884	\$ 9		
	SP3110 - Upgrade pumps	165 @	L/s @ m	2020/21	7,919	3,275	1,571	\$ 276,625	\$ 114,402	\$ 36,217	\$ 22		
	New Pump Station (Barrett Land)	17 @	L/s @ m	2010/11	6,839	2,195	1,133	\$ 149,900	\$ 48,111	\$ 29,961	\$ 26		
	Miscel Pump Station Upgrades			2003/04	16,492	3,841	1,990	\$ 150,000	\$ 34,935	\$ 34,935	\$ 18		
Lennox STW Catchment Area	Miscel Pump Station Telemetry			2003/04	16,492	3,841	1,990	\$ 250,000	\$ 58,225	\$ 58,225	\$ 29	\$ 306	
	Miscel Pump Station Telemetry			2003/04	16,492	3,841	1,990	\$ 250,000	\$ 58,225	\$ 58,225	\$ 29		
Alstonville STW Catchment Area	SP4101 - Decommission			2015/16	2,977	295	184	\$ 10,000	\$ 991	\$ 440	\$ 2		
	SP4103 - Decommission			2007/08	2,977	295	184	\$ 10,000	\$ 991	\$ 756	\$ 4		
	SP4106 - Upgrade Pumps	3 @	L/s @ m	2005/06	2,977	295	184	\$ 23,100	\$ 2,289	\$ 1,999	\$ 11		
Alstonville STW Catchment Area	Miscel Pump Station Upgrades			2003/04	16,492	3,841	1,990	\$ 150,000	\$ 34,935	\$ 34,935	\$ 18		
	Miscel Pump Station Telemetry			2003/04	16,492	3,841	1,990	\$ 250,000	\$ 58,225	\$ 58,225	\$ 29	\$ 64	
	Miscel Pump Station Telemetry			2003/04	16,492	3,841	1,990	\$ 250,000	\$ 58,225	\$ 58,225	\$ 29		
	Miscel Pump Station Telemetry			2003/04	16,492	3,841	1,990	\$ 250,000	\$ 58,225	\$ 58,225	\$ 29		
Wardell STW Catchment Area	Miscel Pump Station Upgrades			2003/04	16,492	3,841	1,990	\$ 150,000	\$ 34,935	\$ 34,935	\$ 18		
	Miscel Pump Station Telemetry			2003/04	16,492	3,841	1,990	\$ 250,000	\$ 58,225	\$ 58,225	\$ 29	\$ 47	
Ballina STW - Release Area 1	New Pump Station	20 @	L/s @ m	2004/05	480	480	298	\$ 161,000	\$ 181,000	\$ 150,467	\$ 505	\$ 505	
	New Pump Station	21 @	L/s @ m	2004/05	500	500	376	\$ 161,000	\$ 181,000	\$ 150,467	\$ 400	\$ 400	
Ballina STW - Release Area 2	Existing Pump Station - Upgrade	105 @	L/s @ m	2015/16	2,460	2,460	1,089	\$ 149,750	\$ 149,750	\$ 66,491	\$ 61		
	New Pump Station - SP1	50 @	L/s @ m	2020/21	2,460	2,460	1,089	\$ 202,000	\$ 202,000	\$ 63,948	\$ 59		
	New Pump Station - SP2	35 @	L/s @ m	2025/26	2,460	2,460	1,089	\$ 195,000	\$ 195,000	\$ 44,014	\$ 40		
	New Pump Station - SP3	30 @	L/s @ m	2025/26	2,460	2,460	1,089	\$ 161,000	\$ 161,000	\$ 36,340	\$ 33		
	New Pump Station - SP4	13 @	L/s @ m	2025/26	2,460	2,460	1,089	\$ 135,100	\$ 135,100	\$ 30,494	\$ 28		
	North Ballina Pump Station	150 @	L/s @ m	2004/05	8,696	3,661	1,696	\$ 456,500	\$ 192,186	\$ 179,613	\$ 106	\$ 327	
	North Ballina Pump Station			2004/05	8,696	3,661	1,696	\$ 456,500	\$ 192,186	\$ 179,613	\$ 106		
Lennox STW - Release Area 1	SP3110 - Emergency Storage	53 @	m ³	2015/16	7,919	3,275	1,571	\$ 86,500	\$ 35,773	\$ 15,884	\$ 9		
	SP3110 - Upgrade pumps	165 @	L/s @ m	2020/21	7,919	3,275	1,571	\$ 276,625	\$ 114,402	\$ 36,217	\$ 22	\$ 31	
Lennox STW - Release Area 2	New Pump Station	17 @	L/s @ m	2015/16	400	400	112	\$ 149,900	\$ 149,900	\$ 66,557	\$ 594	\$ 594	
	New Pump Station	19 @	L/s @ m	2004/05	650	650	345	\$ 182,600	\$ 182,600	\$ 170,654	\$ 494	\$ 494	

APPENDIX 2 EXISTING SEWER INFRASTRUCTURE

Future Pressure Pipes

2003/04

Base Year	DSP Area	Component	Nominal Diameter (mm)	Year of Construction	Total Service ET's	New Service ET's	NPV of New Service ET's	Capital Cost	Effective Capital Cost	NPV of Capital Cost (@ 7%)	Capital Charge per ET	Total Charges	Comments
	Ballina STW Catchment Area	Division of SP2201 to new Nth Ballina PS rising main	DN150	2005/06	6,236	1,201	608	67,396 \$	12,980 \$	11,337 \$	19		
	Ballina STW Catchment Area	Rising main from new Nth Ballina PS to SP2101	DN375	2005/06	8,696	3,661	1,686	25,005 \$	10,527 \$	9,195 \$	5		
	Ballina STW Catchment Area	Division of SP2101 to Ballina STW	DN450	2010/11	8,696	3,661	1,696	223,200 \$	93,967 \$	56,518 \$	24		
	Ballina STW Catchment Area	Division of new Nth Ballina PS to Ballina STW	DN375	2010/11	8,696	3,661	1,696	150,000 \$	63,150 \$	39,326 \$	23		82
	Lennox STW Catchment Area	SP2107 rising main	DN200	2005/06	6,839	2,195	1,133	29,424 \$	9,444 \$	8,249 \$	7		
	Lennox STW Catchment Area	Rising main from Barrett Land development	DN150	2010/11	6,839	2,195	1,133	78,444 \$	25,177 \$	15,679 \$	14		
	Lennox STW Catchment Area	SP3001 parallel rising main	DN250	2015/16	6,839	2,195	1,133	230,646 \$	74,027 \$	32,869 \$	29		50
	Alstonville STW Catchment Area	SP4106 rising main	DN63	2005/06	2977	295	184	18,550 \$	1,838 \$	1,606 \$	9		9
	Ballina STW - Release Area 1	Rising main from new development	DN150	2004/05	480	480	298	156,888 \$	156,889 \$	146,625 \$	492		492
	Ballina STW - Release Area 2	Rising main from Aged Care Facility	DN150	2004/05	500	500	376	116,009 \$	116,009 \$	108,420 \$	289		289
	Ballina STW - Release Area 3 (Cumbalum)	SP1 rising main	DN250	2020/21	2460	2,460	1,089	163,518 \$	163,518 \$	51,766 \$	48		
	Ballina STW - Release Area 3 (Cumbalum)	SP2 rising main	DN200	2025/26	2460	2,460	1,089	61,406 \$	61,406 \$	13,860 \$	13		
	Ballina STW - Release Area 3 (Cumbalum)	SP3 rising main	DN200	2025/26	2460	2,460	1,089	120,022 \$	120,022 \$	27,091 \$	25		
	Ballina STW - Release Area 3 (Cumbalum)	SP4 rising main	DN150	2025/26	2460	2,460	1,089	95,017 \$	95,017 \$	21,447 \$	20		
	Ballina STW - Release Area 3 (Cumbalum)	Rising main from new Nth Ballina PS to SP2101	DN375	2005/06	8696	3661	1,696	25,005 \$	10,527 \$	9,195 \$	5		
	Ballina STW - Release Area 3 (Cumbalum)	Rising main from new Nth Ballina PS to Ballina STW	DN375	2010/11	8696	3661	1,696	582,605 \$	245,276 \$	152,745 \$	90		200
	Lennox STW - Release Area 2	Rising main from new development	DN150	2015/16	400	400	112	138,106 \$	138,106 \$	61,321 \$	548		548
	Alstonville STW - Release Area 1 (Wellongba)	Rising main from new development	DN150	2004/05	650	650	345	90,598 \$	90,598 \$	84,671 \$	245		245

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SEAVIEW ESTATE

STAGES 2 & 3

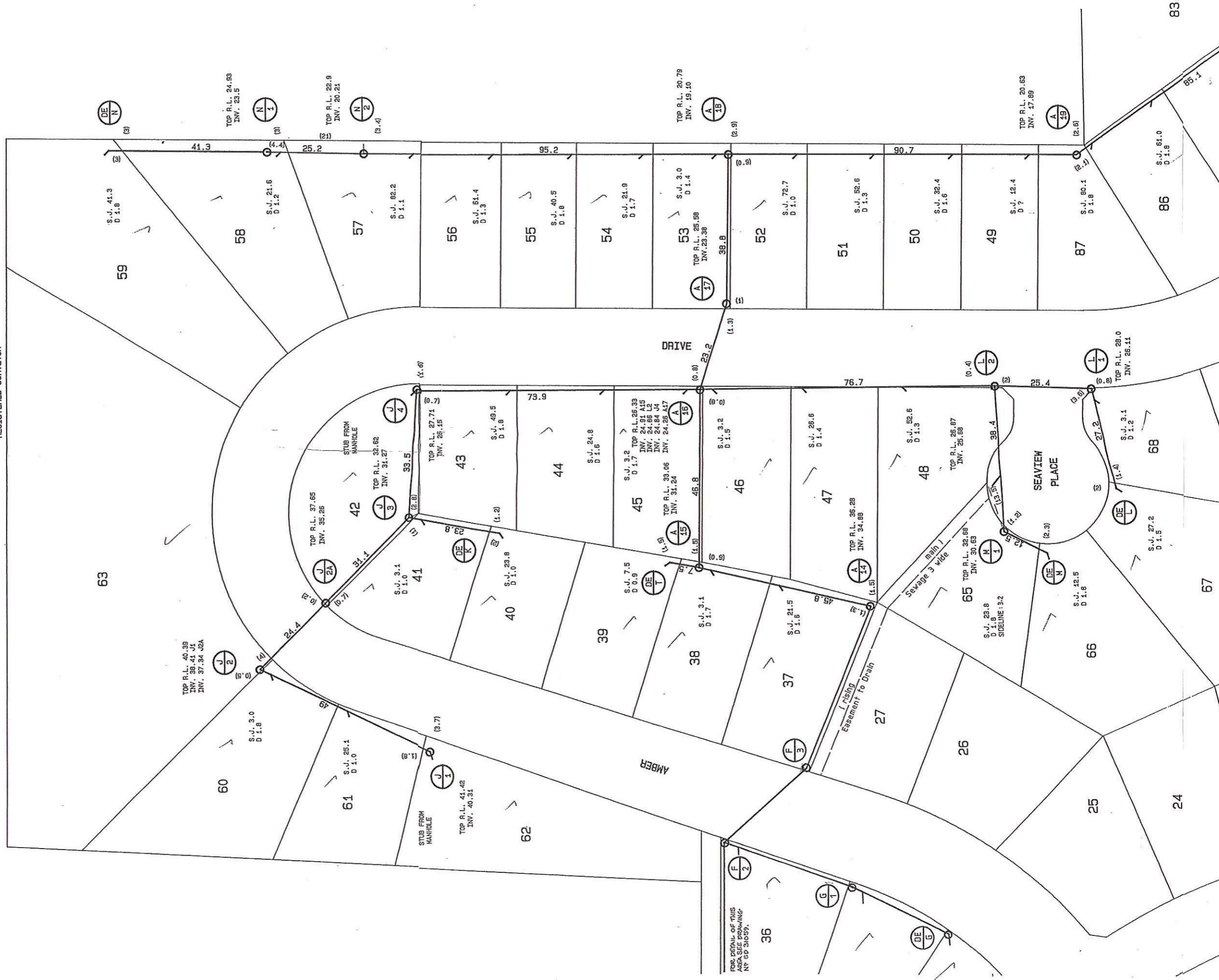
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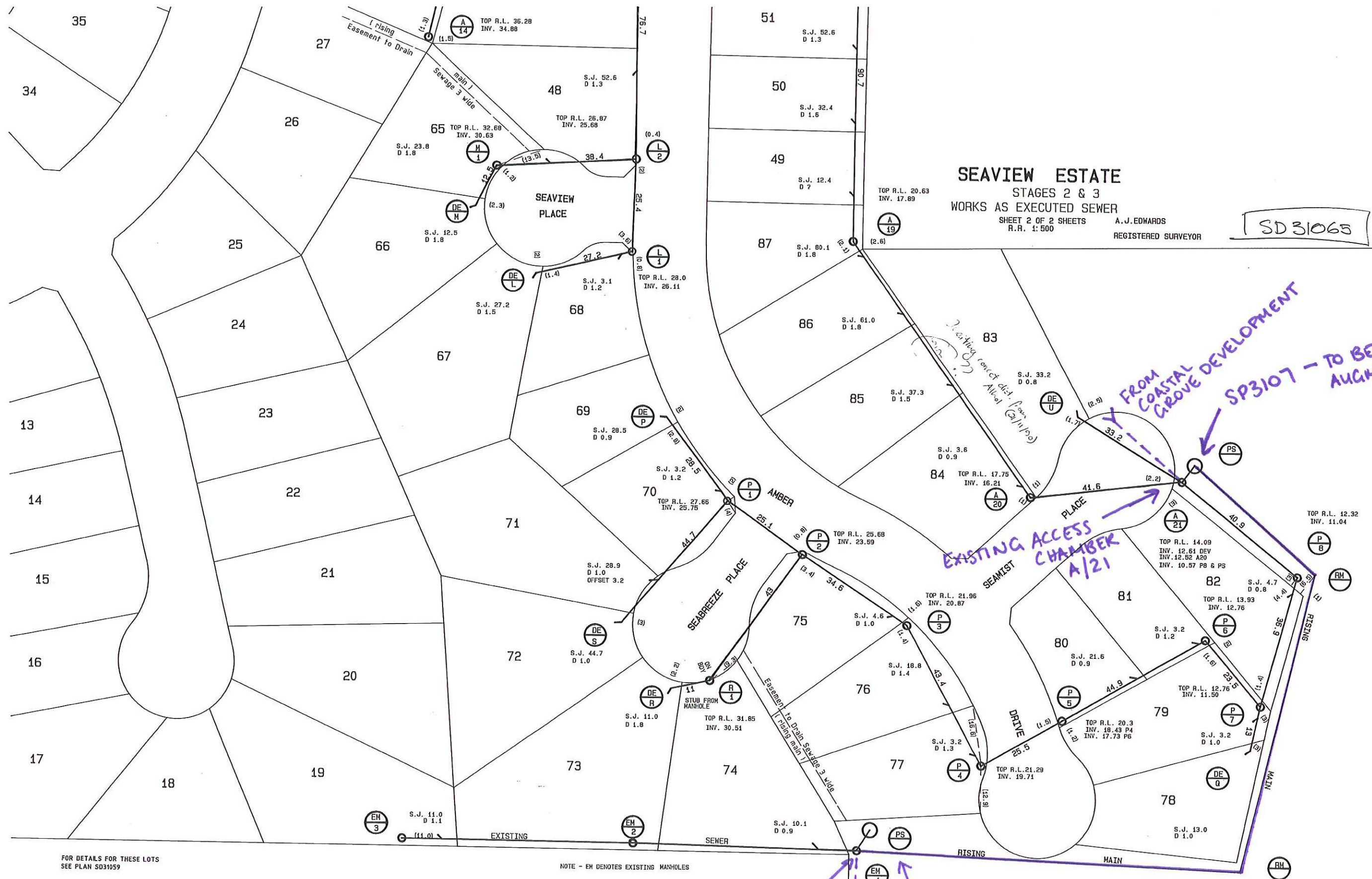
SHEET 1 OF 2 SHEETS
R.R. 1:500

SD 31064

A. J. EDMARDS

REGISTERED SURVEYOR





FOR DETAILS FOR THESE LOTS
SEE PLAN SD31059

NOTE - EM DENOTES EXISTING MANHOLES

EXISTING ACCESS CHAMBER A/21

FROM COASTAL GROVE DEVELOPMENT

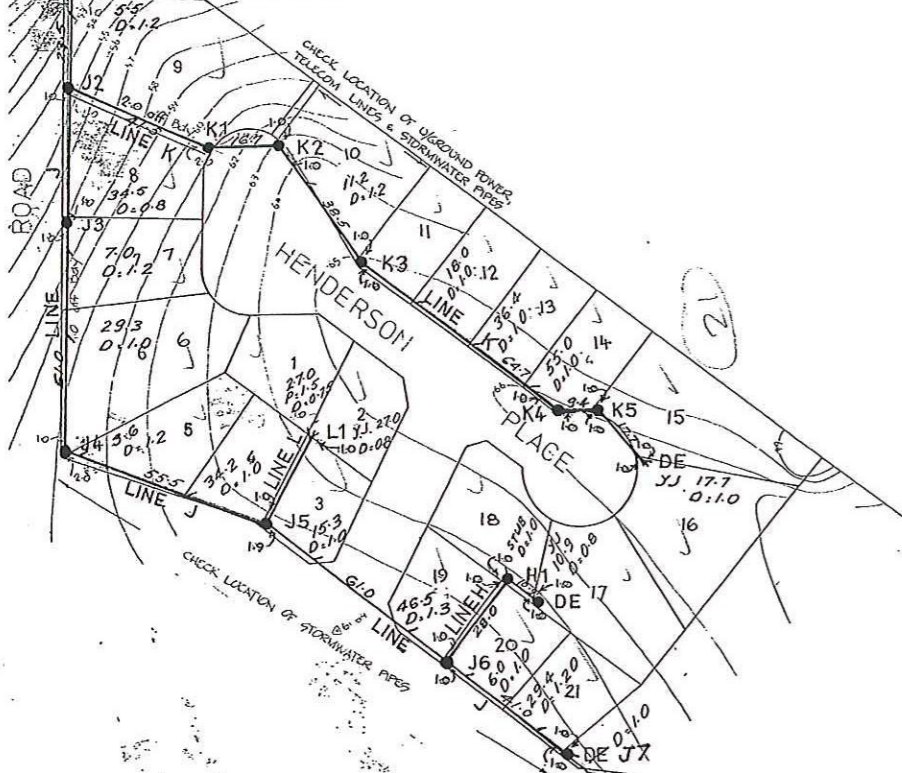
SP3107 - TO BE AUGMENTED

EXISTING ACCESS CHAMBER A/1

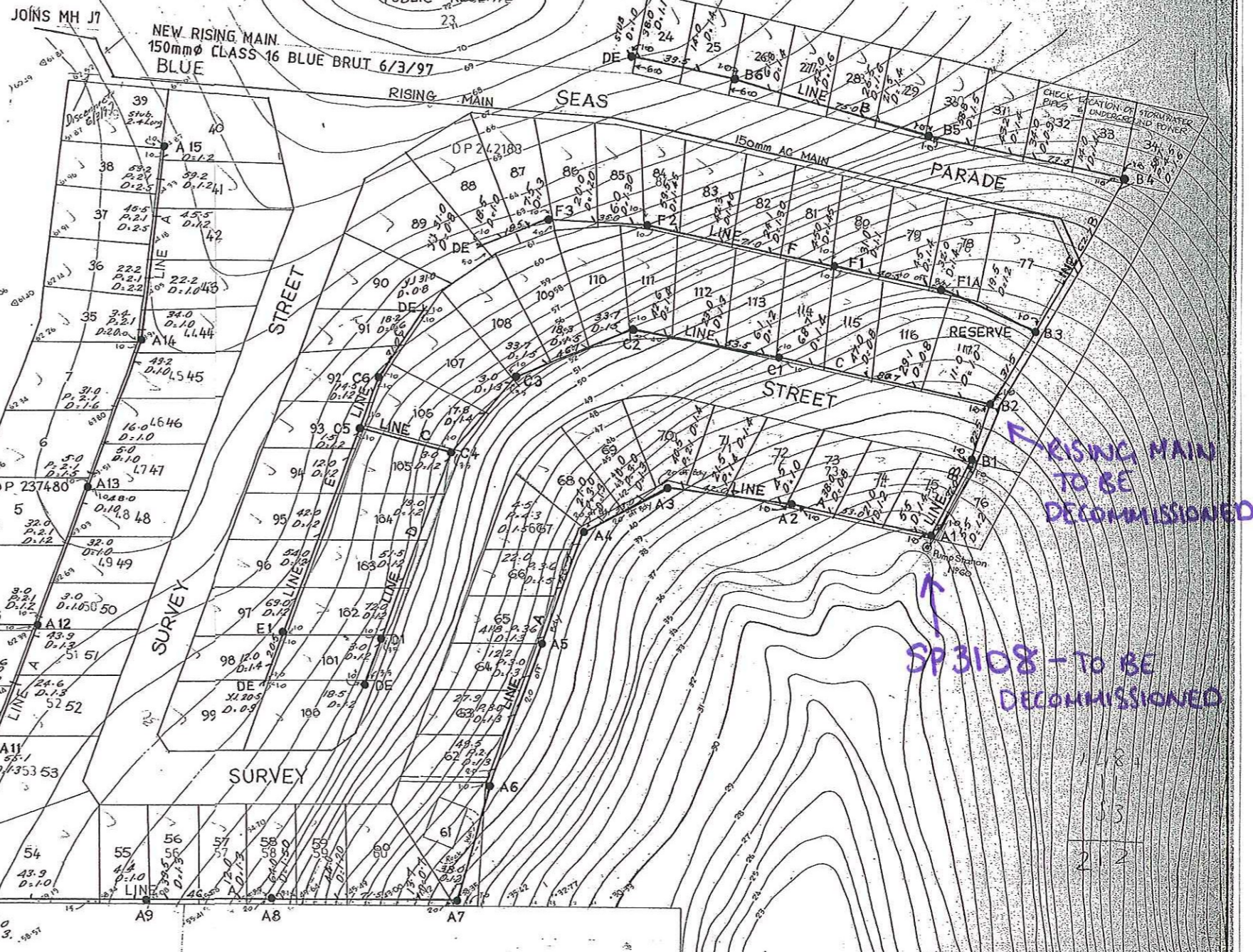
SP3106 - TO BE DECOMMISSIONED



NEW GRAY MAIN
CONNECTS TO MH IN OCEAN BREEZE DR
21/2/97



NEW RISING MAIN
150mm CLASS 16 BLUE BRUT
CONNECTED 6/3/97



RISING MAIN TO BE DECOMMISSIONED

SP3108 - TO BE DECOMMISSIONED

WAE
SD31050

No	Date	By	Change	X'd
2	9/6/81	VE	POSITION OF M9 ALTERED	
1	2/4/81	VE	POSITION OF B3 & FIA ALTERED	
Amendments				

Surveyed	C.J. WATTON	Designed	R.K. WEATHERLEY
Date	24.8.79 7.3.80	Drawn	VE
F.B.		Checked	
L.B.	7/16, 7/17, 7/10	Approved	
Datum	A.M.D.	Date	FEBRUARY 1981
Sheet 1 of 3 Sheets			

SHIRE OF BALLINA	
LENNOX HEAD SEWERAGE BLUE SEAS ESTATE PLAN VIEW	
Scale	1:1000
Plan No	LHS/77
	A1

**APPENDIX 3
EXISTING PUMP STATION SP3107**

Pump Station Details

Asset No. SP3107
 Description SEAMIST PLACE

Pump Well			
Levels	m AHD		
Top of Well	13.60		
Roof Thickness			0.35
Pump Well Inlet	10.40	Depth to Inlet (m)	3.20
Top Water Level (TWL)	10.25	Depth to TWL (m)	3.35
Bottom Water Level (BWL)	9.10	Depth to BWL (m)	4.50
Floor Level	8.80	Depth to Floor (m)	4.80
		TWL-BWL (m)	1.15
Well Dia. (m)	1.77		
Area (m ²)	2.46		
Storage Volume above TWL (m ³)	7.38		
Rising Main Details			
Total length (m)	230		
Diameter (mm)	100	PVC Class 12	
Discharge Level mAHD	17.8		
High Point Details	Chainage	Level mAHD	
None			

**APPENDIX 4
EXISTING VARIABLE GRADE RM PROFILE
SP3106 TO LENNOX STW**

SP3106 Amber Drive PS Rising Main Details

Chainage data from Longsections

Pipe data

Pipe length m	From Plans LHS/2 series	Adjusted pipe chainage - Zero at SP3106	Ground level mAHD from longsections	Invert mAHD (assume 1m deep except where known)	Dia	Material	Class	Comments
0		0			100	AC		Amber Dr PS to 200AC is 100AC length assumed
20	2822.49	20	27.56	26.56	250	AC	C	100mm Tee for Amber Dr PS
	2827.49	25	27.56	26.56	250	AC	C	
	2844.1	41.61	28.85	27.85	250	AC	C	
	2914.7	112.21	35.97	34.97	250	AC	C	
	2948.05	145.56	36.45	35.45	250	AC	C	
	2993.81	191.32	44.73	43.73	250	AC	C	
	3006.93	204.44	45.36	44.36	250	AC	C	
	3050.34	247.85	48.92	47.92	250	AC	C	
	3102.3	299.81	52.33	51.33	250	AC	C	
	3183.5	381.01	53.51	52.51	250	AC	C	
	3211.93	409.44	53.6	52.6	250	AC	C	Air valve on 75mm tee Assumed GL 53.6
	3242.3	439.81	53.4	52.4	250	AC	C	
	3331.27	528.78	50.8	49.8	250	AC	C	100mm Tee for Castle Dr PS
	3382.87	580.38	46.32	45.32	250	AC	C	
	3443.48	640.99	33.78	32.78	250	AC	C	
	3472.58	670.09	28.78	27.78	250	AC	C	
	3523.07	720.58	21.05	20.05	250	AC	C	
	3621.64	819.15	11.67	10.67	250	AC	C	
	3722.96	920.47	6.75	5.75	250	AC	C	
	3863.83	1061.34	2.69	1.69	250	AC	C	
	3917.93	1115.44	1.77	0.77	250	AC	C	
	3980.54	1178.05	1.79	0.79	250	AC	C	
	4099.82	1297.33	1.24	0.24	250	AC	C	
	4190.01	1387.52	1.28	0.28	250	AC	C	
	4209.59	1407.1	1.3	0.3	250	AC	C	
	4227.34	1424.85	1.32	0.32	250	AC	C	
	4263.8	1461.31	1.33	0.33	250	AC	C	
	4301.11	1498.62	1.65	0.65	250	AC	C	
	4316.49	1514	1.8	0.8	250	AC	C	
	4361.2	1558.71	9.28	8.28	250	AC	C	
	4421.69	1619.2	15.3	13.835	250	AC	C	Air valve on 75mm tee Dave Kelly survey 25Nov2004 confirmed Top of pipe at airvalve int North Ck Rd/Skennars Head RD at 14.1
	4475.41	1672.92	13.09	12.09	250	AC	C	
	4566.65	1764.16	11.53	10.53	250	AC	C	
	4657.36	1854.87	14.29	13.29	250	AC	C	
	4759.6	1957.11	18.49	17.49	250	AC	C	
	4781.45	1978.96	18.18	17.18	250	AC	C	
	4808.08	2005.59	18.55	17.645	250	AC	C	Air valve on 75mm tee Dave Kelly survey 25Nov2004 confirmed Top of pipe at airvalve int North Ck Rd at 17.91
	4901.36	2098.87	16.16	15.16	250	AC	C	
	5001.52	2199.03	14.86	13.86	250	AC	C	
	5075.56	2273.07	14.42	13.42	250	AC	C	
	5184.58	2382.09	15.54	14.54	250	AC	C	
	5190.48	2387.99	15.51	14.51	250	AC	C	
14		2401.99		15.2	250	uPVC	AS1477 Class 12 Receiving Chamber Pipe Inv RL15.2	Pipe length taken from separate detail plan

Notes

250 dia AC Class C ID = 243.4mm Wall Thickness= 21.3mm
 These levels from survey information

Longsection Drawings

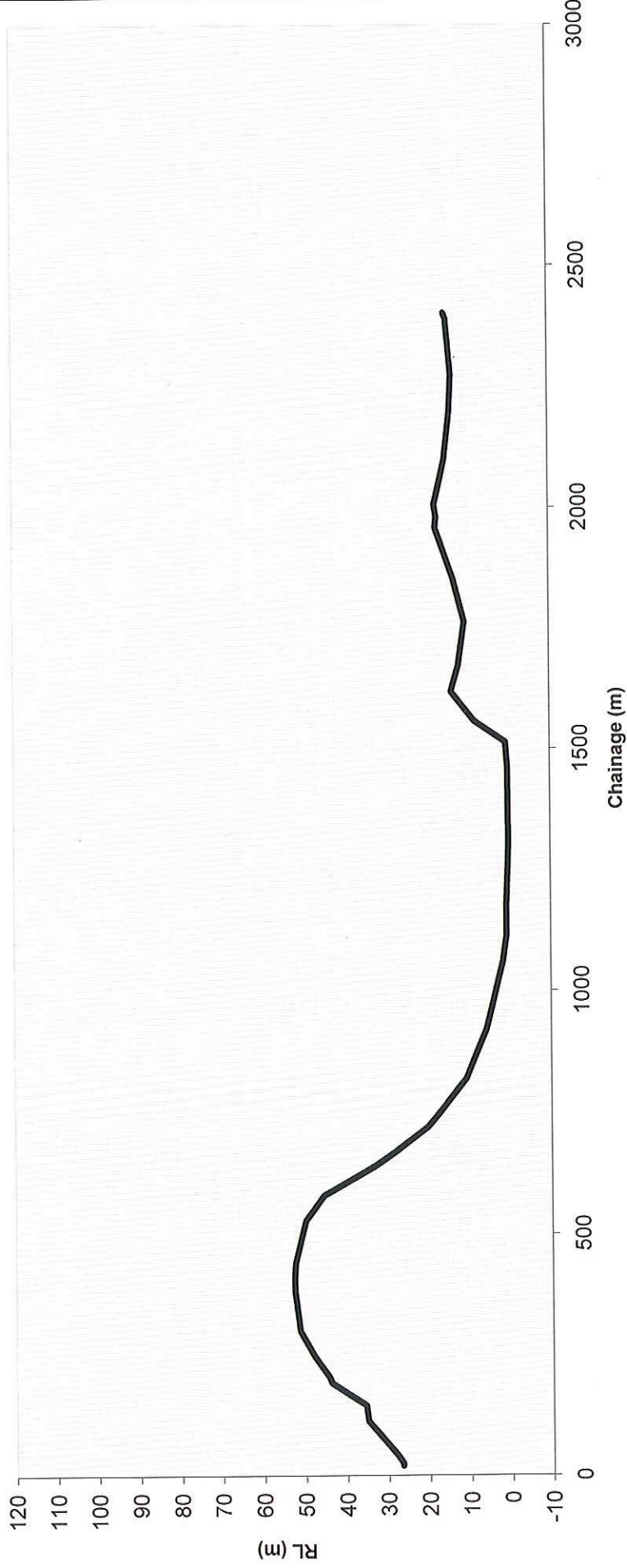
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RM30017.tif	Drg LHS/2 Plan 7 of 14
RM30018.tif	Drg LHS/2 Plan 8 of 14
RM31004.tif	Drg LHS/2 Plan 9 of 14

Pump Station Details

Asset No. SP3106
 Description AMBER DRIVE

Pump Well			
Levels	m AHD		
Top of Well	27.77		
Roof Thickness			0.35
Pump Well Inlet	25.46	Depth to Inlet (m)	2.31
Top Water Level (TWL)	23.54	Depth to TWL (m)	4.23
Bottom Water Level (BWL)	23.30	Depth to BWL (m)	4.47
Floor Level	22.69	Depth to Floor (m)	5.08
		TWL-BWL (m)	0.24
Well Dia. (m)	1.47		
Area (m ²)	1.69		
Storage Volume above TWL (m ³)	6.54		
Rising Main Details			
Total length (m)	0		
Diameter (mm)	0	Class	
Discharge Level mAHD	0		
High Point Details	Chainage	Level mAHD	
None			

SP3106 Amber Dr PS Rising Main



— Invert mAHD (assume 1m deep except where known)

APPENDIX 5 WATER PRESSURE ENQUIRY

enquiries refer

Don Chesworth

in reply please quote

Mains Pressure Certificate, Doc No 840035



ballina
shire council

28 July 2006

Mr Richard Baker
Patterson Britton & Partners
PO Box 515
NORTH SYDNEY NSW 2059

Dear Richard

**Re: Mains Pressure Certificate
Lot 2 DP 622475 Survey Street, Lennox Head**

I refer to your request for a Water Main Pressure Certificate for the proposed 45 Lot subdivision of Lot 2 DP 622475, Survey Street, Lennox Head.

The pressures in the existing main adjacent to the northern boundary of 73 Survey Street (the southern leg of Survey Street), relative to a ground level of RL 39m AHD are as follows:

Maximum pressure:	43.2m
Minimum pressure:	36.7m

The minimum pressure has been calculated with a demand of 0.06l/s/ET.

The subdivision reticulation layout will need to be designed to maintain a minimum pressure of 20m at the property boundary. The high ground in this subdivision will need to be checked to comply with this requirement. A cross connection to the existing reticulation at Seamist Place will assist in raising the minimum pressure.

Should you require any further information please contact Mr Don Chesworth of Council's Civil Services Group, telephone 6686 1259.

Yours faithfully

Matthew Fanning
**Manager Water & Sewerage
Civil Services Group**