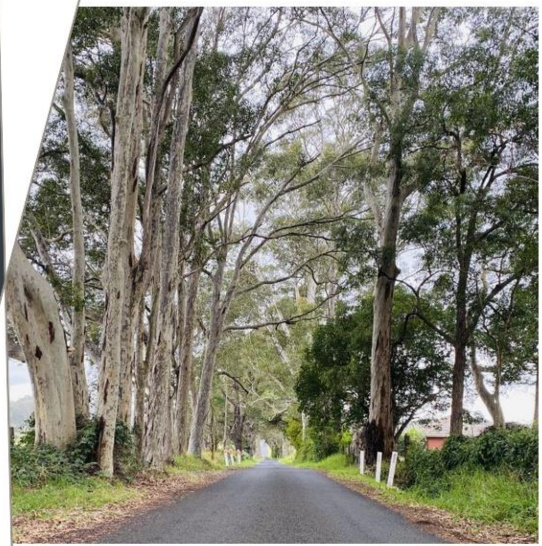
# Strategic Options Assessment

## Taylors Lane – Strategic Options Assessment

8202213401



Prepared for
Shoalhaven City Council

16 September 2022

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## Document Information

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## Document History

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| 1 | 6 April 2022 | Draft issued to client | JMG | BRH |
| 2 | 20 June 2022 | Final draft issue | JMG | BRH |
| 3 | 12 August 2022 | Addressing Council comments | RA | BRH |
| 4 | 16 September 2022 | Final Issue | BRH | BRH |

## Executive Summary

Shoalhaven City Council (Council) requires a Strategic Options Assessment of road upgrade options being considered for Taylors Lane in Cambewarra. This assessment builds upon the Review of Options for Taylors Lane prepared by Studio GL.

Taylors Lane is an existing local laneway. Future development plans will increase the use of Taylors Lane and traffic studies indicate an upgrade will be required. A key constraint to the Taylors Lane upgrade is the presence of significant stands of trees within the existing road reserve that are a feature of the landscape and are valued by the community. Following a public exhibition Council resolved to defer a decision on the upgrade pending further review.

Previous reporting has assessed planning controls and zoning around Taylors Lane, along with the required road structure to support local development along with retention of the existing trees. Analysis of the likely benefits/risks/opportunities of a number of road upgrade options was undertaken at a strategic level, and further investigations were recommended to assess the feasibility of the options identified.

The scope of this report is:

- Present concept civil drawings for each road option identified in the Studio GL report.
- Undertake a desktop study to comment on feasibility and provide a qualitative assessment of each option in relation to the following technical considerations:
  - Civil design.
  - Impact on existing utilities.
  - Geotechnical.
  - Hydrology and Flooding impacts.
  - Traffic.
  - Environmental, including contamination, heritage and noise.
- Undertake a cost estimate based on available information for each road upgrade option.
- Score and rank all options that retain the Taylors Lane trees against 2 key criteria – development cost and environment/cultural heritage. Identify the options that are not considered feasible based on the technical analysis.
- The highest-ranking feasible options that retain the Taylors Lane trees are compared with the 'base case' options that remove the trees.

Four of the seven eastern alignment options were deemed unfeasible following the desktop assessment due to unknown long-term impacts to tree health and/or unacceptable traffic outcomes. Of the feasible options, options E1 and E3 retain the stand of trees along Taylors Lane, whilst option E2 would require the removal of these trees. Of all the feasible options, option E1 was the highest performing option based on an equal weighted score for development cost and environmental/heritage impact. Option E1 involves re-routing Taylors Lane to the north of its existing alignment allowing the stand of trees along Taylors lane to be retained.

Estimated development costs for option E2 suggest construction would be approximately $1 million cheaper than option E1, however would result in the loss of the existing trees along Taylors Lane and incur additional environmental impacts.

Figure 1-1 Summary of findings for feasible eastern alignment options

| Rank | Option | Cost /50 | Environment & Culture /50 | Score /100 | Cost estimate ($M) |
|---|---|---|---|---|---|
| *Options that retain the Taylors Lane trees* | | | | | |
| **1** | E1 | 36.59 | 35.71 | **72.30** | $5.36 |
| **2** | E3 | 24.93 | 36.00 | **60.93** | $7.06 |
| *Option that removes the Taylors Lane trees* | | | | | |
| **N/A** | E2 | 42.12 | 27.78 | **69.89** | $4.39 |

Two of the three western alignment options were deemed unfeasible following the desktop assessment. Option W3 and W2 were deemed unfeasible as the effect of the development on tree roots and resulting long-term tree health is unknown. The one-way road associated with option W3 is also contrary to the road network required to support development of the URA as identified in the Nowra-Bomaderry Structure Plan (2006).

Option W1 was the only feasible western alignment option and involves widening Taylors Lane whilst maintaining the existing centreline. Option W1 would result in the loss of the existing stand of trees along Taylors Lane.

Figure 1-2 Summary of findings for feasible western alignment options

| Rank | Option | Cost /50 | Environment & Culture /50 | Score /100 | Cost estimate ($M) |
|---|---|---|---|---|---|
| *Option that removes the Taylors Lane trees* | | | | | |
| **N/A** | W1 | 28.04 | 25.00 | 53.04 | $3.20 |

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# 2 Introduction

Shoalhaven City Council (Council) has engaged Cardno (NSW/ACT) Pty Ltd (Cardno) to undertake a cost assessment of road upgrade options being considered for Taylors Lane in Cambewarra.

This assessment builds upon the Review of Options for Taylors Lane Report prepared by Studio GL (June, 2021).

## 2.1 Project Background

Taylors Lane is an existing local laneway in the suburb of Cambewarra and currently services several large rural residential properties. Future development plans for the area, namely the Moss Vale Road South Urban Release Area (MVRS URA), will increase the use of Taylors Lane and traffic studies indicate that an upgrade will be required to accommodate future transport demands as well as to provide connectivity with the proposed Far North Collector Road (FNCR).

A key constraint to the Taylors Lane upgrade is the presence of significant stands of trees located within the existing road reserve. It is understood these trees are considered a feature of the landscape and are valued by the community. Council has previously considered several options for the upgrade of Taylors Lane, however, following public exhibition of the options and community opposition to the loss of trees in the preferred option, Council resolved to defer a decision on the upgrade pending further review.

Studio GL was then engaged to provide a review of the planning controls and zoning around Taylors Lane in Cambewarra. The purpose of the review was to consider the required road structure to support the development of the URA and also the retention of the existing trees. Part of their scope was to include an analysis of the likely costs/benefits/risks/opportunities of a number of road upgrade options. This analysis was undertaken at a strategic level, and further investigations were recommended to assess the feasibility of the options identified.

Cardno has since been engaged to build upon the review by Studio GL and assess the identified road upgrade options at a feasibility level.

## 2.2 Scope of this Report

The scope of this report is to:

> Prepare concept civil drawings for each road option identified in the Studio GL report.

> Undertake a preliminary desktop study to comment on feasibility and provide a qualitative assessment of each option in relation to the following considerations:

  - Civil design.
  - Impact on existing utilities.
  - Geotechnical.
  - Hydrology and Flooding impacts.
  - Traffic.
  - Environmental, including contamination, heritage and noise.

> Undertake a cost estimate based on available information for each road upgrade option.

> Score and rank all options that retain the Taylors Lane trees against 2 key criteria – development cost and environment/cultural heritage. Identify the options that are not considered feasible based on the technical analysis.

> The highest-ranking feasible options that retain the Taylors Lane trees are compared with the 'base case' options that remove the trees.

# 3 Identified Options

The Taylors Lane updgrade options were identifed in Studio GL's report (June, 2021). The information contained within this section is largely adopted from Studio GL's report and is duplicated here for context and completeness.

Options for the future road upgrade divide Taylors Lane into two sections; east and west. The Moss Vale Road South URA boundary serves as a division that defines the two sections. The western portion of Taylors Lane is located within the URA boundary and features trees primarily along the northern edge of the road reserve. The eastern part of Taylors Lane currently intersects with Moss Vale Road and features the greatest density of trees on both sides of the lane.

Three options were considered for the western section of Taylors Lane (W1-W3), with an additional extension of W3 also considered (W3a). The options investigate replacing the existing lane, re-routing the lane from the existing alignment, and using the existing lane as a one-way road.

Five options were considered for the eastern section of Taylors Lane (E1-E5). These include re-routing Taylors Lane slightly north of its existing alignment, replacing the existing lane, and rebuilding the road well to the south of the existing lane in several locations. An additional option E1a was also considered which involves construction of a raised pavement within the existing road reserve to facilitate protection of the underlying tree roots.

All options considered are shown in **Figure 3-1** below.

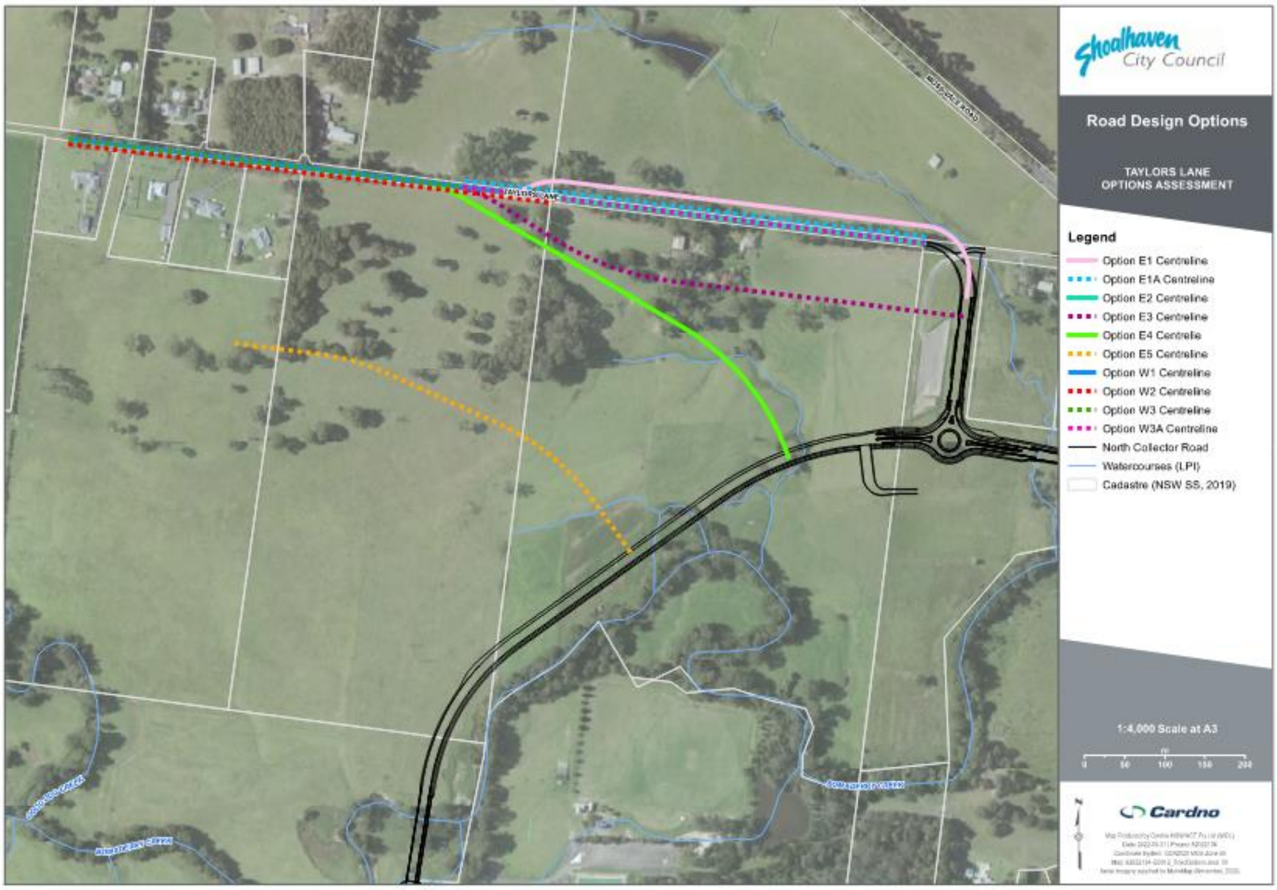



Figure 3-1 All east and west road options considered

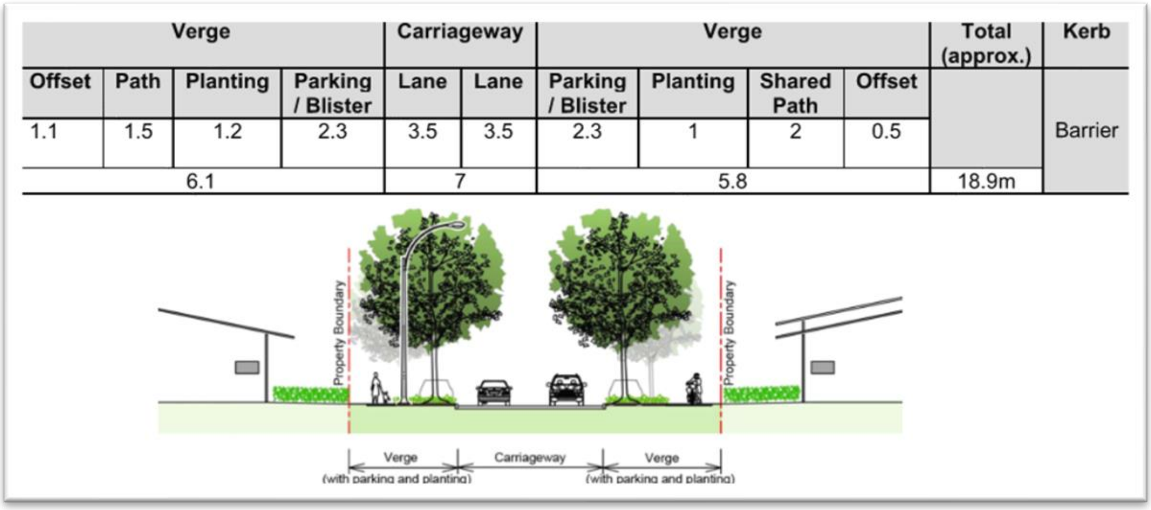
## 3.2 Western Options

### 3.2.1 Option W1

Option W1 was proposed by Council and is consistent with the “Tree Lined Boulevard” street type from the Council Development Control Plan (DCP) Chapter NB3.

This option removes the existing trees and replaces them with new street trees as well as providing standard wide verges, enabling pedestrian and cycleway opportunities.

The existing Taylors Lane road centreline is maintained with widening proposed on both sides of the road.



| Verge | | | | Carriageway | | Verge | | | | Total (approx.) | Kerb |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Offset | Path | Planting | Parking / Blister | Lane | Lane | Parking / Blister | Planting | Shared Path | Offset | | |
| 1.1 | 1.5 | 1.2 | 2.3 | 3.5 | 3.5 | 2.3 | 1 | 2 | 0.5 | | Barrier |
| 6.1 | | | | 7 | | 5.8 | | | | 18.9m | |



Figure 3-2 Tree-Lined Boulevarde Typical Section (Source: SCC DCP Chapter NB3)

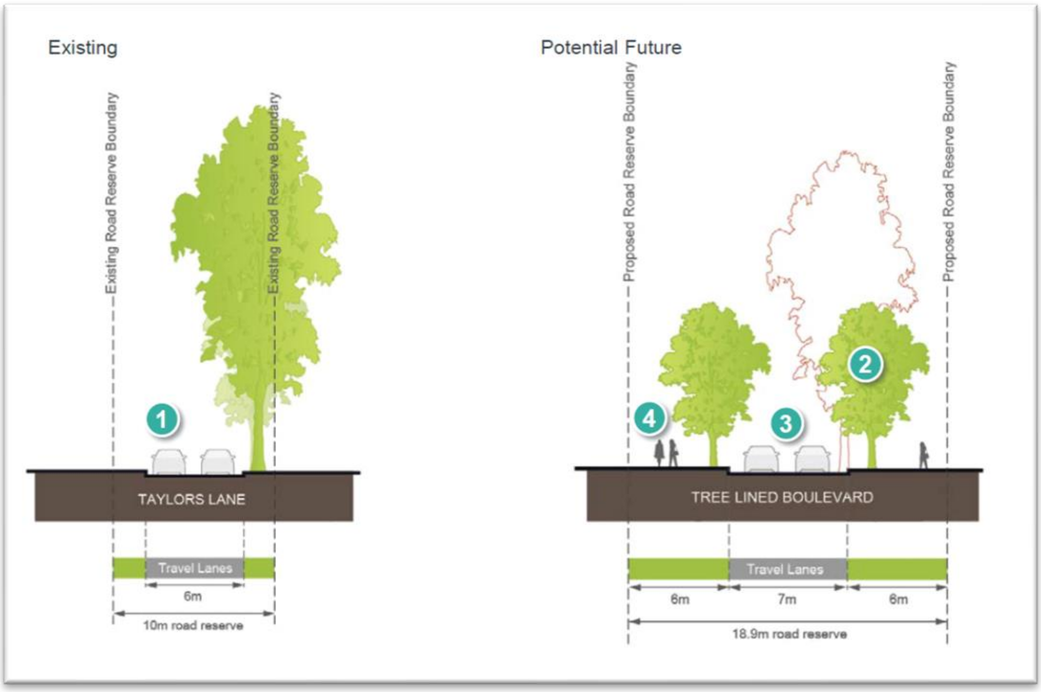



Figure 3-3 Option W1 Typical Section (Source: Studio GL, June 2021)


Figure 3-4 Option W1 alignment (Refer SK001, Appendix A)

### 3.2.2 Option W2

Option W2 was proposed by Studio GL and proposes an enlarged road reserve of 23m. The existing trees along the northern side of the lane are retained with proposed road widening to the south and large median with shared path.

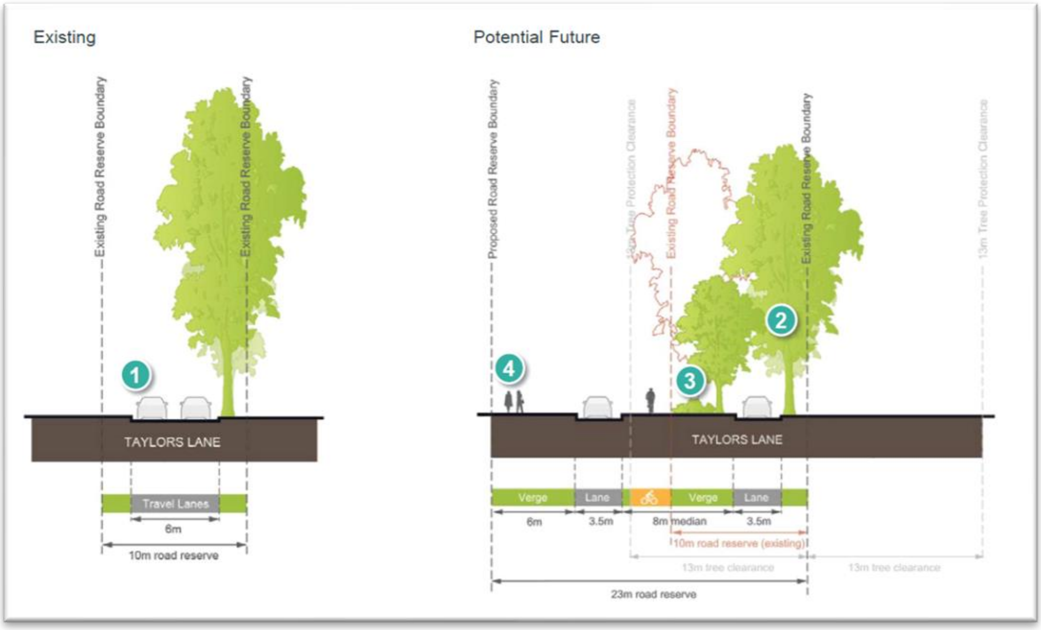



Figure 3-5 Option W2 Typical Section (Source: Studio GL, June 2021)

Figure 3-6 Option W2 Alignment (Refer SK002, Appendix A)

### 3.2.3 Option W3

Option W3 retains the existing trees along the northern side of the lane and the existing road reserve width. This option allocates one active traffic lane east bound with the remainder of existing carriageway allocated to dedicated cycleway.

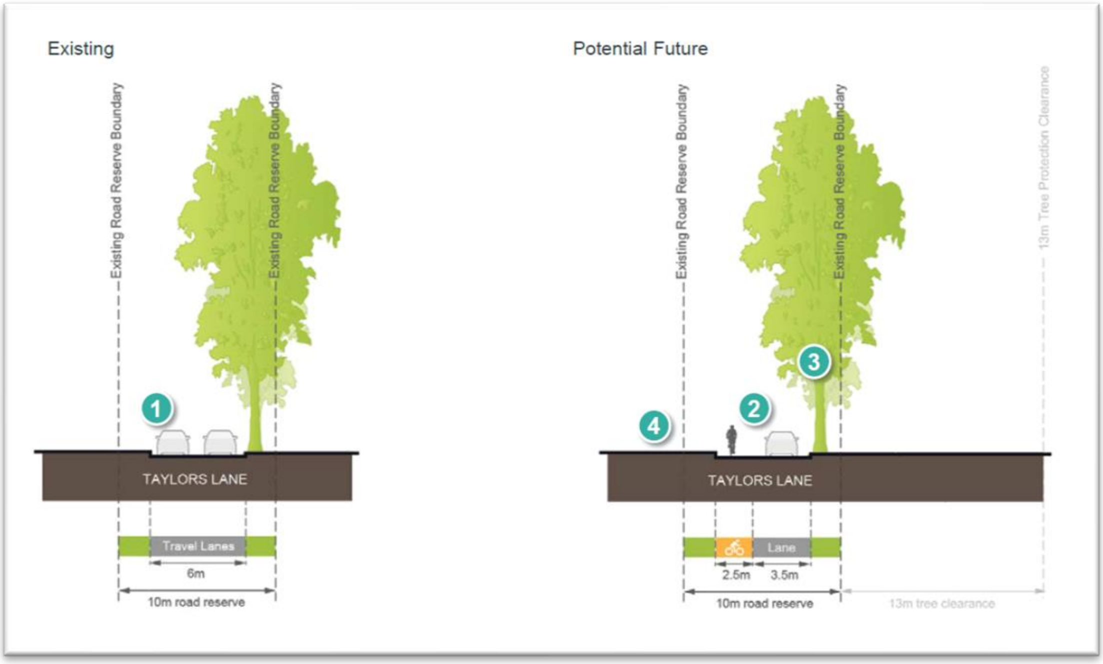



Figure 3-7 Option W3 Typical Section – looking west (Source: Studio GL, June 2021)

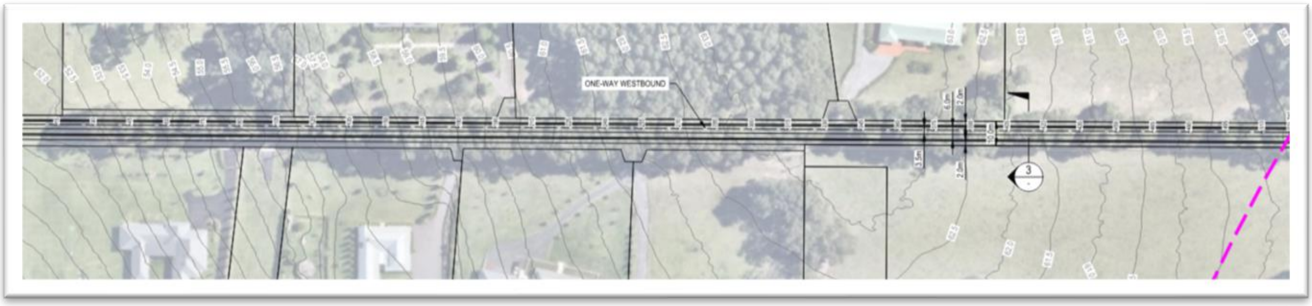



Figure 3-8 Option W3 Alignment (Refer SK003, Appendix A)

### 3.2.4 Option W3a

Taylors Lane to retain current road reserve and existing trees.

Vehicular traffic to become one-way eastbound (3.5m) plus 2-way dual use ped/bike path (2.5m).

One way exit from Moss Vale Road South (MVRS) Urban Release Area (URA) towards Far North Collector Road (FNCR). No access from FNCR into MVRS URA.

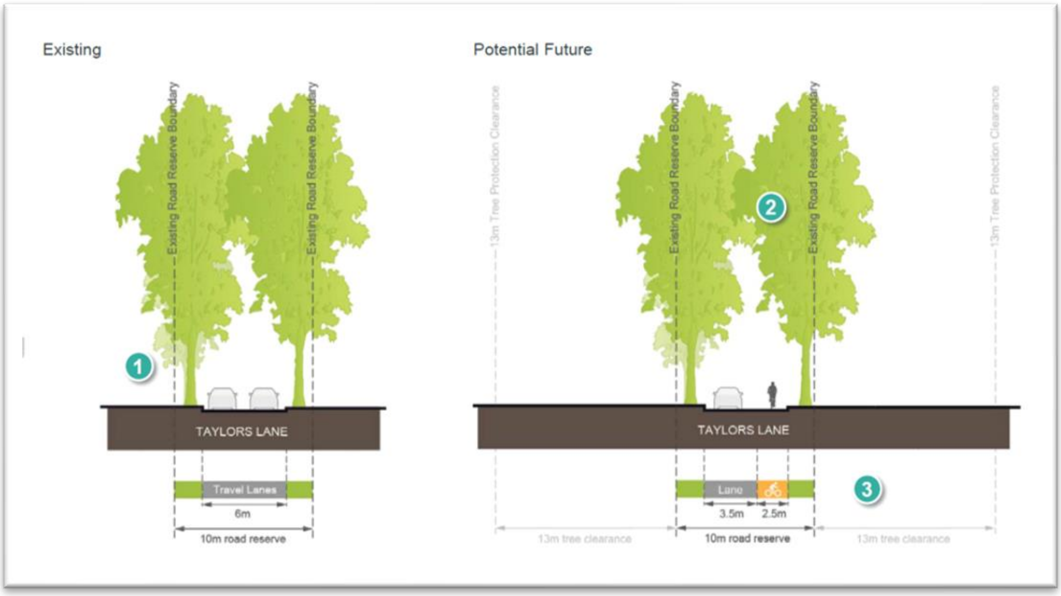



Figure 3-9 Option W3a Typical Section – looking east (Source: Studio GL, June 2021)

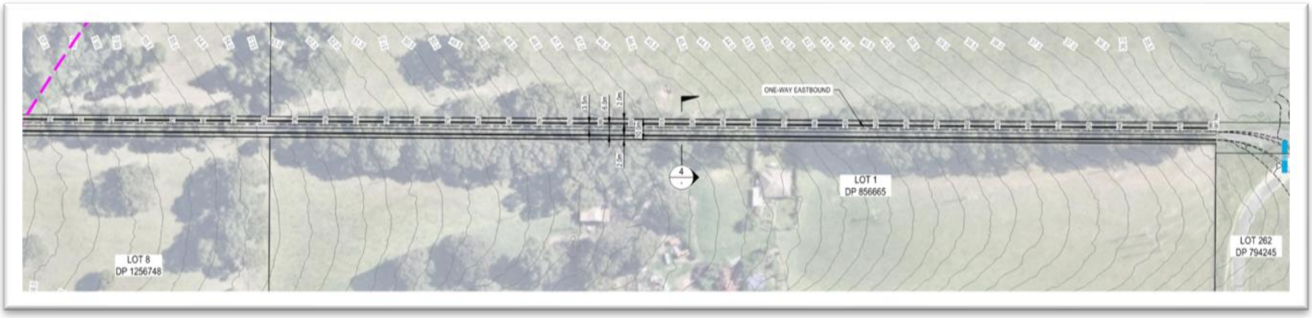



Figure 3-10 Option W3a Alignment (Refer SK003, Appendix A)

## 3.3 Eastern Options

### 3.3.1 Option E1

Option E1 sees Taylors Lane re-routed north of its existing alignment which allows the existing trees to be retained. The new road to be in accordance with Council DCP 2015 Chapter NB3: Moss Vale Road Urban Release Area. A key feature of this option is a 10m tree protection zone offset from northern stand of trees.

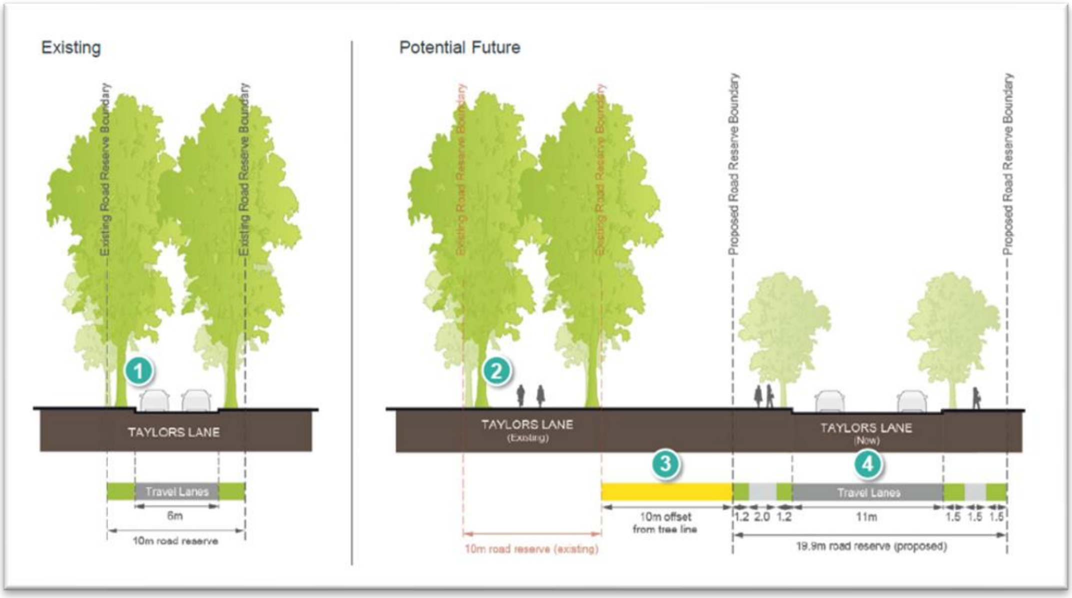



Figure 3-11 Option E1 Typical Section (Source: Studio GL, June 2021)

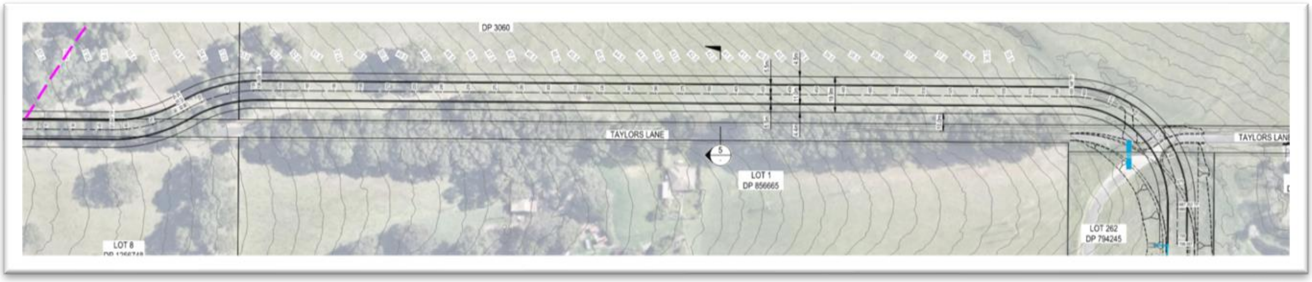



Figure 3-12 Option E1 Alignment (refer SK004, Appendix A)

### 3.3.2 Option E1a

In Option E1a, Taylors Lane is to retain existing trees and to be re-categorised as shared roadway (a low-speed zone with no heavy vehicles) on raised concrete pavement to support tree root protection.

Use of the existing Taylors Lane road reserve for one traffic lane as a shared user path. Second shared user path constructed on the northern side of the existing northern trees.

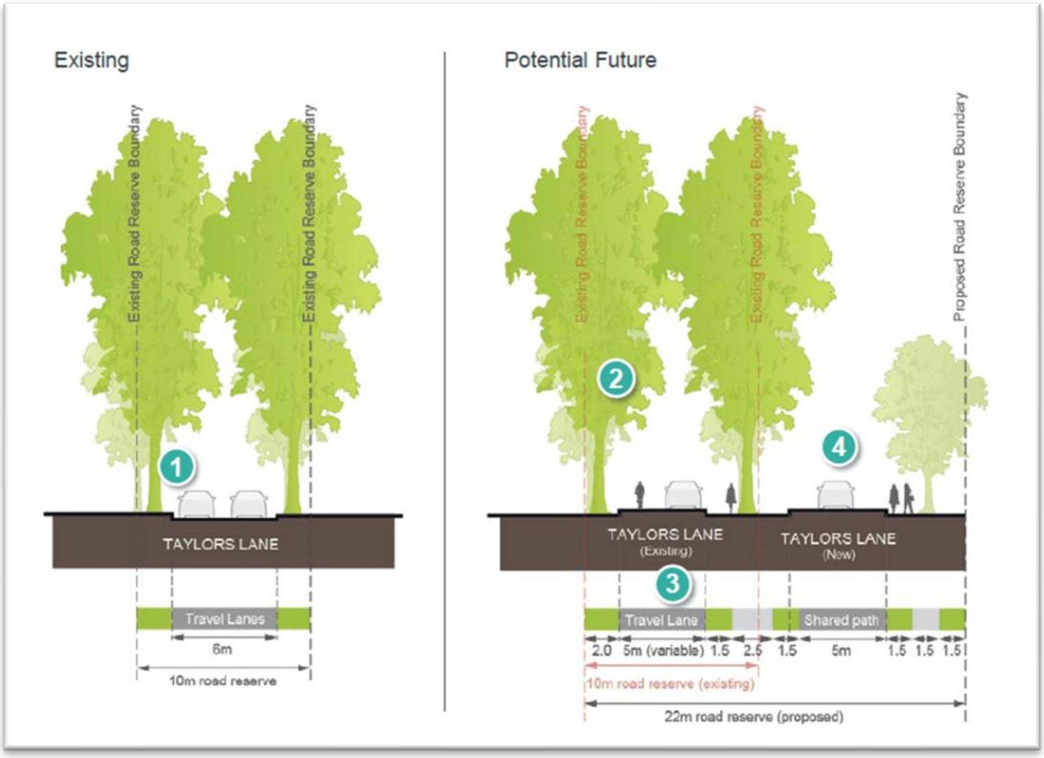



Figure 3-13 Option E1a Typical Section (Source: Studio GL, June 2021)

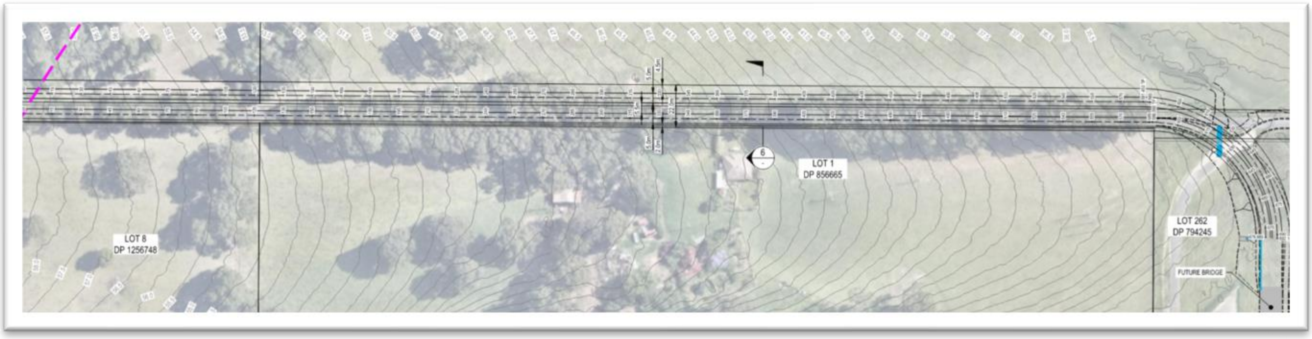



Figure 3-14 Option E1a Alignment (Refer SK004, Appendix A)

### 3.3.3 Option E2

The second option was Council's previously preferred option, which removed the majority of trees and rebuilt the road with a wider footprint within the current alignment. This option retains the existing alignment of Taylors Lane and widens it to accommodate the additional traffic, however it does require the removal of all trees within widened road reserve.

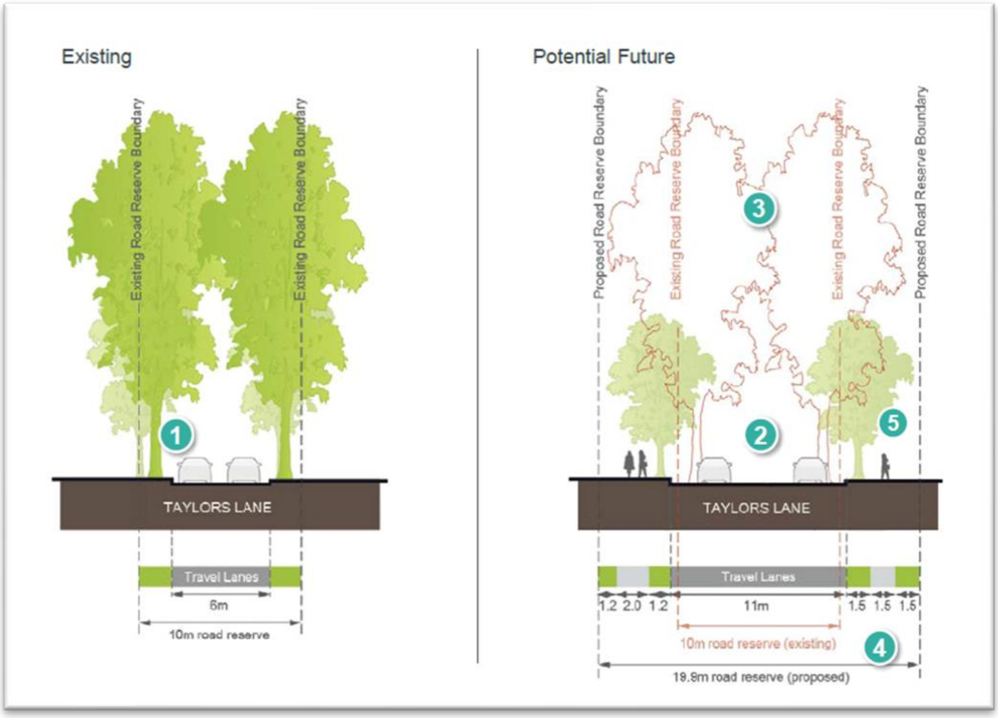



Figure 3-15 Option E2 Typical Section (Source: Studio GL, June 2021)

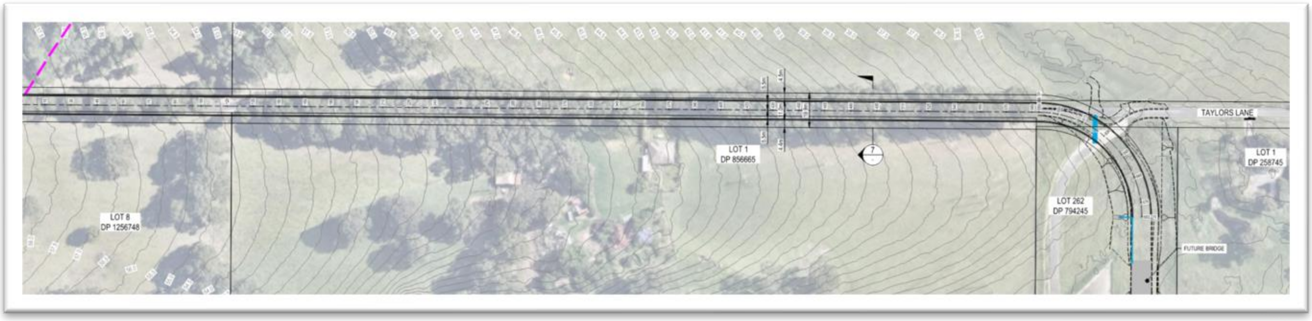



Figure 3-16 Option E2 Alignment (Refer SK005, Appendix A)

### 3.3.4 Option E3

Option E3 proposes the road relocated to the south of its current alignment, clear of the existing trees. It retains the east west alignment, and the proposed connection to the FNCR.

The road cross-section proposed is consistent with the “Collector Road” from the Council DCP.

| Verge | | | Carriageway | | Verge | | | Total (approx.) | Kerb |
|---|---|---|---|---|---|---|---|---|---|
| Offset | Path | Planting | Lane | | Planting | Shared Path | Offset | | Barrier (630mm) |
| 1.5 | 1.5 | 1.5 | 5.5 | 5.5 | 1.2 | 2 | 1.2 | | |
| 4.5 | | | 11 | | 4.4 | | | 19.9m | |

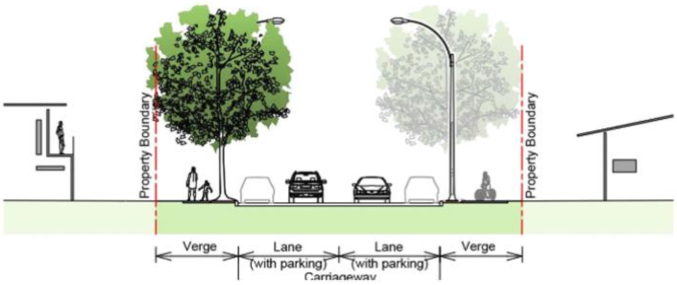



Figure 3-17 Collector Road – Typical Section (Source SCC DCP)

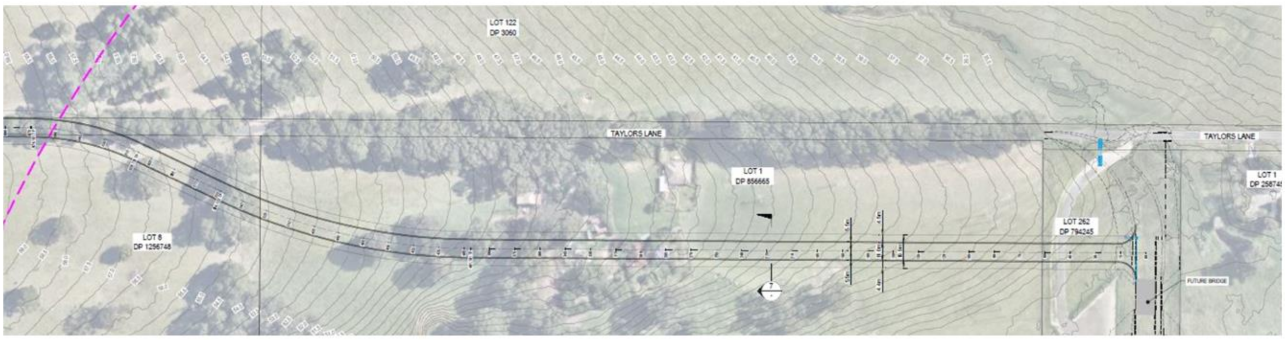



Figure 3-18 Option E3 Alignment (Refer SK006, Appendix A)

### 3.3.5 Option E4

Option E4 moves the new road further south, and modifies the connection to the FNCR, coming in at a bend west of the current roundabout.

The road cross-section proposed is consistent with the “Collector Road” from the Council DCP (refer Figure 3-17).


Figure 3-19 Option E4 Alignment (Refer SK007, Appendix A)

### 3.3.6 Option E5

Option E5 moves the new road further south west. The location of the connection into the URA is also further south, as is the proposed connection to the FNCR.

The road cross-section proposed is consistent with the “Collector Road” from the Council DCP (refer Figure 3-17).

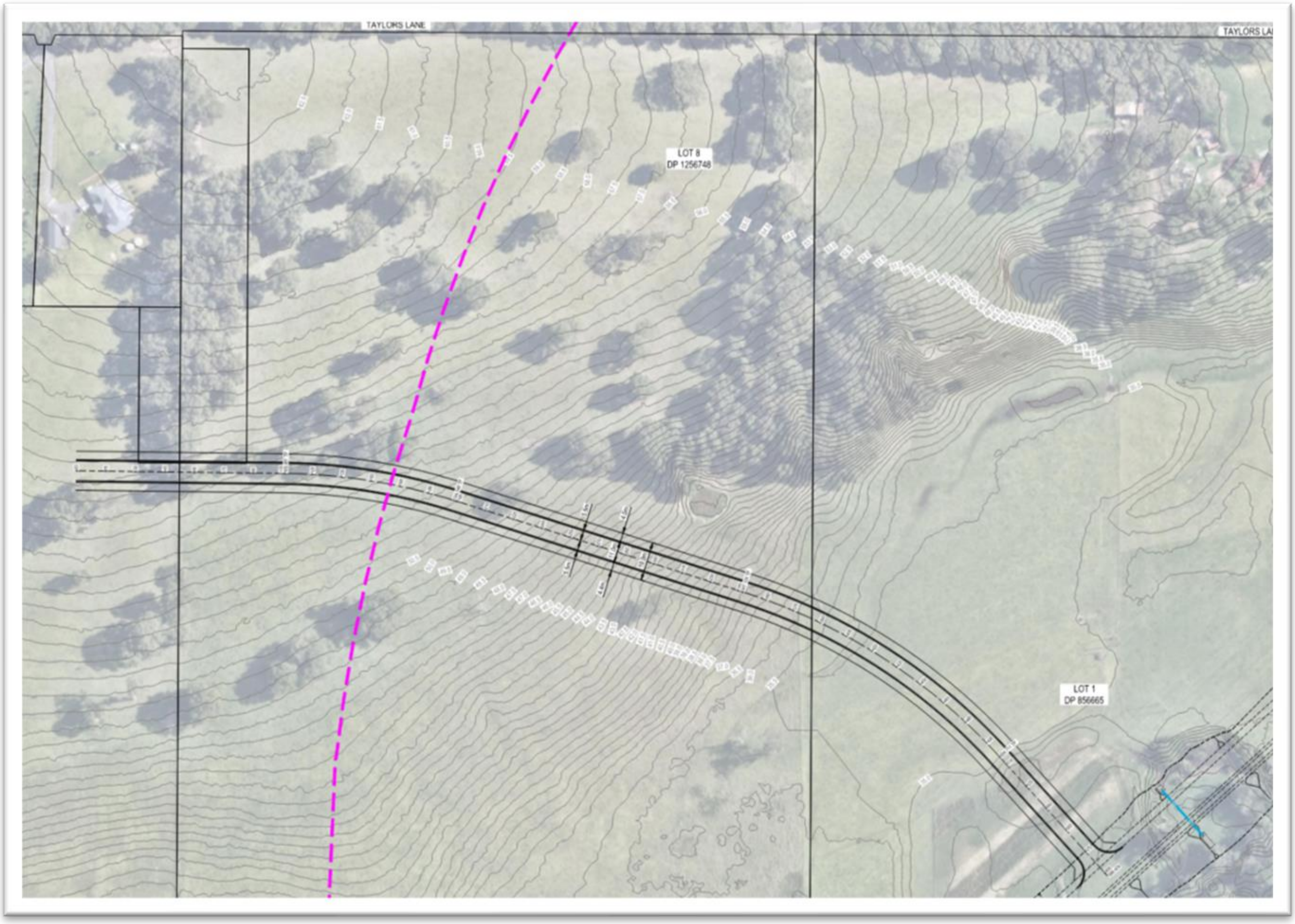



Figure 3-20 Option E5 Alignment (Refer SK008, Appendix A)

# 4 Civil Design Considerations

The road options, adopted from Studio GL's report, have been two-dimensionally designed in AutoCAD as a concept level design (Refer **Appendix A: Concept Option Sketches**).

It is noted that these sketches have been based on the existing options previously presented (Except as noted below for option E3) With the exception of and no optioneering / design optimisation was undertaken as part of the assessment. There will be opportunity to refine these alignments to achieve a more optimal design in future project stages, however that is not within the scope of this report.

## 4.1 Option W1

Option W1 maintains the existing Taylors Lane road centreline and allows for the provision of the full DCP compliant road reserve (Refer SK001, **Appendix A**).

From a civil design perspective, Option W1 is relatively simple as the existing Taylors Lane road alignment and geometry is maintained.

The removal of the existing trees would allow provision for required infrastructure, including stormwater pit and pipe network, and relatively typical construction.

## 4.2 Option W2

Option W2 maintains the existing alignment and geometry, with additional road widening to the south to allow retention of the existing northern trees (Refer SK002, **Appendix A**).

Opportunity for a trunk stormwater drainage line to be constructed within the southern lane and reverse cross fall could be introduced to the northern lane to facilitate drainage into the trunk line and avoid installing new stormwater infrastructure adjacent to the existing trees (refer **Figure 4-1**).

It is unclear at this stage exactly what pavement work would be undertaken for the northern lane therefore the impact on long term tree health is not known. As a result this option is considered not feasible.

Existing road pavement within the future landscaped median would need to be removed.

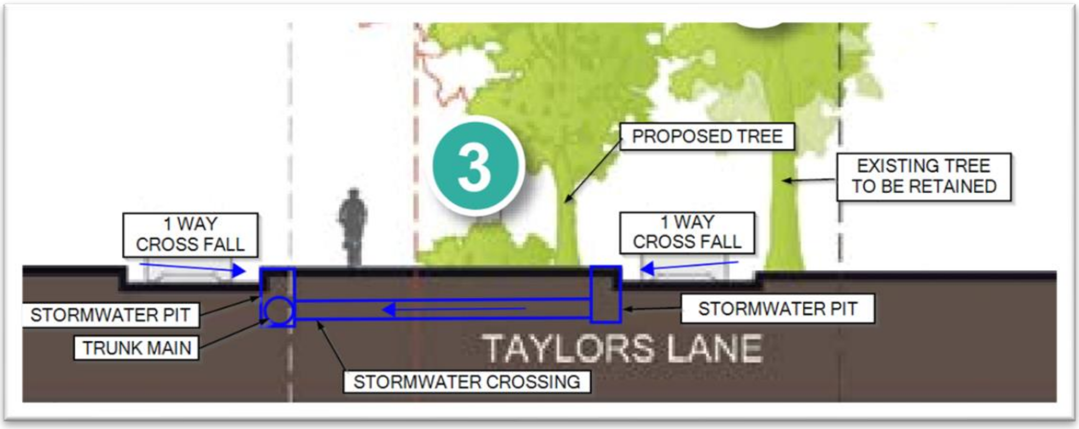



Figure 4-1 Option W2 - Stormwater Schematic

## 4.3 Option W3

Option W3 maintains the existing road reserve and retains the existing trees. Vehicular traffic is limited to one-way (eastbound) (Refer SK003, **Appendix A**).

Similar to Option W2, opportunity for the trunk stormwater drainage line to be located away from existing northern trees with introduction of one-way cross fall to carriageway (refer **Figure 4-2**).

It is unclear at this stage exactly what pavement work would be required for the trafficable lane and how to ensure existing tree roots are to be protected, therefore the impact on long term tree health is not known. As a result this option is considered not feasible.

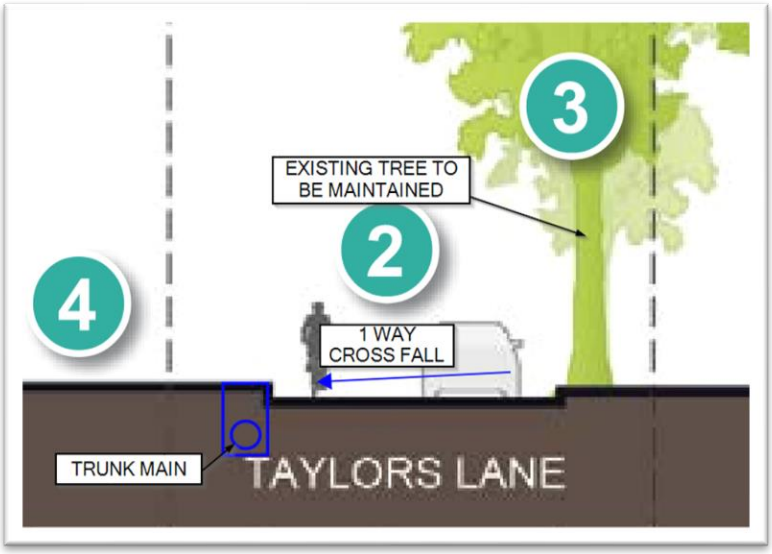



Figure 4-2 Option W3 - Stormwater Schematic

## 4.4 Option W3a

Option W3a is an extension of Option W3 that extends east toward the FNCR. The existing alignment and geometry of Taylors Lane is maintained (refer SK003, **Appendix A**).

The challenge with the eastern portion of Taylors Lane is the presence of large existing trees on both sides of the road. It may be difficult to achieve a drainage solution that does not compromise existing trees. A design solution may utilise overland flow management and careful site analysis to identify suitable points of discharge that limit damage / removal of existing trees.

It is also unclear at this stage with the currently available information what pavement work would be required for the trafficable lane. There may be opportunity to reclaim existing pavement materials and therefore minimise excavation works near existing trees. The impact of this option on long term tree health is not known.

A one-way road would be contrary to road network needed to support development of the URA as identified in the Nowra-Bomaderry Structure Plan (2006). The basis for the planned 2-way connection between MVRS URA and the FNC is to mitigate traffic impacts on the State road network (Moss Vale Rd) and improve local access into MVRS URA. As a result this option is considered not feasible.

## 4.5 Option E1

This option allows for the provision of the full DCP compliant road reserve and is relocated to the north such that the design it is not constrained by the existing trees (refer SK004, **Appendix A**). This alignment would allow provision for required infrastructure, including stormwater pit and pipe network, and relatively typical construction.

A key challenge with Option E1 is the interaction with the existing Bomaderry Creek tributary. Currently the tributary crosses Taylors Lane via two existing DN450 culverts. It is understood, however, that these culverts will be decommissioned as part of the FNCR construction works and realigned and replaced with three DN600 RCP culverts. The FNCR works also include realignment of the tributary immediately upstream of the culverts and this area is directly impacted by option E1. A design solution would likely involve extending these DN600 culverts north and further realignment of the tributary upstream (Refer **Figure 4-3**).

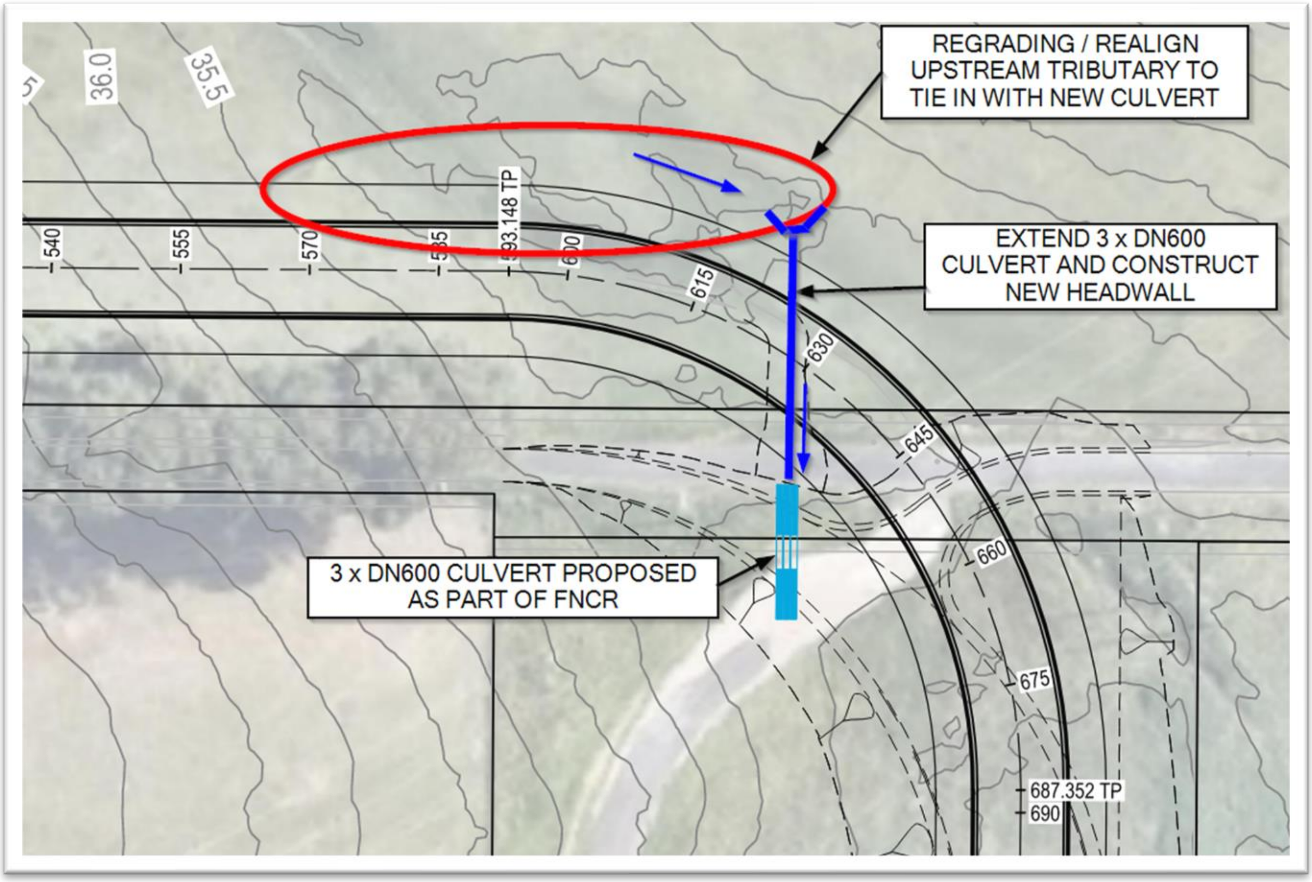



Figure 4-3 Option E1 - Stormwater Schematic

Due to the presence of the watercourse and the interface with FNCR, earthworks are expected to comprise filling at the eastern extent. Land topography within the remaining alignment is generally consistent with the existing Taylors Lane road reserve with approximately 3% fall to the east. Three dimensional modelling should be undertaken in later project stages to accurately estimate the earthworks quantities.

## 4.6 Option E1a

Option E1a involves utilising the existing Taylors Lane road reserve for one traffic lane and as a shared user path. A second traffic lane including shared path is proposed to be constructed on the northern side of the existing northern trees (Refer SK004, **Appendix A**). It is understood the existing Taylors Lane would be re-categorised as shared roadway (A low-speed zone with no heavy vehicles) on raised concrete pavement to support tree root protection.

In terms of stormwater management, further consideration would be required in future project stages. The typical section of E1a shows a raised carriageway suggesting that overland flows will be carried within the verge areas. The verge is also shown with footpath identified for pedestrian activity so it is unclear how the design will provide safe stormwater management.

Regarding interface with the Bomaderry Creek tributary and the FNCR, the design is similar to E1 in that the proposed culvert will need to be extended north. Earthworks are not expected to be as significant as E1 due to the reduced footprint and smaller encroachment on the tributary.

Regarding the raised pavement construction, it is unclear whether the raised pavement is a feasible option and whether a piled bridging system could be installed while maintaining the objective of tree protection. It is anticipated that constructability assessment including arborist consultation would confirm issues with this option. The effect on root zones and long-term tree health is not known, and this option is therefore considered not feasible.

## 4.7 Option E2

Option E2 maintains the existing Taylors Lane road centreline and allows for the provision of the full DCP compliant road reserve but also requires the removal of the existing trees (Refer SK005, **Appendix A**).

From a civil design perspective, Option E2 is relatively simple as the existing Taylors Lane road alignment and geometry is maintained.

The removal of the existing trees would allow provision for required infrastructure, including stormwater pit and pipe network, and relatively typical construction.

There is some interface work required with the FNCR. Similar to E1 and E1a, the future FNCR culvert would need to be extended to accommodate the new road extent.

## 4.8 Option E3

Option E3 creates a new wider road to the south of Taylors Lane with a similar east west alignment (Refer SK006, **Appendix A**).

Option E3 has been revised from its original alignment as it intersected the future FNCR at a proposed bridge and it now intersects the future FNCR to the north of a proposed bridge. Assessment in future project stages would be required to ensure further compatibility with the FNCR infrastructure.

The existing land topography across the proposed alignment is generally similar to that of the existing Taylors Lane, although some areas of steeper grade (approx. 7%) exist. Although no three-dimensional modelling has been undertaken at this stage, a design solution should be achievable with filling expected.

From a stormwater management perspective, road drainage via pit and pipe network is achievable. An external catchment also needs to be managed in this option, with the current alignment creating a trapped low point immediately north at the interface with FNCR. A swale leading to a culvert crossing is a potential design solution, however there will be implications regarding additional land acquisition that need to be considered.

## 4.9 Option E4

Option E4 proposed the new road further south and modified the connection to the FNCR (refer SK007, **Appendix A**).

The proposed alignment is located across farmland and would allow provision for required infrastructure, including stormwater pit and pipe network, and relatively typical construction.

A key issue with this design option is the proximity to, and crossing of, an unnamed Bomaderry Creek tributary. The connection point with FNCR appears to be very close to the invert of the creek and stormwater management and flooding issues would need to be considered in future project stages to ensure this is a feasible design option.

The alignment for E4 also crosses an existing farm dam at approx. chainage 315. There are also areas of steep grade up to approx. 20% that would need to be addressed in the design during future project stages.

## 4.10 Option E5

Option E5 shifts the connection point further south again and rather than connecting back to the existing Taylors Lane road reserve, connects into the southern end of the future MVRS URA (Refer SK008, **Appendix A**).

The proposed alignment is located across farmland and would allow provision for required infrastructure, including stormwater pit and pipe network, and relatively typical construction.

The connection point with FNCR is located within a low-lying area and stormwater management and flooding issues would need to be considered further to ensure this is a feasible design option, should it be a possible option in future stages.

# 5 Utilities

The existing underground utility infrastructure in this area was primarily identified through a Dial Before You Dig (DBYD) search. Some survey information related to the FNCR design was also provided to Cardno by Council including the high-pressure gas main (Eastern Gas Pipeline) and HV transmission lines.

The asset owners identified within the subject area include Endeavour Energy, Jemena, Optus, Telstra, and Shoalhaven Water.

Sketches showing the existing utilities and how they intersect with the proposed options are included in **Appendix B: Utility Layout Sketches**.

## 5.1 Electrical

An overhead high voltage (HV) transmission network (Up to 132 kV) owned by Endeavour Energy is located within the subject area and overpasses the existing Taylors Lane road adjacent to the future intersection with the FNCR.

The electrical easement is approximately 68 m wide and contains HV poles at various locations. It is understood that at least some of the HV network is to be undergrounded as part of the FNCR works. It is anticipated that the undergrounded assets will be compatible with proposed Taylors Lane works, and no additional protections will be required. In addition it is assume that any overhead assets to be left in place will have sufficient clearance to the Taylors Lane works.

All of the eastern options (E1-E5) will need to consider the HV transmission network to ensure minimum vertical clearance can be achieved. Further consideration will also need to be given to location of HV poles within the easement and not impacting these assets. Options E3 and E4 are currently shown in close proximity to HV poles and may require realignment if required in later project stages.

There is also an overhead distribution network owned by EE located immediately south of the existing Taylors Lane reserve which supplies existing rural properties to the west. It is envisaged that this overhead network will be converted to underground as part of the future urban release construction works. It is also noted that an underground network connects from this overhead line and extends north through Lot 1 DP 949932 to Moss Vale Road.

## 5.2 Gas

A high-pressure gas main (The Eastern Gas Pipeline (EGP)) owned by Jemena is located within the subject area and crosses the existing Taylors Lane and the future FNCR.

Gas protection measures are documented in the FNCR tender drawing set prepared by Indesco and comprise installing a concrete protection slab with piles into rock. These protection measures, while typical for high pressure gas mins, are a high cost item.

All of the eastern options (E1-E5) will need to consider the EGP and ensure that the asset is not impacted by the proposed works. There may be opportunity for options E1a and E2 to utilise the proposed protection measures as part of the FNCR but further analysis and consultation with Jemena would be required in later project stages. Options E1, E3, E4 and E5 would all require additional significant protection measures.

## 5.3 Telecommunications

### 5.3.1 Optus

Several Optus owned assets are located within the eastern portion of the subject area including an inter-office fibre (IOF) line. The depth of these assets is unknown at this point in time and consultation is required with the asset owner in later project stages to confirm protection measures are required.

### 5.3.2 Telstra

An existing Telstra cable extends from Moss Vale Road into Taylors Lane and appears to service three lots (Lot 261 DP 794245, Lot 1 DP 258745 & Lot 1 DP 856665). The depth of these assets is unknown at this point in time and consultation during later project stages is required with the asset owner to confirm protection measures are required.

## 5.4 Sewer

A sewer main that is currently under construction to service the URAs is located within the subject area, and crosses Taylors Lane adjacent to the future FNCR intersection. The main is aligned north-south and is understood to flow to a future sewer pump station (SPS) which will be located on the southern side of the FNCR.

Options E1, E1a, E2 and E3 intersect the constructed sewer main., Asset protection such as a bridging or capping slab could be considered as a design solution in future project stages. The sections of wastewater mains likely to be intersected by the Taylors Road upgrade are expected to have adequate cover as the location is at the end of the gravity system and had to be deep enough to cross the existing road

Shoalhaven Water has advised that protection works are not funded in the current sewer main works so costs will need to be considered in the Taylors Lane upgrade. The sewer is a gravity main so adjustments post-construction may not be possible.

Shoalhaven Water's preference is to avoid impacting on the sewer works, to avoid potential impacts on developments and the timing of the release of the Urban Release Areas that will be serviced by the sewer infrastructure. The location of the sewer infrastructure has been included in the drawings in **Appendix B** based on the design files provided by Shoalhaven Water.

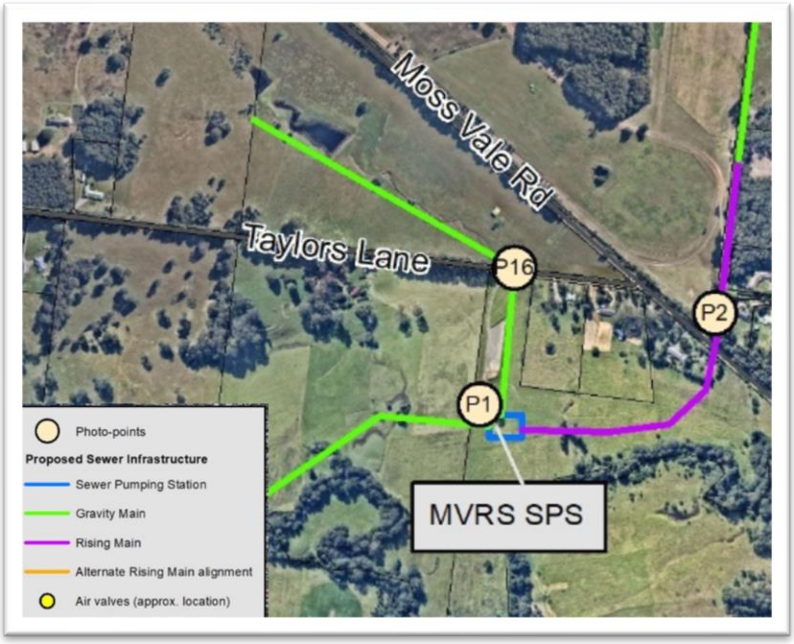



Figure 5-1 Sewer Infrastructure currently under construction (Source: REF – Shoalwater Infrastructure – Moss Vale Road URAs June 2020)

## 5.5 Potable Water

No potable water assets were found within the proposed work area.

# 6 Geotechnical

## 6.1 Topography

The site is located north of the existing Bomaderry Creek alignment in which a flood plain extends significantly toward Taylors Lane and is generally flat with a slight graduation toward the south. Taylors Lane itself heads uphill toward the west starting from approximately 220m west of the intersection of Taylors Lane and Moss Vale Road.

The slopes along the existing road alignment are generally 2 to 3%, A high point is present about 1,030m west of the intersection of Taylors Lane and Moss Vale Road. The road either side of this high point slope downhill in eastern and western directions. The existing alignment follows a ridgeline with the adjacent land dipping away to the north and south.

Contour maps based on LiDAR data from 2011 are provided in **Appendix C.**

## 6.2 Geology

The 1:100,000 MinView NSW surface geology accessed 23 February 2022, read in conjunction with the Shoalhaven 1:100,000 Quaternary Geology map and 1:250,000 Wollongong Geological Sheet suggests the following:

- The low-lying areas of the site, mainly the floodplain to the south and where an unnamed tributary creek transects Taylors Lane about 210m west of the intersection with Moss Vale Road and Taylors Lane is comprised of Quaternary floodplain deposits (Q_af).
- It is also noted that a Quaternary deposit Q-avf is located at the western extent of Taylors Lane associated with Good Dog Creek.
- The higher topographic areas, mainly west along Taylors Lane past the unnamed tributary creek are comprised of residual soil overlying the Berry Siltstone (Psbh).

### 6.2.1 Geological Deposits

The subsurface quaternary geology descriptions are given below:

- **Q_af**– Quaternary aged floodplain comprised of silt, clay, fluvial sand and gravel.
- **Q_avf** – Quaternary aged alluvial and colluvial fan comprised of fluvial sand, silt, gravel and clay.

The subsurface Permian aged deposits, comprised of residual soil overlaying rock are as follows:

- **Psbh** – Permian aged siltstone, shale and sandstone deposits.

A geological map is presented in **Figure 6-1** below with three (3) formal plans of the geology in conjunction with proposed road alignment options are included well as included in **Appendix C.**

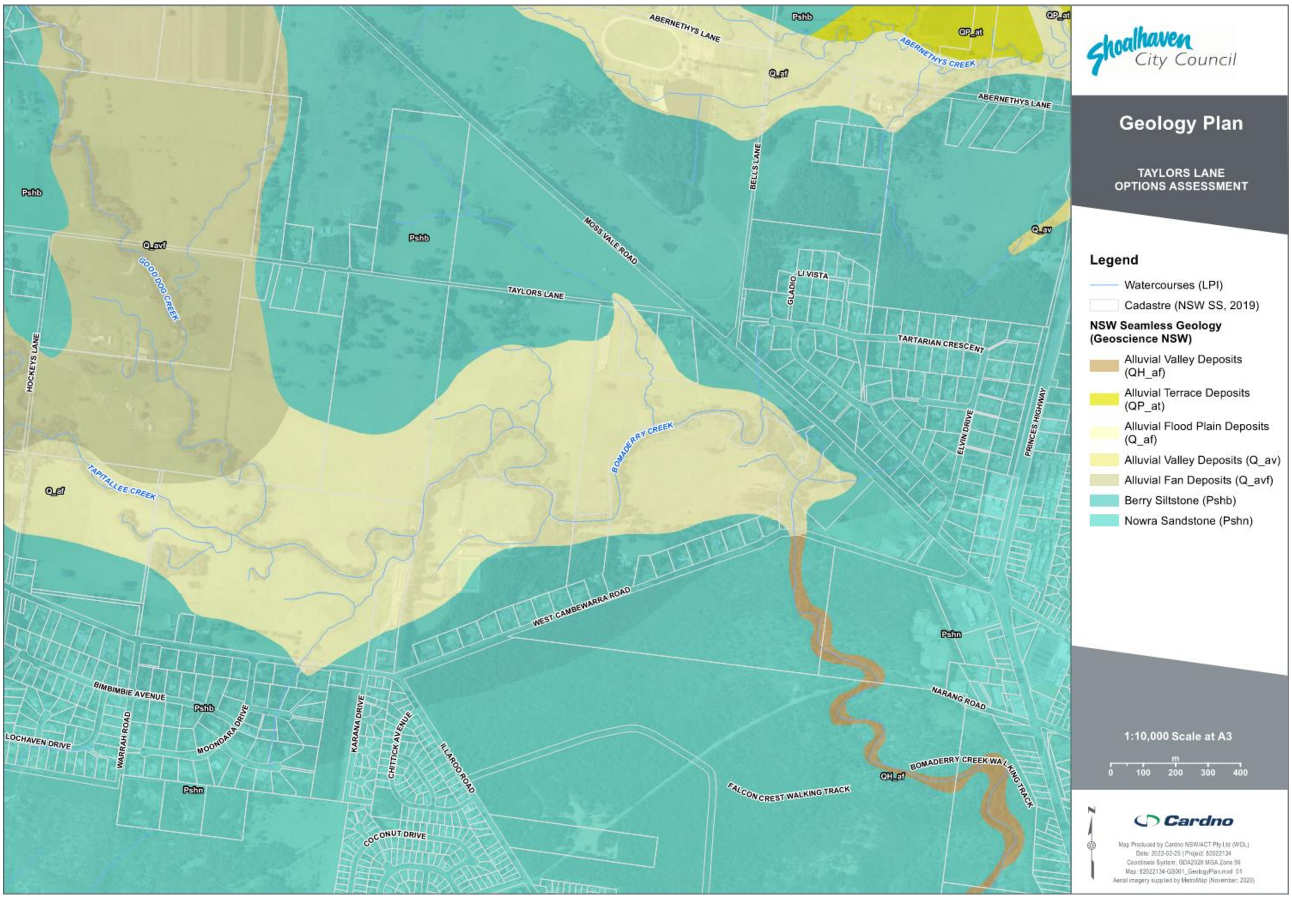


Figure 6-1 Site Geology Map

### 6.2.2 Soil Landscapes

Reference to the NSW eSpadev2.1 accessed on 23 February 2022 indicates the site is underlain by two separate soil landscapes comprised of the following:

> Coolangatta Erosional Soils Landscape:
  - Landscape – Undulating low hills on the Berry Formation, slopes of 3 to 11 degrees, extensively cleared with open woodland and occasional shrubs.
  - Soils – Comprised of lithosols on the crests and upper slopes of hills 0.5m to 1m deep brown soils mid slope and >1.5m deep red and yellow podzolic soils on lower slopes and adjacent to drainage lines.

> Shoalhaven Fluvial Soils Landscape:
  - Landscape – Level to gently undulating riverbeds, river banks, active floodplains and backwater swamps. Less than 5m relief on rises and slopes less than 2° (apart from riverbanks).
  - Soils – Moderately deep 0.5m to 1.0m prairie soils on levees. Red path and yellow and red podzolic soils in terraces, alluvial soils and greyed podzolic soils on the floodplains.

## 6.3 Watercourses

The site is situated north of Bomaderry Creek with some named tributaries such as Tapitallee Creek to the south west of Taylors Lane and Good Dog Creek to the west of Taylors Lane, as well as a number of other unnamed tributaries. An unnamed tributary creek transects Taylors Lane about 210 m west of the intersection with Moss Vale Road and Taylors Lane with a series of small dams located 400 m upstream to the north of Taylors Lane.

## 6.4 Historical Satellite Imagery Review

Reference to the NSW Historical Imagery interactive web browser map, Google Earth Imagery and Metromap Imagery dated from January 1969 – April 2006 on record. A review of the aerial imagery noting significant changes of the site has been summarised and included in **Appendix C**.

## 6.5 Review of Previous Geotechnical Reports

Cardno has been supplied with and reviewed the following reports relevant to the proposed alignment options along Taylors Lane:

> Lot 1 DP949932 Taylors Lane, Cambewarra NSW "Report on Geotechnical Pavement Investigation" ref TERRA20-280.Rep1.Rev3 dated 9th November by Terra Insight Pty Ltd;

> North Nowra Collector Road "Stage 2 Geotechnical Investigation" ref: 5017190262-B1 dated 27th August 2019 by Construction Sciences Pty Ltd;

> Far North Collector Road "Geotechnical Investigation" ref: 10791/P/385 R1 dated 9th April 2021 by Construction Sciences.

Relevant (nearby) investigation points from this investigation to the proposed alignment options for Taylors Lane are summarised in **Appendix C**.

## 6.6 Discussion

Based on the information reviewed above, the likely subsurface conditions for the proposed east and west Taylors Lane alignment options are given in **Table 6-1** below.

Table 6-1 Likely Subsurface Conditions at Proposed Taylors Lane Alignment Options

| Option | Commentary |
|---|---|
| W1, W2 and W3 | The alignment is entirely within the Berry Siltstone. Slopes up to 3° with a high point approximately halfway along the proposed western alignments.<br>Subsurface likely to comprise:<br>residual Sandy CLAY / CLAY / Silty CLAY of firm to stiff consistency to at least 1.2m depth;<br>existing pavement build up to 0.20m in thickness underlain by up to 0.25m of fill;<br>topsoil encountered ranging from 0.10m to 0.15m in thickness. |
| E1 | The alignment starts within the Quaternary aged floodplain at the eastern end of the proposed alignment option, extending in to the Berry Siltstone area within about 25m of the start of the alignment. Slopes up to 3° degrees.<br>Subsurface likely to comprise:<br>0.6 to 1.1m depth of fill to comprise Silty CLAY and Gravelly SAND, likely at its deepest where Taylors Lane crosses the unnamed tributary creek transecting Taylors Lane about 210m west of the intersection with Moss Vale Road and Taylors Lane;<br>Existing pavement of 0.15 to 0.20m in thickness;<br>Alluvium comprised of Clayey SILT / Silty CLAY, firm to stiff consistency up to 1.2m to 1.5m depth where Taylors Lane crosses the unnamed tributary creek ;<br>Residual Sandy CLAY / CLAY / Silty CLAY of firm to stiff consistency to at least 1.3m depth. Within the Berry Siltstone area either side where Taylors Lane crosses the unnamed tributary creek |
| E1a, E2 and W3a | The alignment starts within the Berry Siltstone area. Slopes up to 3° degrees.<br>Subsurface likely to comprise:<br>existing pavement material of 0.15 to 0.20m thick overlaying residual Sandy CLAY / CLAY / Silty CLAY of firm to stiff consistency to approximately 1.3m depth. |
| E3 | The alignment starts within the Quaternary aged floodplain at the eastern end of the proposed alignment option, extending in to the Berry Siltstone area within about 20m of the start of the alignment. Slopes up to 3° degrees .<br>In the floodplain area the subsurface is likely to comprise 0.25m to 0.3m of Clayey SILT and SILT topsoil overlaying 4.85m to 5.30m depth of predominantly CLAY and Sandy CLAY Alluvium<br>Within the Berry Siltstone area the subsurface is likely to comprise residual Sandy CLAY / CLAY / Silty CLAY of firm to stiff consistency to at least 1.3m depth. |
| E4 | The alignment starts within the Quaternary aged floodplain at the eastern end of the proposed alignment option, extending in to the Berry Siltstone area about 20m along from of the start of the alignment. Generally flat land is present within the floodplain area and slopes up to 3° falling downhill toward the south-east in the Berry Siltstone area. An isolated section from 160m to 290m from start of the alignment option has slopes ranging from 14° to 18° as the road alignment heads up toward the adjacent ridge line.<br>In the floodplain area the subsurface likely to comprise 0.25m to 0.3m of Clayey SILT and SILT topsoil overlaying 4.85m to 5.30m depth of predominantly CLAY and Sandy CLAY Alluvium;<br>Within the Berry Siltstone area the subsurface is likely to comprise residual Sandy CLAY / CLAY / Silty CLAY of firm to stiff consistency to at least 1.3m depth. |
| E5 | The alignment starts within the Quaternary aged floodplain at the eastern end of the proposed alignment option, extending in to the Berry Siltstone area about 220m along from of the start of the alignment. Generally flat land is present within the floodplain area and slopes up to 3° falling downhill toward the south-east in the Berry Siltstone area. An isolated section from 220m to 330m from start of the alignment option has a slope dipping downhill toward the southeast at about 6°.<br>In the floodplain area the subsurface likely to comprise alluvial deposits up to 4.80m to 5.20m depth comprised of predominantly CLAY and Sandy CLAY and possibly Silty SAND / SAND / Gravelly SAND Alluvium.<br>Within the Berry Siltstone area the subsurface is likely to comprise residual Sandy CLAY / CLAY / Silty CLAY of firm to stiff consistency to at least 1.3m depth. |

## 6.7 Geotechnical Recommendations

It is clear from the desktop analysis above that there are two main geological formations in the area of the Taylors Lane options, being the Quaternary and Berry Siltstone. In general, the Quaternary formation will involve more geotechnical risks when compared to the Berry Siltstone, such as poor subgrade performance requiring costly treatment e.g. Bridging layers and/or lime stabilisation. The Berry Siltstone can be considered higher performing, with better bearing capacity (For untreated subgrade) and less chance of being water affected due to its relatively high elevation along the ridge line.

Therefore, the options can be ranked from a geotechnical perspective based on the relative amounts of Quaternary and Berry Siltstone formation that is anticipated to be encountered along the alignment option:

- Options W1, W2, W3, W3a, E1a and E2:
  - Most desirable as they expected to by underlain almost entirely by Berry Siltstone.
- Options E1, E3 and E4:
  - Less desirable due to the presence of 20-25 metres of Quaternary in the option alignment.
- Option E5:
  - Clearly least desirable due to 220 metres of Quaternary formation in the option alignment.

# 7 Hydrology and Flooding

A desktop analysis of the available flood data was undertaken for a feasibility assessment to identify the design constraints for proposed Taylors Lane upgrade options. The proposed road alignment designs were analysed against the flood constraints to establish the planning controls and concept stormwater strategy for the proposed site. A review of the relevant guidelines and standards applicable to flooding and stormwater requirements was also undertaken to identify the appropriate DCP provisions.

## 7.1 Available data

The following documents were reviewed to provide flood and stormwater advice associated with the proposed development:

> Shoalhaven Development Control Plan 2014 Chapter NB3: Moss Vale Road South Urban Release Area

> Shoalhaven Development Control Plan 2014 Chapter G9: Development on Flood Prone Land

> Bomaderry Creek Floodplain Risk Management Study and Plan, FRMSP (Cardno, 2016)

> Shoalhaven Council's online interactive map

> Addendum to Far North Collector Road Culvert and Bridge Design Options Report and corresponding HEC-RAS model (Surface Water Consulting, 2021) (FNCR Study)

> Civil engineering sketches drawing SK001 to SK008 version 1 dated 1 April 2022 (Stantec)

> Civil engineering drawing Far North Collector Road, version No. D dated 15 November 2021 (Indesco)

## 7.2 Flooding

The existing and proposed road alignments are located within a flood prone area and are partly subjected to the 1% AEP flood. The proposed road falls under the 'Earthworks' category based on "Schedule 1 – Land Use Categories" in Chapter G9 From Council's DCP. The flood planning controls associated with roads is not permitted within a High Hazard Floodway based on DCP *'Schedule 2 – Flood Related Development Controls – Generic'* and permissible within all other hazard and hydraulic categories.

The current Taylors Lane road alignment is within a Flood Fringe to Floodway area based on the information within the FNCR Modelling – refer **Figure 7-1**.

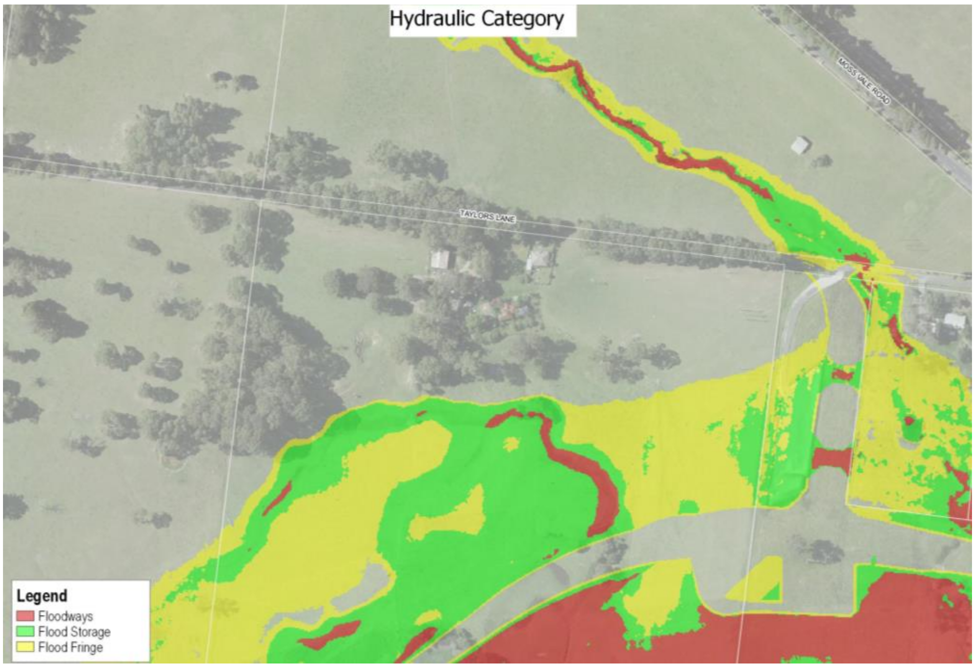



Figure 7-1 Existing site hydraulic category generated from FNCR Study HEC-RAS model results (Surface Water Consulting, 2021)

A feasibility assessment to identify the potential constraints posed by flooding on the proposed alignments was undertaken based on the flood information obtained from the FNCR Study. This modelling is relatively consistent with that shown on Shoalhaven Council's online interactive map. The flooding constraints have been documented in **Table 7-2.**

The flood extents and hydraulic category shown in **Table 7-2** are based on the results obtained from the FNCR Study, which reflects the current state of the study area and also includes the design earthworks for the FNCR. The hydraulic categories are classified as floodway, flood storage and flood fringe areas. Post processing of the FNCR Study flood model results was undertaken using the GIS software package QGIS to produce the hydraulic category layer. The hydraulic category layer was created using the categorisation shown in **Table 7-1** as defined in the Bomaderry Creek Flood Study (BMT WBM, 2010) and is also defined qualitatively below.

Floodway areas are defined as:

> *"…those parts of the floodplain where a significant discharge of water occurs during floods. They are often aligned with natural defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flow, or a significant increase in flood levels (and/or velocities)."*

Flood storage areas are defined as:

> *"…those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood."*

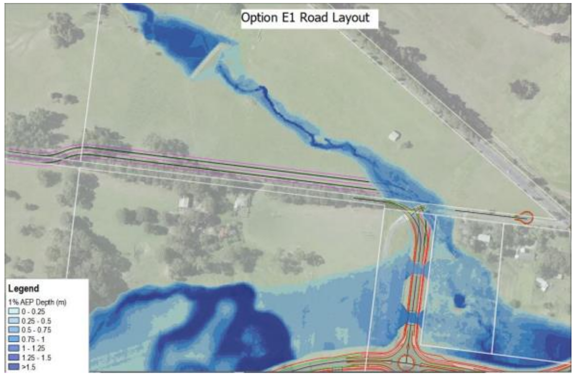
Flood fringe areas are defined as:

> *"…that part of the floodplain remaining after the floodway and flood storage areas have been defined."*

Table 7-1 Bombaderry Creek Flood Study Hydraulic Category Definitions

| Hydraulic Category | Flood Study Definition |
|---|---|
| Floodway | Velocity * Depth > 0.5 $m^2/s$ |
| Flood Storage | Velocity * Depth < 0.5 $m^2/s$ and Depth > 0.5 metres |
| Flood Fringe | Velocity * Depth < 0.5 $m^2/s$ and Depth > 0.5 metres |

Table 7-2 Flood constraints

<table>
<tr><th>Road Layout</th><th>1% AEP Flood</th><th>1% AEP Hydraulic Category</th><th>Comments</th></tr>
<tr><td>Option E1</td><td>
</td><td>
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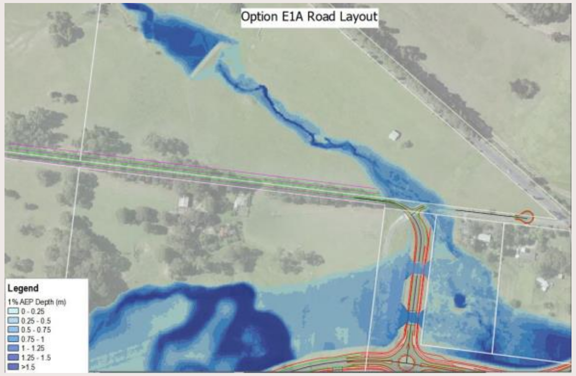
- Road alignment is within the 1% AEP floodplain.
- A portion of the alignment encroaches into the Flood Storage area, and into a small Floodway area on the eastern side of the proposed road.
- Impacts will be expected as a result of this encroachment. Further modelling will be required to confirm impacts associated with this encroachment in later project stages.

</td></tr>
<tr><td>Option E1A</td><td>
</td><td>
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- Road alignment is within the 1% AEP floodplain.
- Alignment only encroaches Flood Fringe and marginally within the Flood Storage area.
- Only minor localised impacts will be expected and will not likely require significant mitigations. Further modelling will be required to confirm impacts associated with each of these design options in later project stages.

</td></tr>
</table>

<table>
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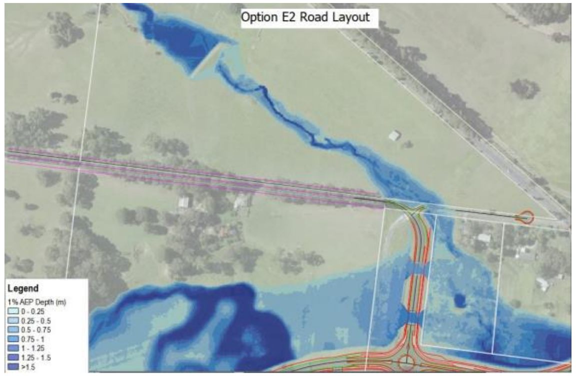
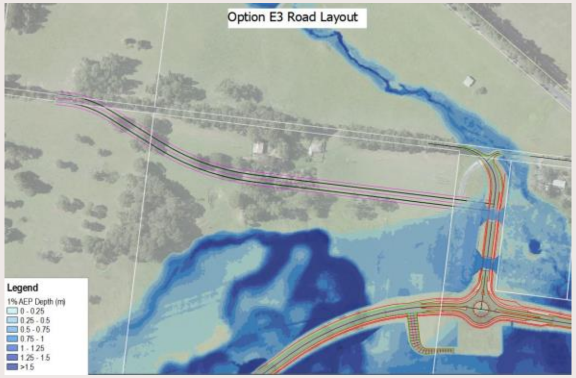
<td>Option E2</td>
<td>
</td>
<td>
</td>
<td>
<ul>
<li>Road alignment is within the 1% AEP floodplain.</li>
<li>Alignment only encroaches Flood Fringe and marginally within the Flood Storage area.</li>
<li>Only minor localised impacts will be expected and will not likely require significant mitigations. Further modelling will be required to confirm impacts associated with each of these design options in later project stages.</li>
</ul>
</td>
</tr>
<tr>
<td>Option E3</td>
<td>
</td>
<td>
</td>
<td>
<ul>
<li>Road alignment is within the 1% AEP floodplain.</li>
<li>Alignment only encroaches Flood Fringe and marginally within the Flood Storage area.</li>
<li>Only minor localised impacts will be expected and will not likely require significant mitigations. Further modelling will be required to confirm impacts associated with each of these design options in later project stages.</li>
<li></li>
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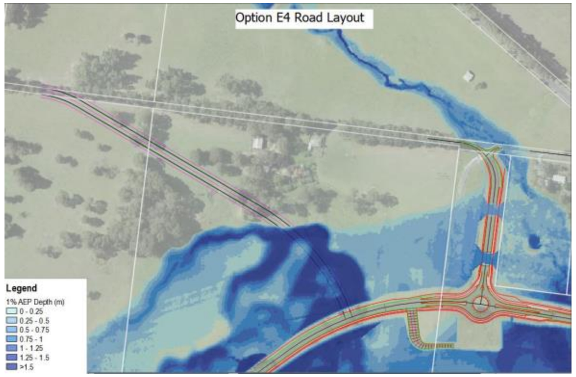
<td>Option E4</td>
<td>
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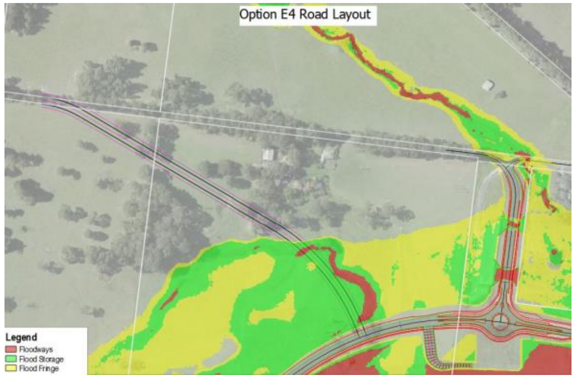
<td>
</td>
<td>
<ul>
<li>Road alignment is within the 1% AEP floodplain.</li>
<li>This alignment encroached into the Floodway area. The remainder of Option E4 encroaches into the Flood Storage.</li>
<li>Impacts are expected as a result of this options. However, this can be mitigated by hydraulic structures such as bridges or multiple cross culverts.</li>
<li>Further modelling will be required to confirm impacts associated with each of these design options in later project stages.</li>
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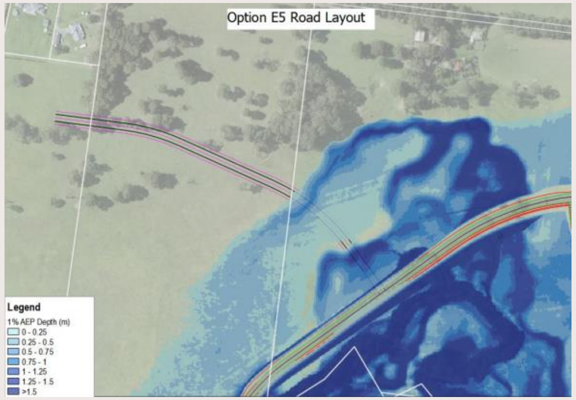
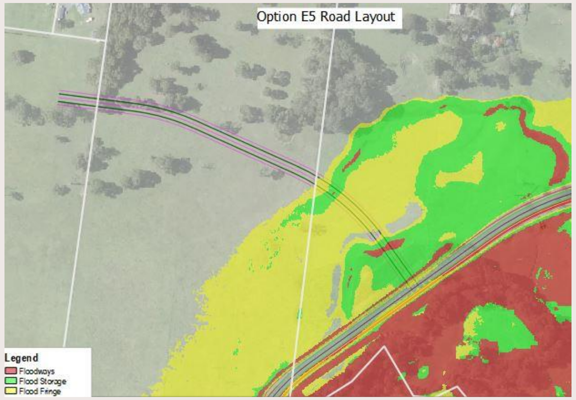
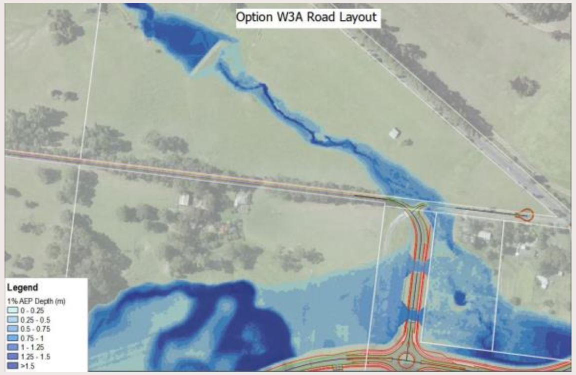
| | | | |
|---|---|---|---|
| **Option E5** |  |  | ▪ Road alignment is within the 1% AEP floodplain.<br>▪ This alignment encroached into the Floodway area. Option E5 encroaches into Flood Storage and Flood Fringe areas.<br>▪ Impacts are expected as a result of these options. However, this can be mitigated by hydraulic structures such as bridges or multiple cross culverts.<br>▪ Further modelling will be required to confirm impacts associated with each of these design options in later project stages. |
| **Option W1** |  |  | ▪ Road alignment lies completely outside of the floodplain area (including PMF). Note this is considering mainstream flooding only and has not accounted for overland flow.<br>▪ These design options will not cause any offsite flood impacts. |

| | | | |
|---|---|---|---|
| **Option W2** |  |  | ▪ Road alignment lies completely outside of the floodplain area (including PMF). Note this is considering mainstream flooding only and has not accounted for overland flow.<br>▪ These design options will not cause any offsite flood impacts. |
| **Option W3** |  |  | ▪ Road alignment lies completely outside of the floodplain area (including PMF). Note this is considering mainstream flooding only and has not accounted for overland flow.<br>▪ These design options will not cause any offsite flood impacts. |

| | | | |
|---|---|---|---|
| **Option W3A** |  |  | ▪ Road alignment is within the 1% AEP floodplain.<br>▪ Alignment only encroaches Flood Fringe and marginally within the Flood Storage area.<br>▪ Only minor localised impacts will be expected and will not likely require significant mitigations. Further modelling will be required to confirm impacts associated with each of these design options in later project stages. |

## 7.3 Hydrology and Flooding Discussion

Based on the feasibility assessment presented above, we recommend that:

> For design option E1:
  - Impacts are anticipated to be significant as the alignment encroaches into the Floodway area.
> For design options E1A, E3 and E2:
  - Impacts are anticipated to be localised and marginal as the alignment encroaches the Flood Fringe and Flood Storage areas. Therefore, these options are unlikely to require any mitigations.
> For design options E4 and E5:
  - Considerable impacts are expected as a significant portion of the alignment encroaches the Flood Fringe, Flood Storage and Floodway areas. However, this can be mitigated by hydraulic structures such as a bridge or multiple cross culverts.
> For design option W3A:
  - Impacts are anticipated to be localised and marginal as the alignment encroaches the Flood Fringe and Flood Storage areas. Therefore, this option is unlikely to require any mitigations.

Note further modelling is required in later project stages to confirm impacts associated with all the design options above, should they be chosen as a preferred option.

> For design options W1, W2 and W3:
  - No further recommendations as these alignment options lie completely outside of the floodplain.

## 7.4 Hydrology and Flooding Recommendations

Ranking of options based on hydrology and flooding is provided in the table below. The ranking is based on the hydraulic category of the flooding for each of the options, in order of most preferential to least: outside floodplain, flood fringe only, flood storage and floodways. The interaction with FNCR bridge also factored into one option. Brief comments are included to justify the rankings.

| Option | Rank | Comment |
|---|---|---|
| ***Western alignment options*** | | |
| W1 | 1 | Outside floodplain. |
| W2 | 1 | Outside floodplain. |
| W3 | 1 | Outside floodplain. |
| ***Eastern alignment options*** | | |
| W3A | 1 | Encroachment into flood fringe/ storage only. |
| E1 | 2 | Small encroachment into floodway area. |
| E1A | 1 | Encroachment into flood fringe/ storage only. |
| E2 | 1 | Encroachment into flood fringe/ storage only. |
| E3 | 1 | Encroachment into flood fringe/ storage only. |
| E4 | 3 | Encroachment into floodway, storage. Ranked same as E5, as although it interacts with larger flood storage area, it impacts a similar sized area of floodway. This option would require modelling to differentiate rank. |
| E5 | 3 | Encroachment into floodway, storage and fringe. Ranked same as E4, as although it interacts with smaller flood storage area, it impacts a similar sized area of floodway. This option would require modelling to differentiate rank. |

# 8 Traffic

## 8.1 Intersection with Far North Collector Road

With reference to **Figure 8-1** below, Options E4 and E5 are assumed to only have ‘left in, left out’ access to the FNCR without construction of a roundabout (Or a grade separated intersection). This means that traffic travelling south from the MVRS URA would need to proceed north on the FNCR until the roundabout that is included in the FNCR construction scope and undertake a u-turn via the roundabout to head south. Options E4 and E5 would render the new Taylors Lane / FNC roundabout redundant as it would only service 2 or 3 properties.

All other options have access the FNCR via the currently proposed roundabout and therefore have north-bound and south-bound access to the FNCR. In addition, these options have access to Taylors Lane when approaching from either north or south on the FNCR.

It is assumed that Option E3 will utilise a priority controlled intersection where it meets the north-south alignment of Taylors Lane and therefore traffic can head north or south (To the FNCR) at that point.

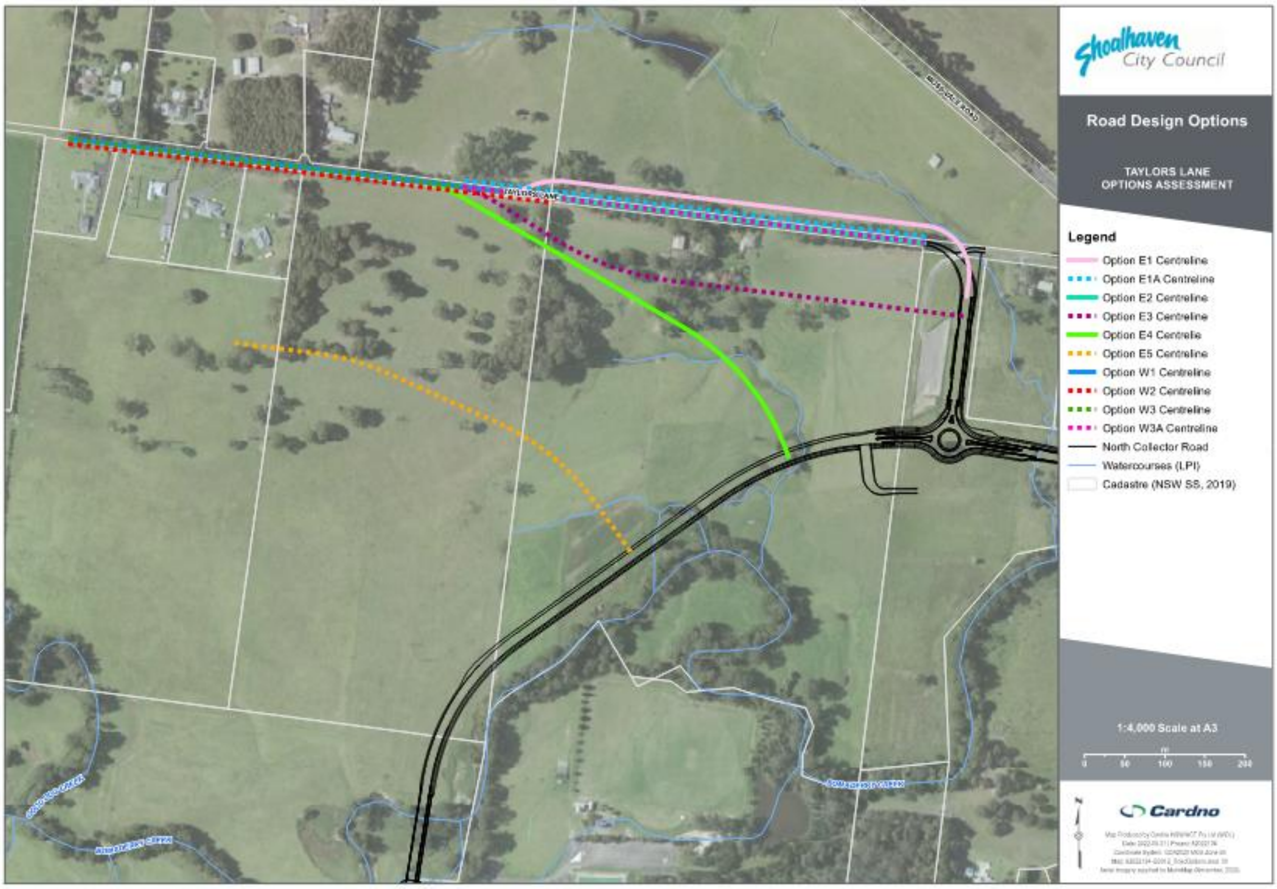



Figure 8-1 All east and west road options considered

## 8.2 Options W3 and W3a

Options W3 and W3a allocate only one traffic lane within the proposed alignment, with the intention of maintaining current road reserve widths and minimising impacts on the significant trees. The proposed configuration is a one-way traffic lane eastbound with adjacent share path, as shown in **Figure 7-1** and **Figure 7-2** below:

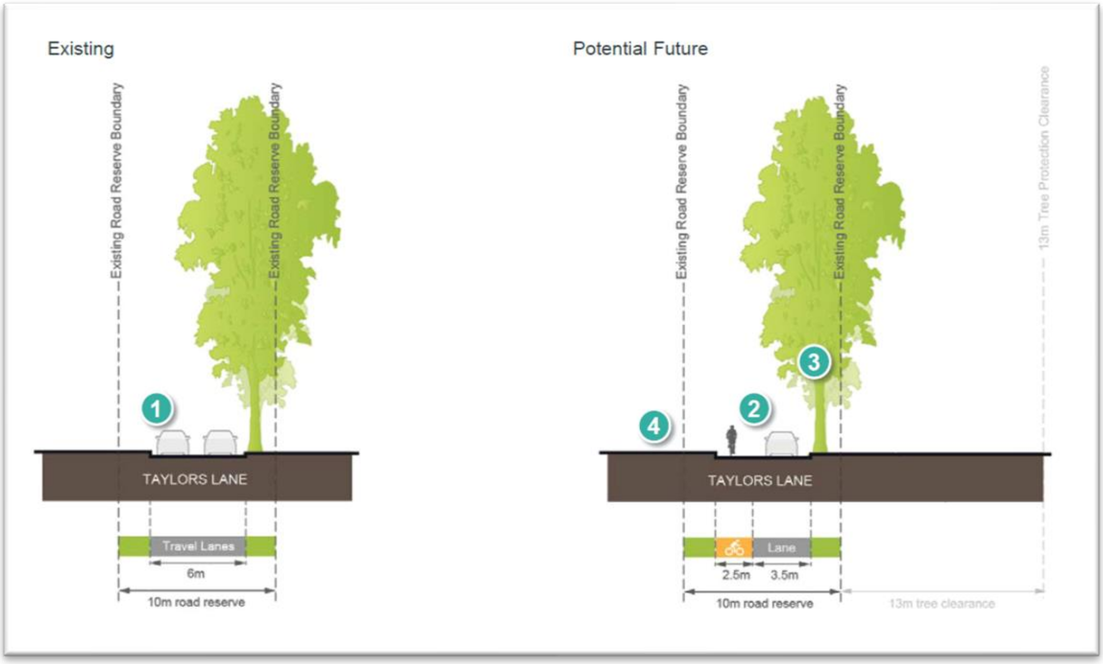



Figure 8-2 Option W3 Typical Section – looking west (Source: Studio GL, June 2021)

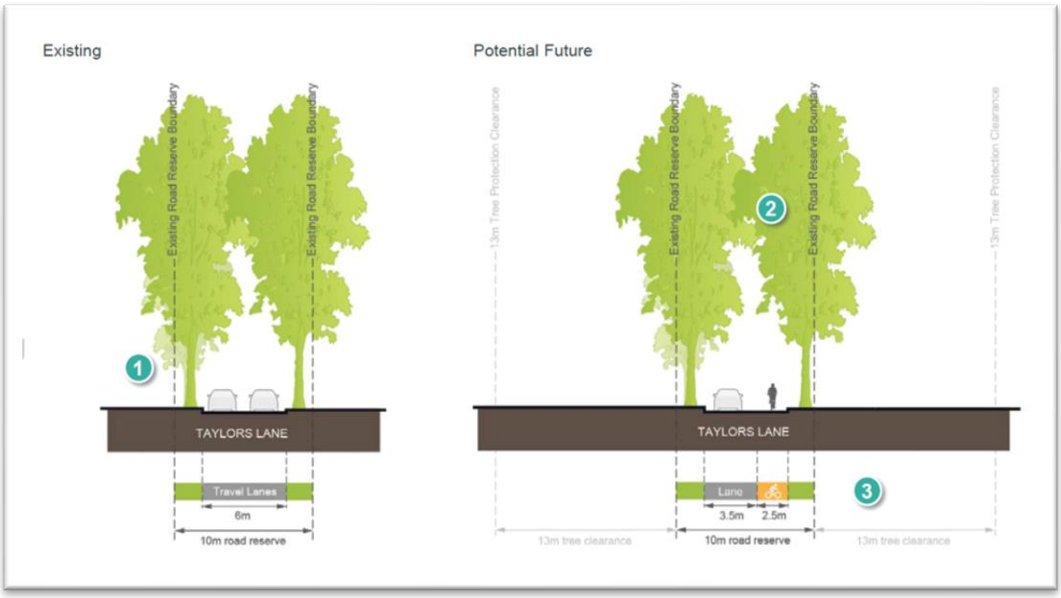



Figure 8-3 Option W3a Typical Section – looking east (Source: Studio GL, June 2021)

While traffic modelling would be required in later project stages to confirm impacts, it is clear that traffic travelling north on the FNCR and wishing to access the MVRS URA would need to proceed past Taylors Lane to the Moss Vale Road roundabout, and head west on Moss Vale Road to access the URA. The traffic performance of intersections along this route would need to be assessed in future project stages to confirm any potential issues.

During further traffic modelling in later project stages consideration could be given to changing the flow of traffic to westbound for Options W3 and W3a. This could lead to better traffic performance of the FNCR roundabout, as traffic would generally undertake a left hand turn to access the MVRS URA and not have priority over other traffic, as opposed to a right or left hand turn onto the FNCR when coming from the URA (For the current eastbound traffic options).

## 8.3 Traffic Recommendations

Based on the assessment presented above, the following summary compares options in relation to traffic:

> Options E1, E1a, E2, W1 and W2:
  - Most desirable as they provide two-way access to the URA and comprehensive access from and to the FNCR.
> Option E3:
  - Slightly less desirable due the additional priority-controlled intersection with the north-south alignment of Taylors Lane.
> Options E4 and E5:
  - Would have only left-in left-out access to the FNCR and would render the new Taylors Lane / FNC roundabout redundant as it would only service 2 or 3 properties. Vehicles travelling to North Nowra from the URA would have to turn left and double back around the new roundabout. Considered not feasible from this perspective.
> Options W3 and W3a:
  - Least desirable due to one-way traffic only within Taylors Lane. Would not achieve the 2-way link between MVRS URA and the FNCR identified in the Nowra-Bomaderry Structure Plan. The effects of one-way on traffic flow and connectivity within the URA are not known. Considered not feasible from this perspective.

# 9 Environment & Heritage

## 9.1 Biodiversity

Desktop reviews of biodiversity constraints were conducted in February 2022 and are considered accurate at the time of writing. A number of the searches discussed below provide findings at a scale that does not allow for precise impact assessment. This is particularly the case for threatened flora, fauna and vegetation communities where the records reported generally relate to those found within a 10km search area and/or are recorded imprecisely in public databases.

A comprehensive assessment of potential project impacts on biodiversity must be undertaken through ground truthing at later design stages as this desktop review only provides a high-level indication of constraints and possible associated costs. The findings of these reviews are detailed below.

## 9.2 NSW listed biodiversity constraints

An overview of biodiversity constraints for all alignment options is provided below:

> A search of NSW BioNet Atlas for threatened species, populations and ecological communities in the vicinity of the alignment found 64 plants and animals recorded within the 10 km search area, of which 38 are listed as vulnerable, 11 are listed as endangered, 1 as an endangered population and 5 as critically endangered under the *Biodiversity Conservation Act* (2016).

> Vegetation mapping of the Shoalhaven, Eurobodalla and Bega Valley LGAs (DPIE 2015) identified 5 vegetation communities or ‘Plant Community Types’ (PCT) surrounding and within the land the alignment options intersect (**Figure 9-1** and **Figure 9-2**):

  - PCT 838: Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion.
  - PCT 694: Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion.
  - PCT 1079: Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin Bioregion.
  - PCT1105: River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion.
  - PCT1212: Spotted Gum - Grey Ironbark - Woollybutt grassy open forest on coastal flats, southern Sydney Basin Bioregion and South East Corner Bioregion.

> A review of past Biodiversity Development Assessment Reports (BDAR) (Lodge Environmental, 2022, 2021a, 2021b) provided by Council indicate that remnant vegetation surrounding the existing Taylors Lane and in the surrounding area is likely PCT 1212: Spotted Gum – Grey Ironbark – Wollybutt grassy open forest on coastal flats, southern Sydney Basin Bioregions and South East Corner Bioregion.

> PCT 1212 is associated with the Threatened Ecological Community (TEC) River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (listed as Endangered under the BC Act and critically endangered under the EPBC Act [see Section 9.3]).

An assessment of vegetation clearing specific to each option is provided below, with options then ranked according to the amount of vegetation clearing required to accommodate the respective road alignment. Estimates of vegetation clearing is summarised below following a review of DPIE (2015) vegetation mapping (**Figure 9-1** and **Figure 9-2**) and the description provided of each option. It should be noted that DPIE (2015) vegetation mapping only provides an indication of the vegetation located within an area. In addition, there are gaps in the mapping which means that it should not be relied upon as the sole point of information, and without further field investigations, to compare and/or assess the ecological impacts of the options. Field assessment in later project stages would be required to validate PCT classifications, and the alignment options would need ground truthing to more accurately quantify differences in clearing between each option.

Western and eastern alignment options have been qualitatively compared below to rank each option based on the expected extent of required clearing to indicate possible cost differences between options. It should be noted that differences in the extent of vegetation clearing between each option is considered relatively minor.

**Western Options**

- Option W1 involves the widening of the current Taylors Lanes alignment and will result in the clearing of trees on both the north and south sides of Taylors Lane.
- Option W2 retains majority of the trees to the north of Taylors Lane. Some clearing of vegetation to the south of Taylors Lane is expected.
- Option W3 retains both the tree community to the north and south of Taylors Lane. Some vegetation will likely be cleared to accommodate road upgrade works and establishment of drainage lines.

Each option is ranked below based on the expected area of vegetation clearing required to accommodate the alignment option (from smallest likely required area of cleared vegetation to greatest):

- 1st: Option W3
- 2nd: Option W2
- 3rd: Option W1

**Eastern Options**

- Option E1 would occur predominately over cleared land. A small number of trees are expected to be cleared along the northern side of the road, although most of the trees along the existing Taylors Lane would be retained.
- Option E1a and W3a would retain majority of the trees located along both the northern and southern extent of the existing Taylors Lane. Some vegetation will likely be cleared for E1a to accommodate works and establishment of drainage lines on the northern side of Taylors Lane.
- Option E2 would result in the clearing of the entire tree community on both the north and south sides of the existing Taylors Lane.
- Options E3 and E4 retains the trees located along both the northern and southern extent of the existing Taylors Lane, although would require clearing of some native vegetation located further south of Taylors Lane.
- Option E5 retains the trees located along both the northern and southern extent of the existing Taylors Lane. This alignment option predominantly runs through a cleared paddock and would likely require only limited clearing of native vegetation.

Each option is ranked below based on the expected area of vegetation clearing required to accommodate the alignment option (from smallest likely required area of cleared vegetation to greatest):

- 1st: Option W3a, E1a
- 2nd: Option E5
- 3rd: Option E1
- 4th: Option E4
- 5th: Option E3
- 6th Option E2

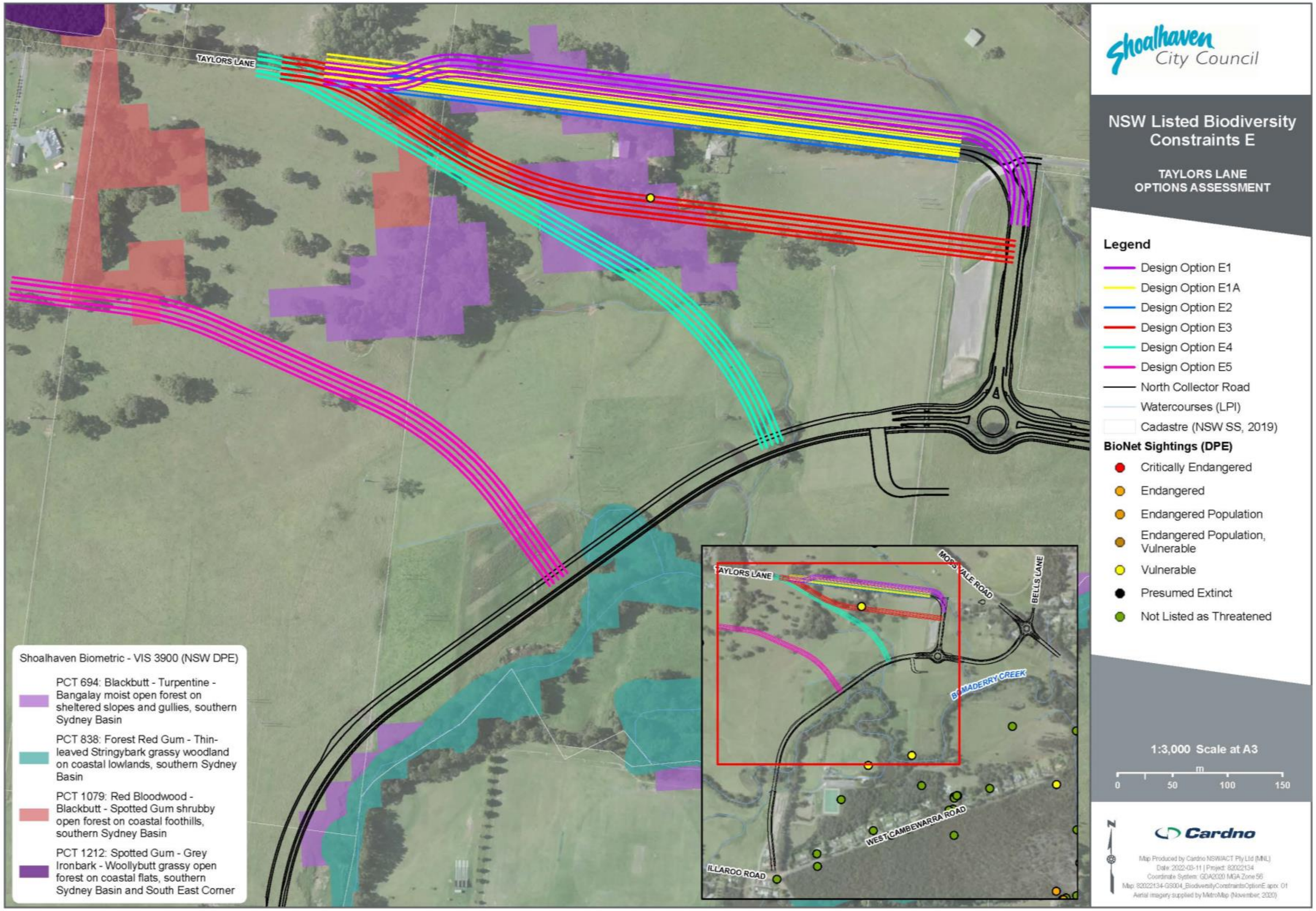



Figure 9-1 NSW listed biodiversity constraints – east

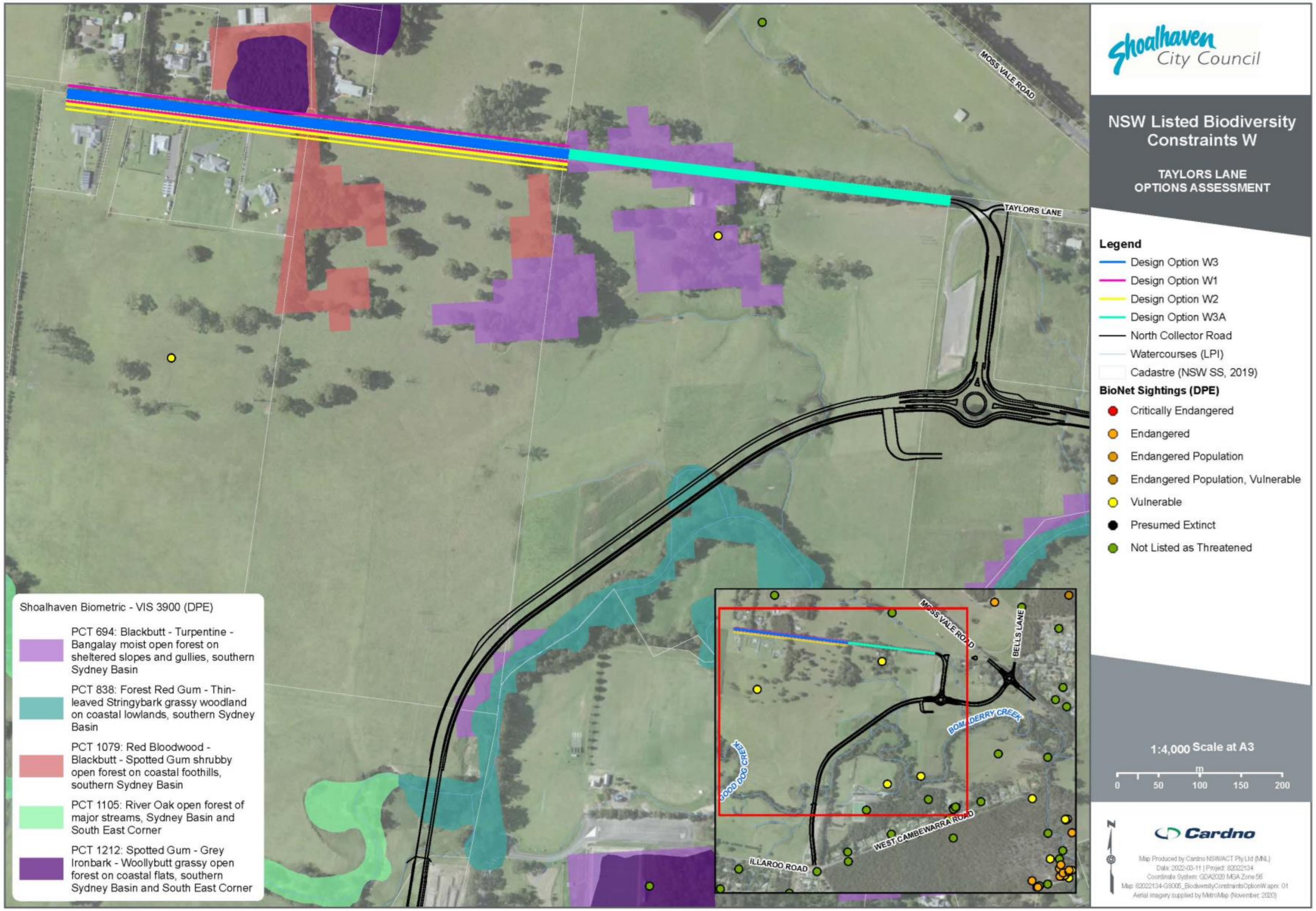



Figure 9-2 NSW listed biodiversity constraints – west

## 9.3 Commonwealth Listed Biodiversity Constraints

> A search of NSW BioNet Atlas for threatened species, populations and ecological communities in the vicinity of the alignment found 30 species listed under the EPBC Act.

> A search of the Protected Matters Search Tool (PMST) was undertaken on 21 February 2022. The following Matters of National Environmental Significance (MNES) were identified within 10km of the proposal:

- 85 threatened species
- 58 migratory species
- 7 TECs.

TECs identified in the PMST search and those mapped within DPIE (2015) datasets are listed below in **Table 9-1.**

Table 9-1 Federally listed TECs

| TEC | EBPC Act Status | Presence |
|---|---|---|
| Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community | E | Likely to occur |
| Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland | E | Known to occur |
| Illawarra and south coast lowland forest and woodland ecological community | CE | Likely to occur |
| Illawarra-Shoalhaven Subtropical Rainforest of the Sydney Basin Bioregion | CE | Likely to occur |
| River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria | CE | Likely to occur |
| Robertson Rainforest in the Sydney Basin Bioregion | CE | May occur |
| Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion | E | May occur |
| Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion | CE | Known to occur |

*E: Endangered. CE: Critically Endangered*

Potential impacts on Commonwealth listed biodiversity constraints have been considered in the cost estimate by comparing the amount of vegetation clearing likely to be required for each of the options (i.e. where more vegetation clearing is required it was assumed a greater potential exists for impact on Commonwealth listed species and therefore greater costs associated with further investigations/project approval can be expected). This is a desktop method of comparing the options and is relatively imprecise in determining actual impacts on Commonwealth species. Field surveys will need to be undertaken at later project stages to determine the precise impacts and the potential need for an Environmental Impact Statement (EIS).

Based on the estimated degree of vegetation clearing, the western and eastern alignment options have been ranked from least likely to most likely to impact Commonwealth listed entities:

<u>Eastern Options</u>

> 1st: Option W3a & Option E1a

> 2nd: Option E5

> 3rd: Option E1

> 4th: Option E4

> 5th: Option E3

> 6th: Option E2

Western Options

- 1st: Option W3
- 2nd: Option W2
- 3rd: Option W1

## 9.4 Important Conservation Tenures

- A search of the Critical Habitat register NSW Office of Environment and Heritage was conducted and found no areas of critical habitat or Areas of Outstanding Biodiversity Value (AOBV) within proximity of the alignment options.
- No alignment options intersect with any NSW National Parks and Wildlife Services (NPWS) reserves.
- The Biobanking Public Register (NSW OEH 2019b) was used to search for Biobanking agreements and statements, none of which were located in proximity of any of the alignment options.
- Bomaderry Creek located to the south of Taylors Lane is mapped as Key Fish Habitat (KFH). Option E5 marginally intersects the KFH buffer zone (**Figure 9-3** and **Figure 9-4**).
- A search of the Fisheries NSW Spatial Data Portal did not identify any freshwater threatened species listed under the FM Act within vicinity of the alignment options.

One marginal difference was identified between the eastern options. As option E5 intersects a KFH buffer zone, further consideration of potential impacts and/or consultation with the Department of Primary Industries (DPI) – Fisheries may be required at a later project stage. No further differentiators were identified for the eastern alignment options in relation to important conservation tenures.

No difference was identified between the western alignment options relating to important conservation tenures.

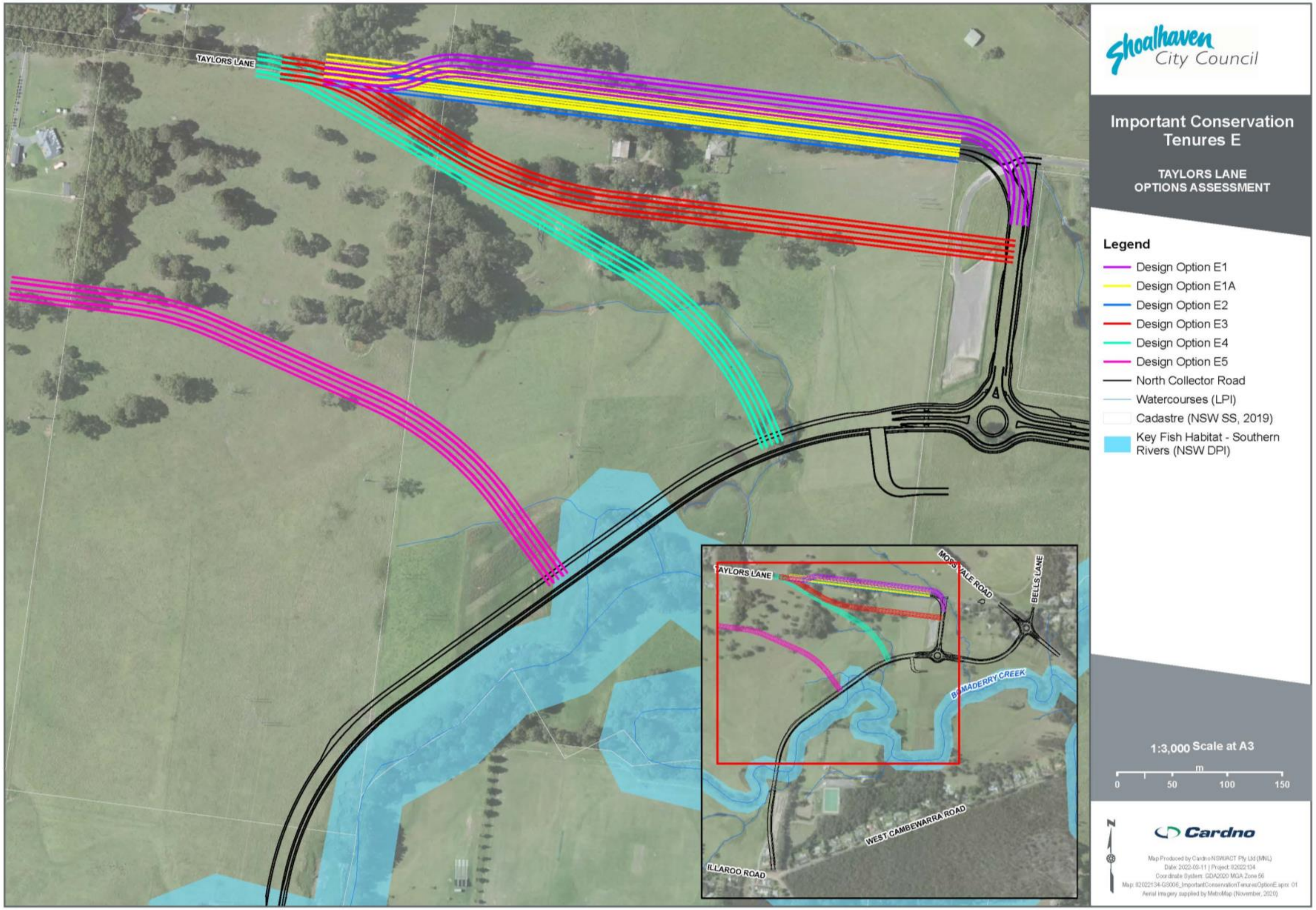



Figure 9-3 Constraints map showing important conservation tenures - east

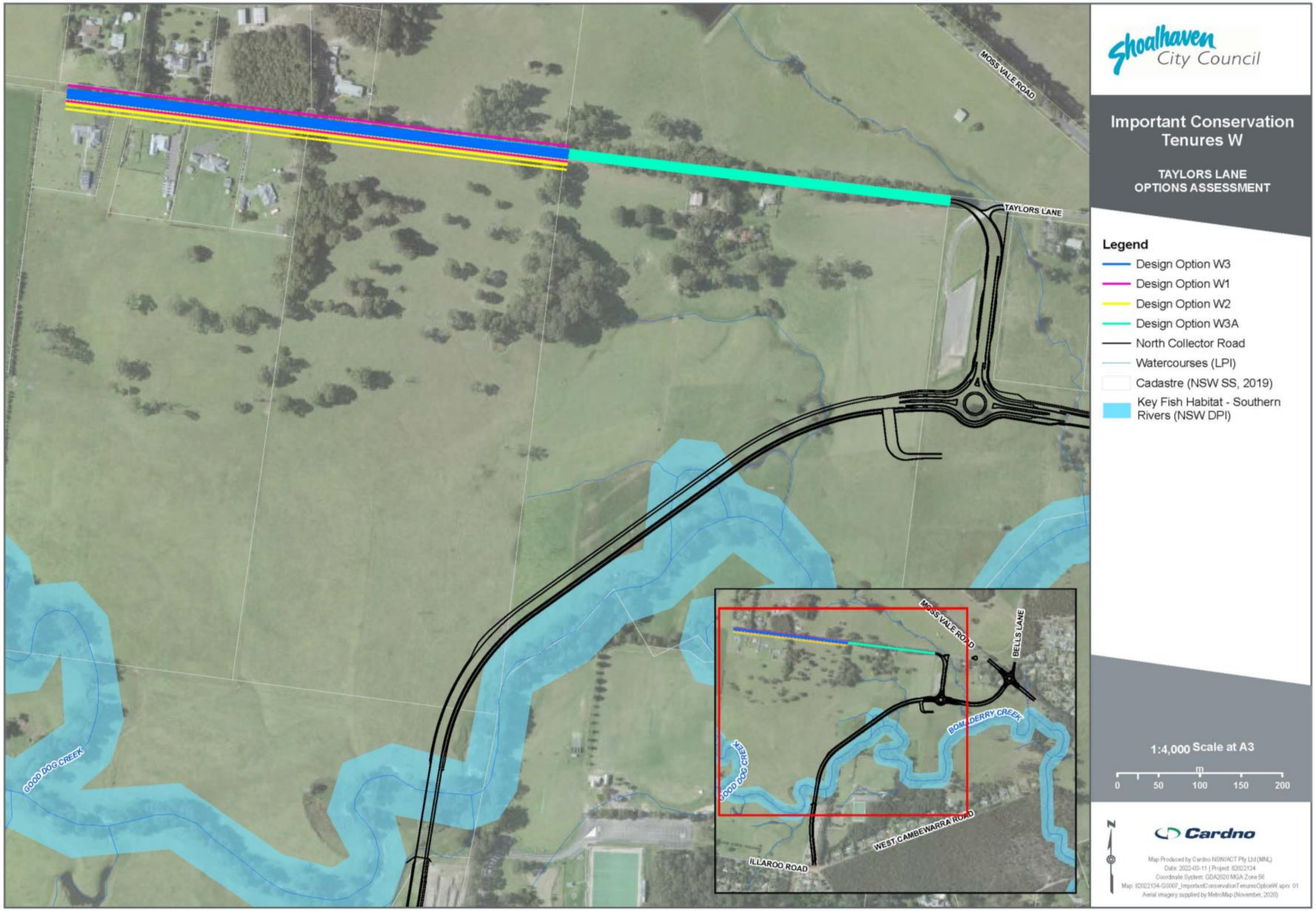



Figure 9-4 Constraints map showing important conservation tenures - west

## 9.5 Water Quality & Groundwater

- Alignment options E1, E1a*, E4 and E5 intersect mapped drainage lines (**Figure 9-5** and **Figure 9-6**):
  - Options E4 and E5 intersect a draignage line mapped as a first order stream (Strahler 1952).
  - Option E1 and E1a intersect a mapped second order stream (Strahler 1952).
- Options E1, E1a and E4 intersect Riparian Lands and Watercourses mapped in the Shoalhaven LEP (**Figure 9-5** and **Figure 9-6**):
  - Option E4 intersects a Catogory 3 Riparian Land and Watercourse.
  - Option E1 and E1a intersect a Catogory 2 and 3 Riparian Land and Watercourse.
- None of the western alignment options intersect mapped drainage lines and/or Riparian Lands and Watercourses.
- A search of the BOM Atlas of Ground Water Dependent Ecosystems (GDEs) within proximity of the alignment options on 7 March 2022 found no aquatic GDEs. All alignment options overlay areas mapped as "moderate – high" potential for terrestrial GDEs. No data was available for subterranean GDEs.
- A search of the WaterNSW Groundwater Map on 7 March 2022 identified 2 groundwater bores located within 500m of the alignment options (**Figure 9-5** and **Figure 9-6**). None of the alignment options intersect either of the groundwater bore sites.
- Consideration of flooding is provided in Section 0.

While works for some alignment options may be within 40m of a waterway and/or intersect mapped Riparian Lands and Watercourses a controlled activity approval under the WM Act is not required as the works would be undertaken by a public authority (Council).

No substantial difference was identified between the western alignment options relating to water quality and groundwater.

Eastern options have been ranked from the least (1) number of water quality and groundwater constraints to the greatest (3). Rankings are based on the number of waterbodies and riparian land and watercourses that are intersected:

- 1st: E2, E3, W3a
- 2nd: E5
- 3rd: E4
- 4th: E1 and E1a

**Note that although the E1a alignment does not intersect a mapped stream as per **Figure 9-5** it is anticipated that a new connection to the existing road network will be required. It is assumed this connection will follow a similar trajectory to E1 and thus E1a is considered to intersect a drainage line (see **Figure 7-5**).*

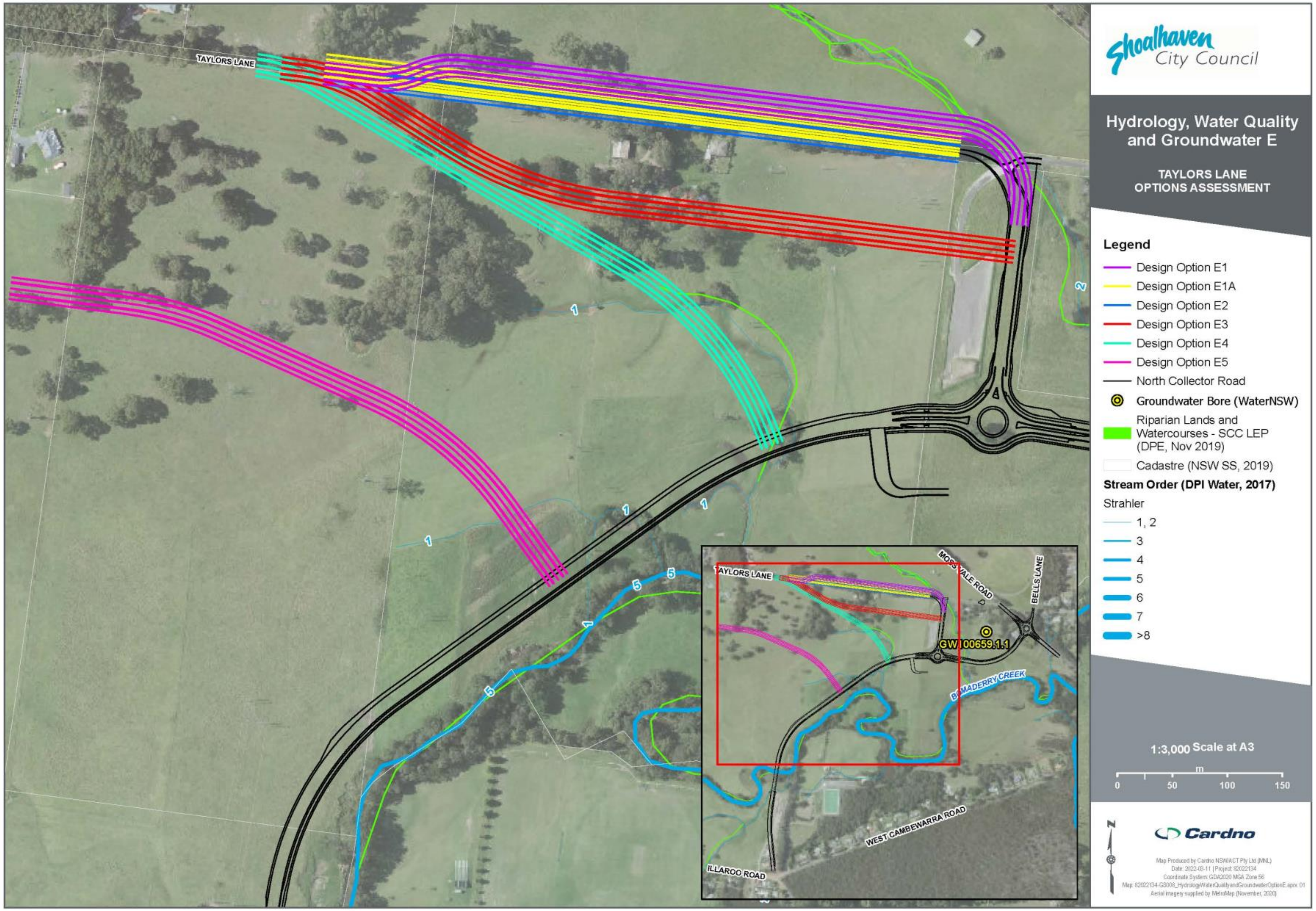



Figure 9-5 Constraints map for hydrology, water quality and groundwater - east

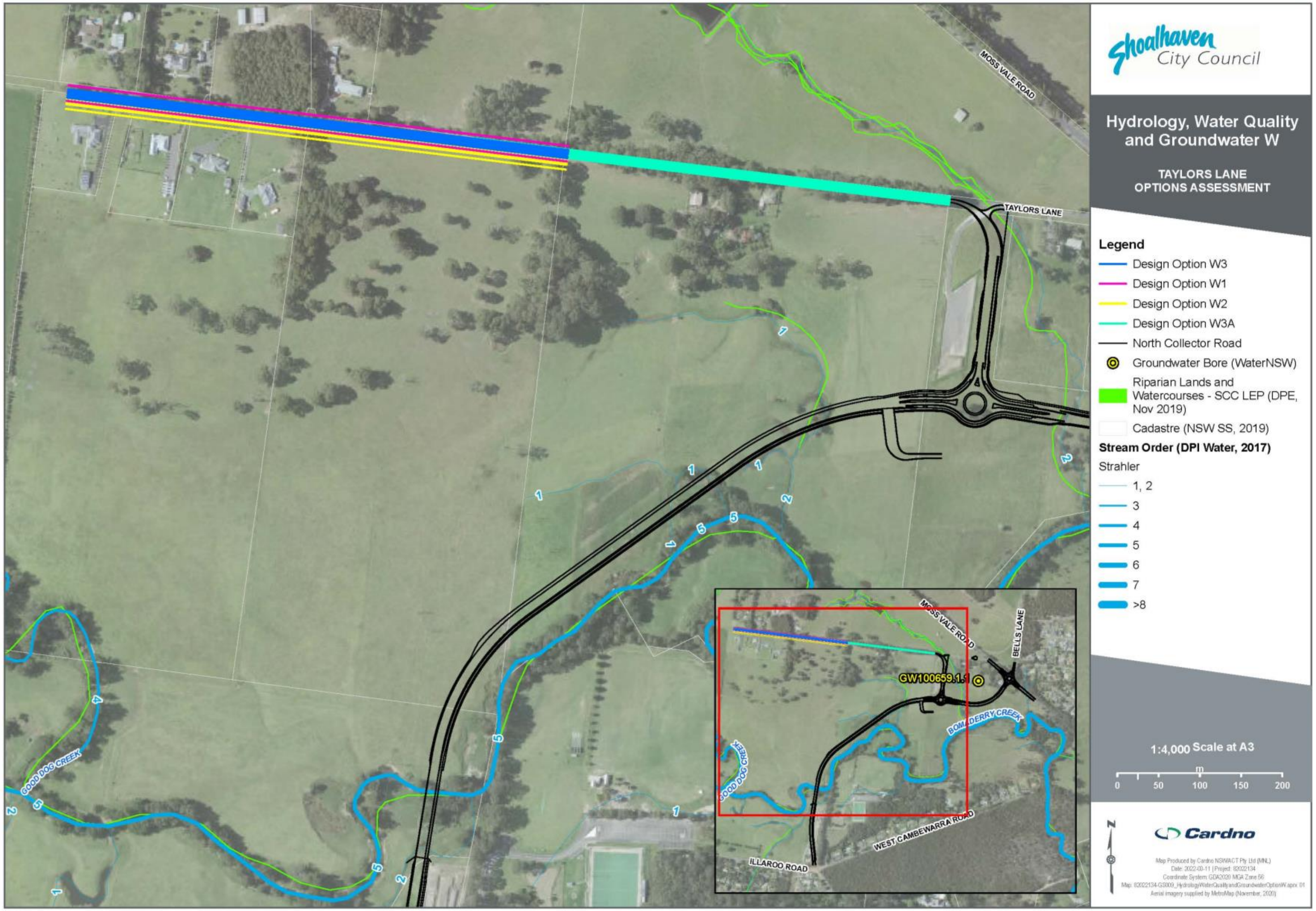



Figure 9-6 Constraints map for hydrology, water quality and groundwater - west

## 9.6 Contamination

- A search of the EPA Contaminated Land Record and the EPA List of NSW contaminated sites notified to EPA conducted on 22 February 2022 did not identify any contaminated land records nor sites that have been notified to the EPA within proximity the any of the alignment options. This does not mean there is no contaminated land on site as not all contaminated areas have been recorded and constraints would need to be confirmed in future project stages.
- The Shoalhaven LEP Acid Sulfate Soil (ASS) maps identify the risk of ASS surrounding both the eastern and western alignments as Class 5: not typically found. Areas classified as Class 5 are located within 500m on adjacent Class 1, 2, 3 or 4 land.

## 9.7 Heritage

### 9.7.1 Local heritage

There are no heritage items identified under the Shoalhaven LEP 2014 that intersect any of the alignment options and therefore no local heritage constraints are identified.

### 9.7.2 State heritage

There are no State Heritage Register listed heritage items within proximity of any of the alignments.

### 9.7.3 Federal heritage

A search of the Australian Government's Australian Heritage Database (DoEE 2019) did not identify any federally listed heritage items within the vicinity of any of the alignments. The PMST search undertaken on 21/02/2022 found that no World Heritage Properties or National Heritage Places were within 10km of the alignment options.

No land claims under the *Aboriginal Land Rights Act 1983* (ALR Act) have been recognised, however all alignments are included in the Native Title Claim (NC2017/003 South Coast People, registered 31/1/2018), made under the *Native Title Act 1993*. No determinations regarding this claim have been made to date.

### 9.7.4 Aboriginal heritage

A basic search of the Aboriginal Heritage Information Management System (AHIMS) was conducted on 22 February 2022. A search buffer of 1km around the proposed alignments was used, which identified 11 Aboriginal heritage sites. A review of past archaeological surveys, cultural heritage assessments and assessments of heritage impacts for development applications on land fronting Taylors Lane indicates potential for additional archaeological sites, particularly in association with permanent water sources and alluvial flats within proximity to the lower order streams within the area (Austral 2021, NGH 2019). Past archaeological surveys have concluded that the general area has low to moderate potential for the disturbance of unidentified Aboriginal artefacts.

Given the potential for Aboriginal artefacts it is expected that all alignment options would require further investigation in later project stages. Assessment of Aboriginal heritage is a requirement under the *National Parks and Wildlife Act 1972* (NPW Act) and standard practice for projects of this kind. Assessment of Aboriginal heritage may include a site visit by a qualified archaeologist, an Aboriginal Due Diligence Assessment (ADDA) in line with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010), and depending on the results, an Aboriginal Heritage Impact Permit (AHIP) in accordance with Section 90 of the NPW Act.

## 9.8 Summary

**Table 9-2** provides a summary of the potential impacts associated with the eastern and western alignment options in relation to key environmental constraints that differ between the alignment options, as discussed previously. This is a desktop-based assessment and presents a high-level comparison of potential biodiversity and heritage constraints only. Results of further investigations in later project stages may change the findings presented in **Table 9-2**.

The eastern and western options are compared individually. A colour coding system has been used to highlight the least, middle and greatest impacts associated with each option.

Table 9-2 Summary of potential environmental impacts

| Constraint | E1 | E1a | E2 | E3 | E4 | E5 | W3a | | W1 | W2 | W3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Environmental | | | | | | | | | | | |
| Amount of estimated vegetation clearing required* | 2 | 1 | 5 | 4 | 3 | 1 | 1 | | 3 | 2 | 1 |
| Key Fish Habitat intersected | no | no | no | no | no | yes | no | | no | no | no |
| Number of crossings of mapped Riparian Land & Watercourse (Shoalhaven LEP) | 2 | 2 | 2 | 0 | 1 | 1 | 0 | | 0 | 0 | 0 |
| Heritage | | | | | | | | | | | |
| Possible impact to Aboriginal heritage sites / requires extra investigation | yes | yes | yes | yes | yes | yes | yes | | yes | yes | yes |

** based on desktop aerial imagery and the option descriptions. A greater score (eastern: 5, western: 3) indicates the greatest amount of vegetation clearing and a score of (1) indicates the least amount. Where no/minimal difference could be estimated the same number is assigned.*

*Green = least impact; Orange = middle impact; Red = greatest impact*

This is a desktop-based assessment and only presents a high-level assessment of environmental constraints. A comprehensive assessment of potential project impacts must be undertaken through ground truthing of the road alignment options and further investigations at later project stages. Results of further investigations may change the findings presented herein.

## 9.9 Environmental approvals pathway

Based on the current understanding of the project and the constraints identified above, the project will likely require assessment and approval via a Review of Environmental Factors (REF) under Part 5 of the EP&A Act. However, this could change based on the precise impacts associated with any of the alignment options. For example, should an option have a significant impact on biodiversity, or other matters, this could trigger an EIS and/or Species Impact Statement (SIS) and the need to consult with and seek approval from DPE and/or the Commonwealth government.

## 9.10 Further investigations during later project stages

While the assessment above has outlined a number of constraints in relation to each of the individual alignment options, the scope of this assessment is high-level and based on desktop assessment only.

Regardless of which option is identified as the preferred option as a result of this options cost assessment process, further investigations will be required during later project stages in order to assess the full suite of potential impacts that may affect the environment as a result of the development. This is anticipated to be via a Review of Environmental Factors (REF) canvassing a range of factors potentially including: ecology, heritage, hydrology, stormwater and flooding, soils and contamination, traffic and transport, landscape and visual amenity, noise and vibration impacts, air quality, socio-economic, waste management, property/land use and cumulative impacts.

Based on the desktop assessment herein it is considered that some of the key aspects of the future detailed environmental assessment will include:

> Aboriginal heritage: which may include a site visit by a qualified archaeologist, an Aboriginal Due Diligence Assessment (ADDA) in line with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010), and depending on the results, an Aboriginal Heritage Impact Permit (AHIP) in accordance with Section 90 of the NPW Act.

> Ecology: an Ecological Impact Assessment (EIA) to assess impacts to flora and fauna, particularly those identified in the BioNet and PMST searches.

> Arborist: It is noted an arborist report has informed recommended Tree Protection Zones for vegetation along the existing Taylors Lane. The report should be reviewed once the preferred option has been identified and consideration given to its recommendations and/or the need for updated arboriculture advice.

# 10 Noise & Vibration

Desktop reviews of aerial imagery, the Schedule of Classified Roads and Unclassified Regional Roads (RMS, 2017) and the *Shoalhaven Local Environmental Plan 2014* (Shoalhaven LEP) were undertaken on 28 March 2022. The reviews aimed to identify the sensitive receivers to noise and vibration associated with construction and operation of the proposed options.

## 10.1 Existing Environment

Taylors Lane is a single narrow carriageway paved for one traffic lane each way, with local narrowing to a single lane. The road is an unclassified local no through road predominantly used by private vehicles of the local residences. Taylors Lane connects to arterial Moss Vale Road to the east. Moss Vale Road is a heavily utilised state classified road featuring a single wide carriageway paved for one traffic lane each way.

Taylors Lane is situated across multiple land zones which are generally typical of land use (**Figure 10-1**). However, as much of Cambewarra is yet to be developed, the area is currently characterised by large rural residential properties, agricultural land and undeveloped bushland.

Despite the current relatively undeveloped status of the land surrounding Taylors Lane, significant development is already underway or planned for the area. This includes:

> Moss Vale Road South (MVRS) urban release area (URA). The western road upgrade options considered fall within this URA, which is masterplanned to include up to 950 new homes to be constructed in the next 5 to 10 years. Initial stages of MVRS have already been constructed.

> The Far North Collector Road (FNCR) which is a sub-arterial road connecting Moss Vale Road (Opposite Bells Lane) to Illaroo Road at Bangalee (Refer Figure 2-1). All eastern road upgrade options connect to the FNCR, which commenced construction in May 2022 and is expected to be completed by the end of 2023.

> A Development Application (DA) has been lodged for a medium density residential subdivision of R3 zoned land (Lot 1 DP 856665 and Lot 122 DP 3060) and it is noted the applicant does not propose to retain the cluster of existing buildings. The DA is currently pending Council assessment.

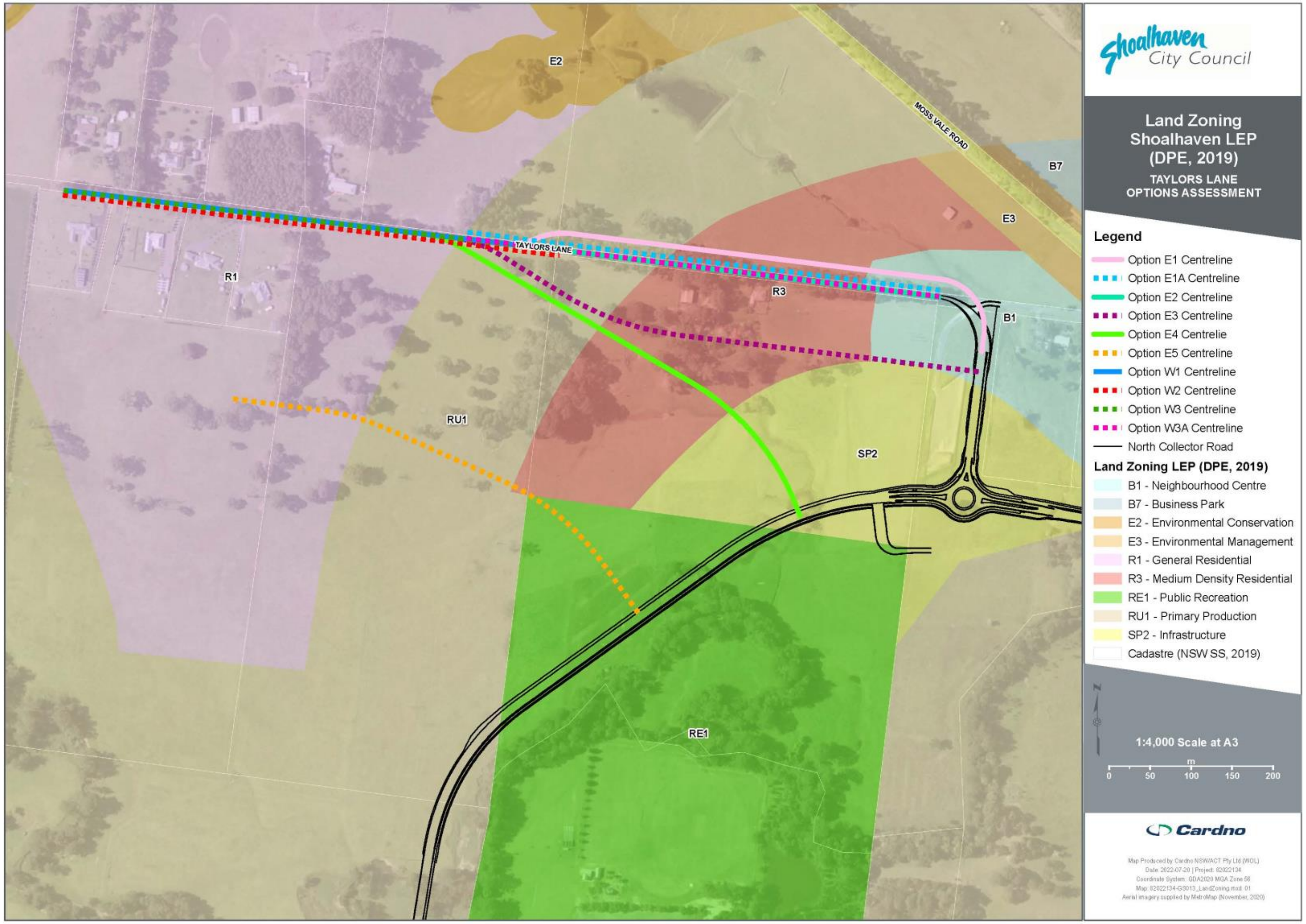



Figure 10-1 Land zoning – Shoalhaven Local Environmental Plan (DPE, 2019)

## 10.2 Sensitive Receivers

Due to the rural nature of the existing environment, noise sensitivity for the area would normally be considered high. Sensitive receivers for the options are predominantly limited to the rural residential properties located on Taylors Lane.

The main sources of existing noise for these sensitive receivers include high speed (Variable but up to 100 kilometres per hour) road traffic noise from Moss Vale Road and noise associated with agricultural production such as the use of tractors. In contrast, noise generated from road construction would be highly noticeable.

However the current and future developments slated for the area as noted in **Section 10.1** are or will be significant sources of noise in the immediate area. It is likely that noise impacts from these significant developments could overshadow any impacts from the Taylors Lane options considered.

**Table 10-1** summarises the type and number of sensitive receivers within 500 metres of each option.

Table 10-1 Noise sensitive receivers

| Option | Sensitive Receiver | | |
|---|---|---|---|
| | Residential | Recreational | TOTAL |
| Western Options | | | |
| W1 | 12 | - | 12 |
| W2 | 12 | - | 12 |
| W3 | 12 | - | 12 |
| W3a | 17 | - | 17 |
| Eastern Options | | | |
| E1 | 20 | - | 20 |
| E1a | 17 | - | 17 |
| E2 | 17 | - | 17 |
| E3 | 20 | 1 | 21 |
| E4 | 14 | 1 | 15 |
| E5 | 11 | 2 | 13 |

## 10.3 Key Risks

The following key risks have been identified:

- Sensitive receivers are located in close proximity to the works. The closest residential receiver to the western options is approximately 14 metres south of W3A. The closest residential receiver to the eastern options is within the alignment of E3, although it is understood that this is an old dwelling that is no longer inhabited and the a pending DA does not propose to retain the buildings within its development footprint.
- Construction may cause noise and vibration impacts to sensitive receivers during standard and out of hours periods. Construction noise is a considerable risk as residents live less than 20 metres away from some options.
- Further assessment would be required to understand the type of equipment, duration, and distance to receivers along with options for mitigation during construction.
- Increased traffic and vehicle usage of Taylors Lane may cause operational noise impacts to sensitive receivers.

## 10.4 Recommendations

The following measures are recommended to address potential noise impacts:

> Consideration of various construction methods and staging during design development to minimise noise and vibration impacts.

> Noise and vibration impact assessment, in the form of a specialist investigation by a suitably qualified acoustic engineer, should be undertaken during later project stages to identify the extent of noise and vibration impacts to nearby sensitive receivers. These further investigations are not required to assess the Taylors Lane upgrade options and can be undertaken in future stages of the project, once a preferred option is confirmed.

# 11 Cost Estimate

A high-level cost estimate has been prepared based on the preliminary design options. These costs are indicative, for strategic comparative purposes only and should be further developed in later project stages. Cost are presented below in **Table 11-1** and **Figure 11-2.** A more detailed breakdown of costs is provided in **Appendix D**; note the table below contains rounded figures to assist interpretation.

The costing has considered:

> Quantities derived from the two-dimensional design work undertaken to further define the route options being considered e.g. Demolition, earthworks, road pavement and landscaping.

> Allowance for stormwater works, based on length of road for the route options considered.

> Bridge allowance where road alignment crosses Bomaderry Creek tributaries (Applies to E3, E4 and E5).

> Protection for / relocation of utilities e.g. Eastern gas pipeline and sewer mains.

> 10% allowance for Preliminaries and Establishment.

> Contingency of 20% reflecting the level of detail at this point of the analysis.

> Land acquisition costs based on area of land to be acquired for the appropriate road reserve and rate per m2 provided by Council.

Table 11-1 Cost Estimate

| Option | Professional Fees | Construction Costs | Land Acquisition | Total |
|---|---|---|---|---|
| **W1** | $250,000 | $2,430,000 | $530,000 | $3,200,000 |
| **W2** | $230,000 | $2,300,000 | $870,000 | $3,400,000 |
| **W3** | $120,000 | $1,180,000 | $0 | $1,300,000 |
| **W3a** | $120,000 | $1,130,000 | $0 | $1,240,000 |
| **E1** | $350,000 | $3,440,000 | $1,590,000 | $5,360,000 |
| **E1A** | $390,000 | $3,870,000 | $1,030,000 | $5,280,000 |
| **E2** | $320,000 | $3,190,000 | $880,000 | $4,390,000 |
| **E3** | $510,000 | $5,010,000 | $1,560,000 | $7,060,000 |
| **E4** | $620,000 | $6,130,000 | $1,040,000 | $7,770,000 |
| **E5** | $610,000 | $6,010,000 | $970,000 | $7,580,000 |

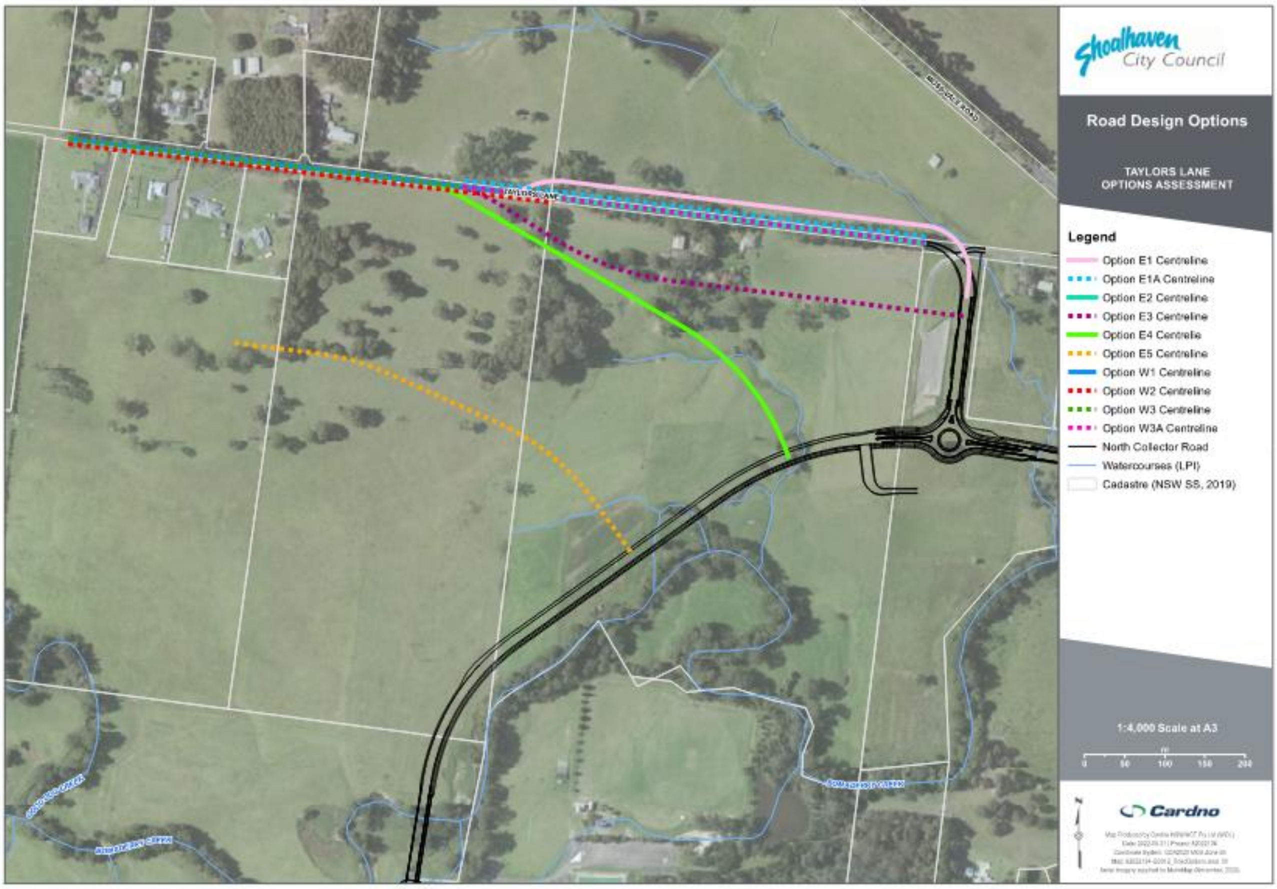



Figure 11-2 All east and west road options considered

# 12 Conclusions

Cardno has undertaken a desktop study to assess the feasibility of different upgrade options for Taylors Lane. A preliminary cost estimate for each option was also prepared.

A summary of the findings for each option is provided below:

## 12.1 Option W1

> Feasible option from a civil design and construction perspective.

> Does not require significant utility relocation and/or protection.

> Subsurface expected to comprise of firm to stiff clay soils.

> Located outside the floodplain.

> Requires the most vegetation clearing of the western options including removal of the significant existing trees.

> Relatively expensive western option, similar in costing to Option W2.

## 12.2 Option W2

> Feasible option from a civil design perspective however further consideration needs to be given to stormwater management as well as pavement design to ensure competent road construction while also protecting existing trees.

> Does not require significant utility relocation and/or protection.

> Subsurface expected to comprise of firm to stiff clay soils.

> Located outside the floodplain.

> Requires some vegetation clearing but retains the existing trees.

> Most expensive western option, marginally more than Option W1.

> Effect on root zones and long-term tree health is not known, and is therefore considered not feasible.

## 12.3 Option W3

> Feasible option from a civil design perspective however further consideration needs to be given to stormwater management as well as road pavement to ensure competent road profile while also protecting existing tree roots.

> Provides one-way vehicle traffic only, the effect on traffic flow and connectivity within MVRS URA is not known and would require modelling. Potentially not feasible from a traffic perspective.

> Does not require significant utility relocation and/or protection.

> Subsurface expected to comprise of firm to stiff clay soils.

> Located outside the floodplain.

> Does not require significant vegetation clearing.

> Significantly cheaper than other western options.

> Effect on root zones and long-term tree health is not known, and is therefore considered not feasible.

## 12.4 Option W3A

> Feasible option from a civil design perspective however further consideration needs to be given to stormwater management as well as road pavement to ensure competent road profile while also protecting existing tree roots.

> Provides one-way vehicle traffic only, the effect on traffic flow and connectivity to MVRS URA is not known and would require modelling. Potentially not feasible from a traffic perspective.

> Does not require significant utility relocation and/or protection.
> Subsurface expected to comprise of firm to stiff clay soils.
> Generally located outside the floodplain. Marginal encroachment at eastern end not expected to be significant issue.
> Does not requires significant vegetation clearing.
> Significantly cheaper than other eastern options.
> Effect on root zones and long term tree health is not known, and is therefore considered not feasible.

## 12.5 Option E1

> Feasible option from a civil design & construction perspective. Would likely involve extending FNCR culverts and further realignment of the Bomaderry Creek tributary.
> Requires significant additional protection measures of Eastern Gas Pipeline. Also, likely requires some protection of sewer asset.
> Subsurface expected to generally comprise of firm to stiff clay soils sith some gravelly sand.
> Marginal encroachment into 1% AEP floodplain including a portion of the alignment encroaches into the Floodway area. Flood impacts will be expected and further modelling will be required.
> Some vegetation clearing required but existing trees retained.
> Average cost compared to other eastern options that retain the stand of trees along Taylors Lane.

## 12.6 Option E1a

> It is unclear whether the raised concrete pavement would be effective and whether a piled bridging system could be installed while maintaining the objective of tree protection. Stormwater management also needs to be considered further. The effect on root zones and long-term tree health is not known, and is therefore considered not feasible.
> Significant utility protection measures not anticipated.
> Subsurface expected to comprise of firm to stiff clay soils.
> Marginal encroachment into 1% AEP floodplain. Flood impacts expected, although not likely significant. Further modelling will be required in future project stages.
> Some vegetation clearing required but existing trees retained.
> Average cost compared to other eastern options that retain the stand of trees along Taylors Lane.

## 12.7 Option E2

> Feasible option from a civil design & construction perspective. Future FNCR culvert would need to be extended to accommodate the new road extent.
> Significant utility protection measures not anticipated.
> Subsurface expected to comprise of firm to stiff clay soils.
> Marginal encroachment into 1% AEP floodplain. Flood impacts expected, although not likely significant. Further modelling will be required in future project stages.
> Requires the most vegetation clearing of the eastern options including removal of the existing trees.
> Relatively low cost compared to other eastern options, although still significantly more expensive than W3a.

## 12.8 Option E3

> Option E3 has been revised from its original alignment as it intersected the future FNCR at a proposed bridge and is now considered a feasible option from a civil design and construction perspective.
> An external catchment needs to be managed in this option, with the current alignment creating a trapped low point immediately north at the interface with FNCR.

- Requires significant protection measures of Eastern Gas Pipeline.
- Subsurface expected to generally comprise of predominantly clay and sandy clay alluvium within the floodplain and residual sandy clay / clay / silty clay of firm to stiff consistency within the Berry Siltstone area.
- Current alignment only shown to encroach the Flood Fringe and Flood Storage areas.
- Some vegetation clearing required but existing trees along Taylors Lane would be retained.
- Third most expensive option after Options E4 and E5.

## 12.9 Option E4

- A key issue with this design option is the proximity to, and crossing of, an unnamed Bomaderry Creek tributary. The connection point with FNCR appears to be very close to the alignment of the creek. Potential stormwater management and flooding issues are not known based on the information currently available.
- Requires significant protection measures of Eastern Gas Pipeline.
- Subsurface expected to generally comprise of predominantly clay and sandy clay alluvium within the floodplain and residual sandy clay / clay / silty clay of firm to stiff consistency within the Berry Siltstone area.
- Further flood modelling is required in future project stages to confirm impacts associated with this option. Considerable impacts are expected as a significant portion of the alignment encroaches the Flood Fringe, Flood Storage and Floodway areas. However, this can potentially be mitigated by hydraulic structures such as bridge/s and/or multiple culverts.
- Some vegetation clearing required but existing trees retained.
- Most expensive compared to other eastern options.
- Would render the new FNC roundabout redundant as it would only service 2-3 properties. Vehicles travelling to North Nowra from the URA would have to turn left and double back around the new roundabout. Considered not feasible.

## 12.10 Option E5

- The connection point with FNCR is located within a low-lying area. Potential stormwater management and flooding issues are not known based on the information currently available.
- Requires significant protection measures of Eastern Gas Pipeline.
- Subsurface expected to generally comprise of predominantly clay and sandy clay alluvium within the floodplain and residual sandy clay / clay / silty clay of firm to stiff consistency within the Berry Siltstone area.
- Further flood modelling is required to confirm impacts associated with this option. Considerable impacts are expected as a significant portion of the alignment encroaches the Flood Fringe, Flood Storage and Floodway areas. However, this can potentially be mitigated by hydraulic structures such as bridge/s and/or multiple culverts.
- Second most expensive option after Options E4.
- Would render the new FNC roundabout redundant as it would only service 2 to 3 properties. Vehicles travelling to North Nowra from the URA would have to turn left and double back around the new roundabout. Considered not feasible.

## 12.11 Multi-Criteria Analysis

Assessment of different technical criteria and costs associated with each alignment option indicated two core differentiators between the options: Development cost (Construction & land acquisition costs) and environment and heritage loss. An equal weighting was assigned to these two groups in the below multi-criteria analysis, and eastern and western alignment options were assessed independently.

The following approach was undertaken to determine weighted scores:

> All options were ranked against each relevant criterion:
  - Development cost including: professional fees, civil construction costs and land acquisition costs.
  - Environment and heritage constraints including: habitat loss, impact on conservation tenures, impacts to cultural heritage and interaction with waterways.
> Each option was than ranked against one another based on the individual criteria (e.g. development cost) to provide a relative rank between 1-10.
> Qualitative adjustments to account for large variances (Where necessary).
> Rankings converted to a score out of 100, with the highest ranked option given a score of 100.
> Criteria weighting then applied to each score, and all scores for a particular option tallied to give an overall score out of 100 to allow comparison of each option based on the sum of all weighted criteria.

Technical investigation in Sections 4 - 10 indicated a number of the alignment options have unknown technical feasibility or are known to be unfeasible. These options were retained within the below analysis for reference and are indicated in red. These alignments however should not be considered practicable options.

It is acknowledged that the presence of the stand of trees within the existing road reserve of Taylors Lane holds significant landscape and social value to the community. Alignment options that require the removal of this stand of trees are indicated below each respective table (**Table 12-1** and **Table12-2**), although have been removed from the ranking process.

Table 12-1 Ranking of eastern alignment options based on development cost and environmental and cultural loss. Options considered unfeasible are indicated in red, whilst feasible options are indicated in green.

| Rank | Option | Cost /50 | Environment & Culture /50 | Score /100 | Cost estimate ($M) |
|---|---|---|---|---|---|
| *Options that retain the Taylors Lane trees* | | | | | |
| **1** | W3a | 50.00 | 50.00 | **100.00** | $1.24 |
| **2** | E1a | 37.51 | 41.67 | **79.17** | $5.28 |
| **3** | E1 | 36.59 | 35.71 | **72.30** | $5.36 |
| **4** | E5 | 23.94 | 37.50 | **61.44** | $7.58 |
| **5** | E3 | 24.93 | 36.00 | **60.93** | $7.06 |
| **6** | E4 | 23.21 | 35.71 | **58.92** | $7.77 |
| *Option that removes the Taylors Lane trees* | | | | | |
| **N/A** | E2 | 42.12 | 27.78 | **69.89** | $4.39 |

Table 12-2 Ranking of western alignment options based on development cost and environmental and cultural loss. Options considered unfeasible are indicated in red, whilst feasible options are indicated in green.

| Rank | Option | Cost /50 | Environment & Culture /50 | Score /100 | Cost estimate ($M) |
|---|---|---|---|---|---|
| *Options that retain the Taylors Lane trees* | | | | | |
| **1** | W3 | 50.00 | 50.00 | **100.00** | $1.30 |
| **2** | W2 | 25.12 | 35.29 | **60.42** | $3.40 |
| *Option that removes the Taylors Lane trees* | | | | | |
| **N/A** | W1 | 28.04 | 25.00 | **53.04** | $3.20 |

As indicated above, options E1 and E3 are the only options that were deemed feasible for the eastern alignment that retain the stand of trees along Taylors Lane. Option E2 was also deemed feasible, however would result in the loss of the stand of trees along Taylors Lane.

E1 received the highest weighted score on the multi-criteria analysis when compared with the other feasible options (E3 and E2) (Refer **Table 12-1**).

**Option E1** - Taylors Lane re-routed north of its existing alignment:

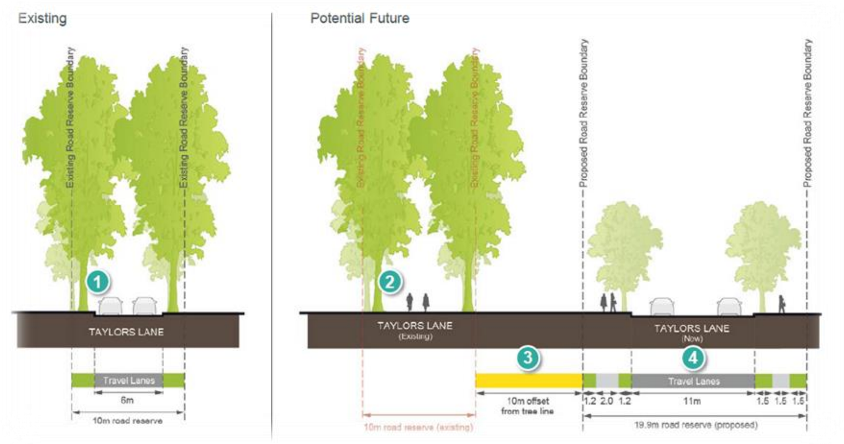



Figure 12-1 Option E1 Typical Section (Source: Studio GL, June 2021)

As indicated in **Table 12-2**, option W1 is the only alignment option that was deemed feasible for the western alignment of Taylors Lane. Neither of the two western alignment options that retained the stand of trees along Taylors Lane were deemed feasible due to unknown long-term impact to tree health and/or unacceptable traffic outcomes.

**Option W1** - the existing Taylors Lane road centreline is maintained with widening proposed on both sides of the road.

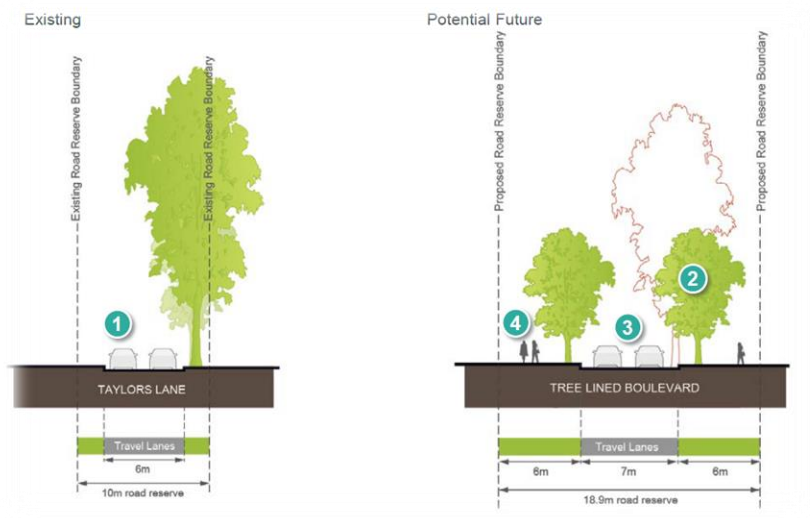



Figure 12-2 Option W1 Typical Section (Source: Studio GL, June 2021)

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Lodge Environmental (2021b) *Biodiversity Development Assessment Report (BDAR).* Prepared by Lodge Environmental on behalf of Maker Engineering Pty Ltd, January 2022

NGH (2020) *Biodiversity Development Assessment Report (BDAR).* Prepared by NGH Environmental Pty Ltd, September 2021

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# APPENDIX

# A

CONCEPT OPTION SKETCHES

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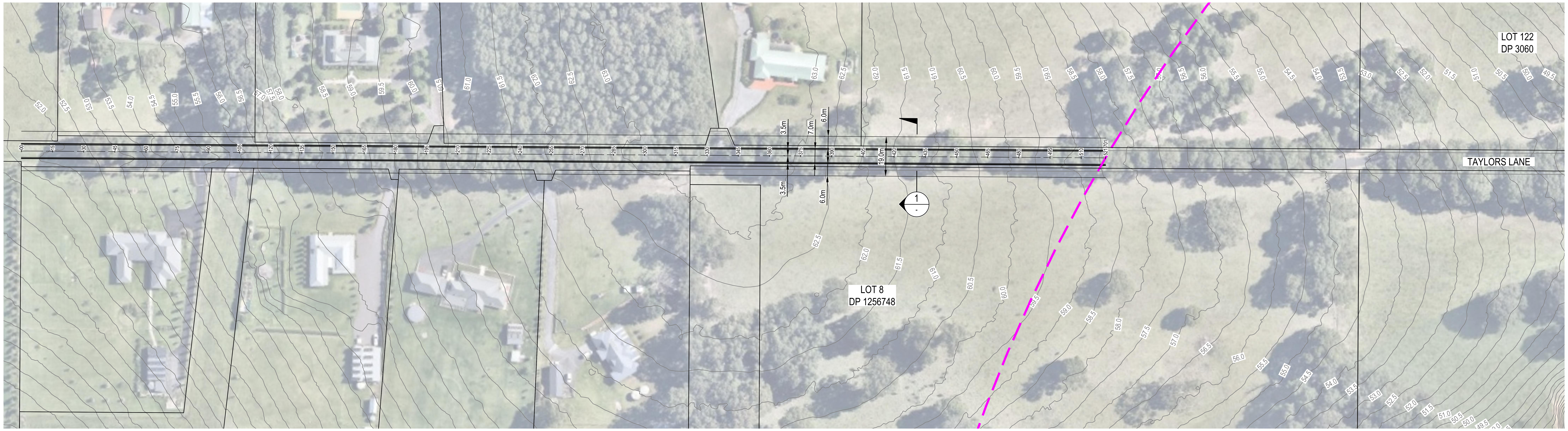


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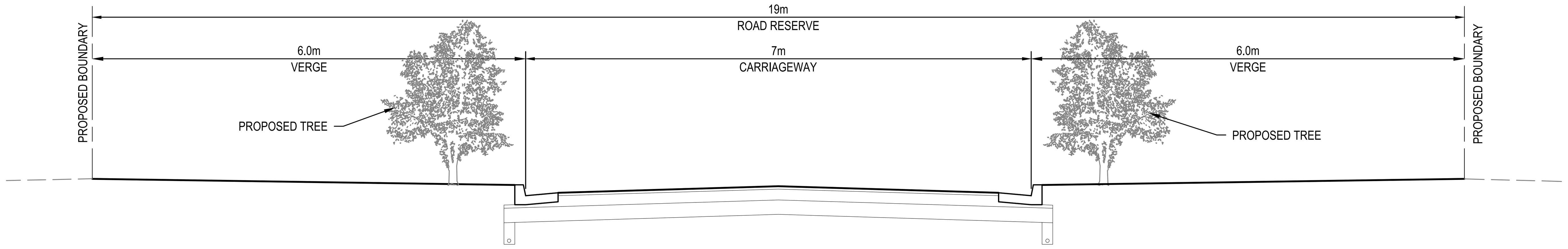


SECTION 1 / -
SCALE 1:50

## LEGEND
- URBAN RELEASE AREA BOUNDARY
- 10.0 EXISTING SURFACE CONTOURS
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE BATTER

0 1 2 3 4 5m
SCALE 1:50 (A1), 1:100 (A3) @A1

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SCALE 1:1000 (A1), 1:2000 (A3) @A1

NORTH

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Project: TAYLORS LANE
OPTIONS COST ASSESSMENT
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Revision: 1

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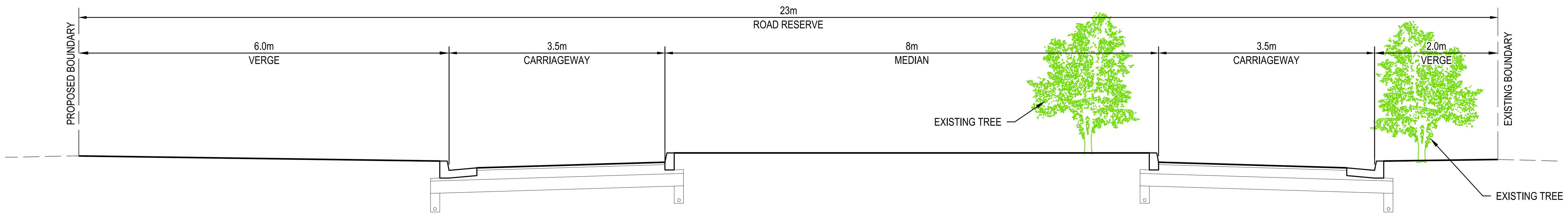


SECTION 2 -
SCALE 1:50

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- URBAN RELEASE AREA BOUNDARY
- 10.0 EXISTING SURFACE CONTOURS
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE BATTER

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0 20 40 60 80 100m
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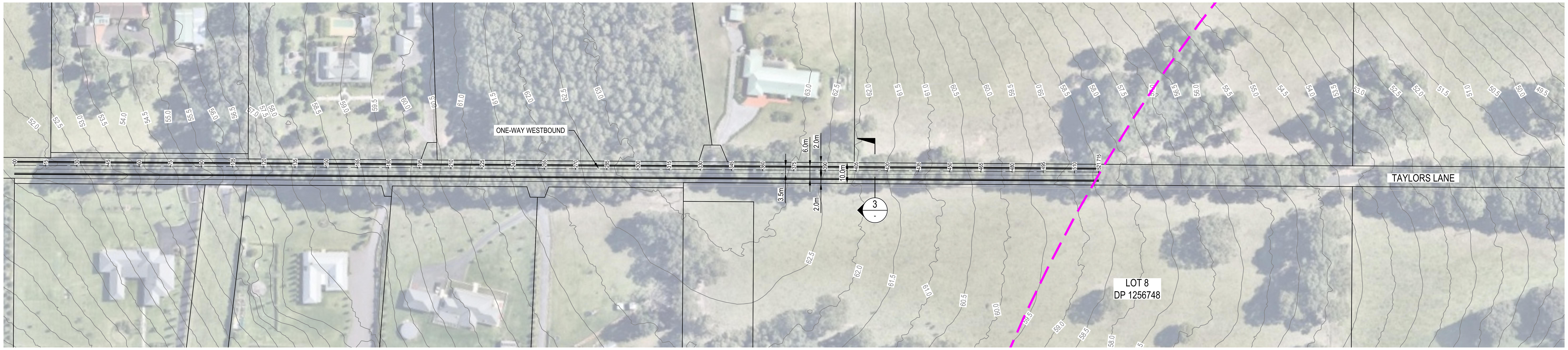


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## OPTION W3A ROAD LAYOUT

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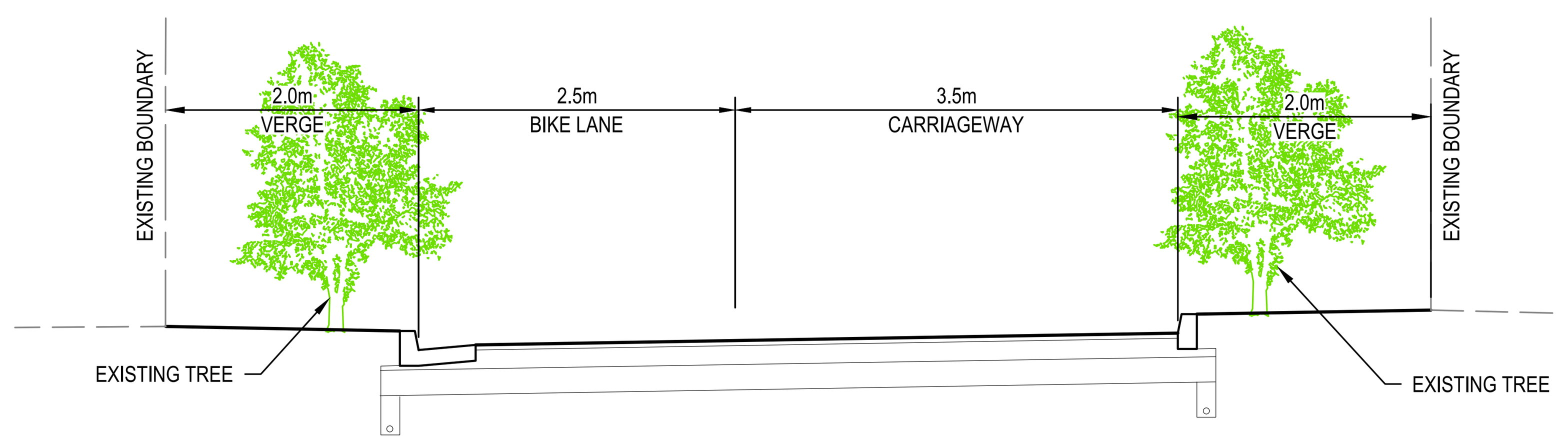


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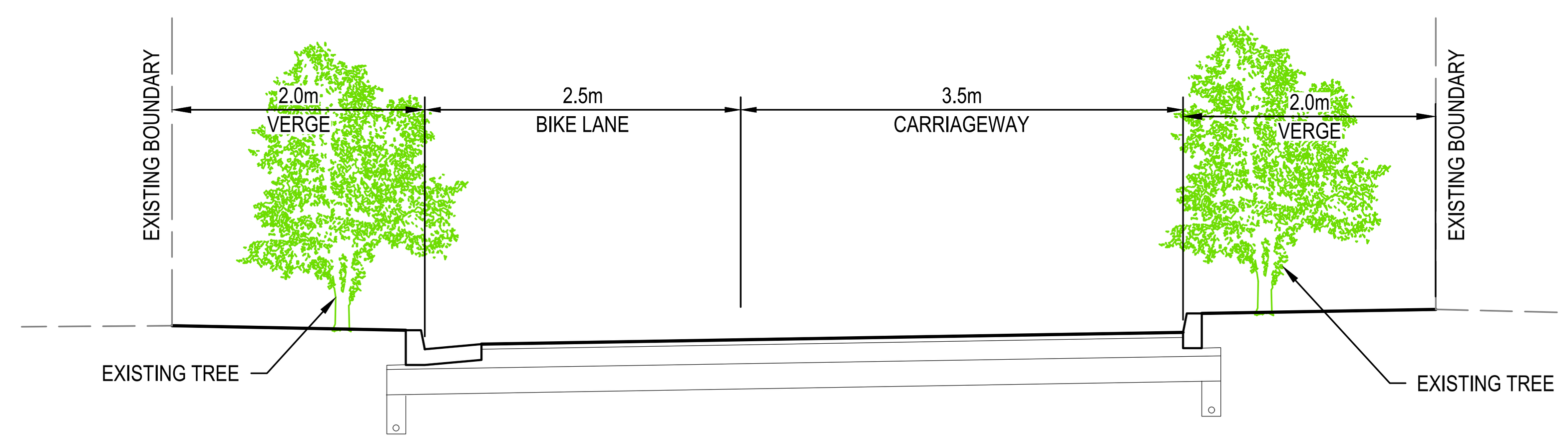


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## LEGEND

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- 10.0 EXISTING SURFACE CONTOURS
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE FAR NORTH COLLECTOR DRAINAGE
- FUTURE BATTER

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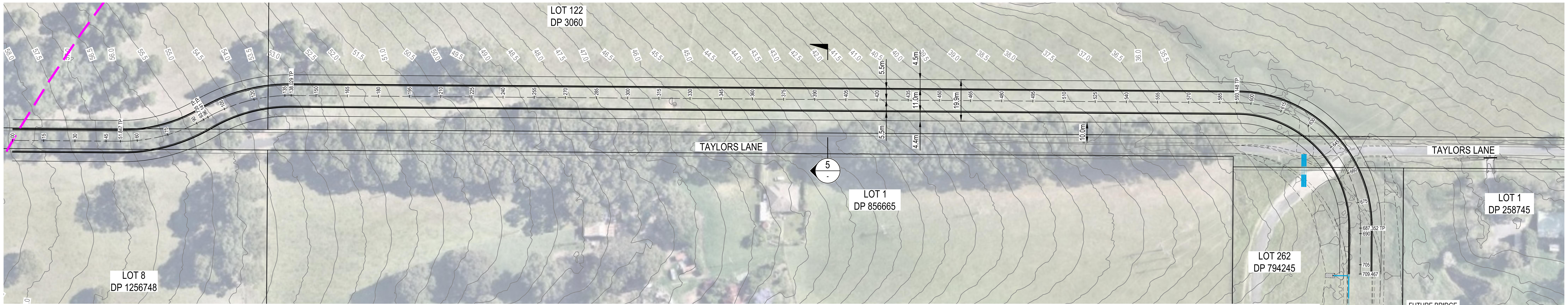


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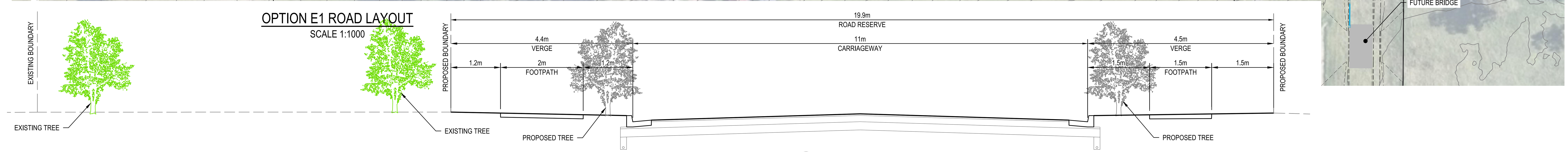


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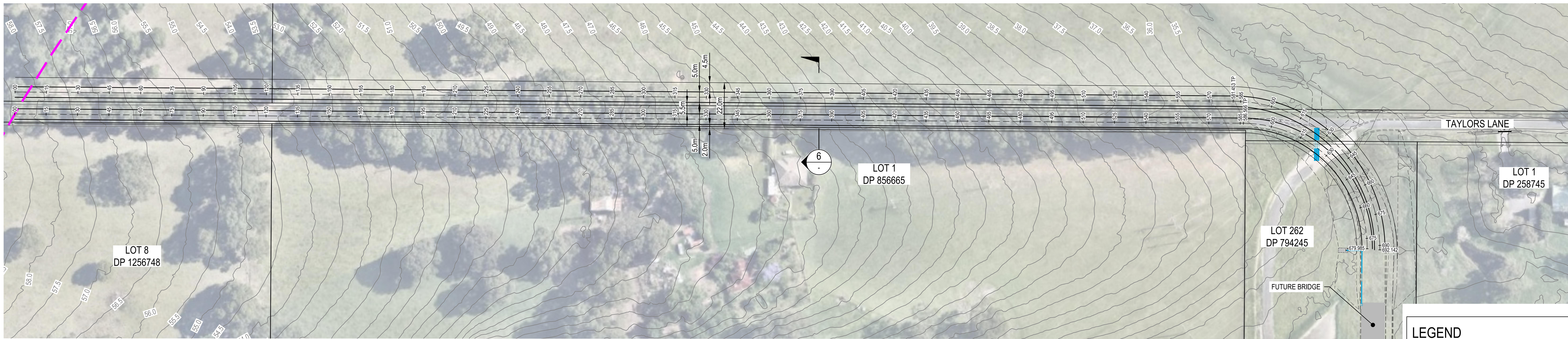


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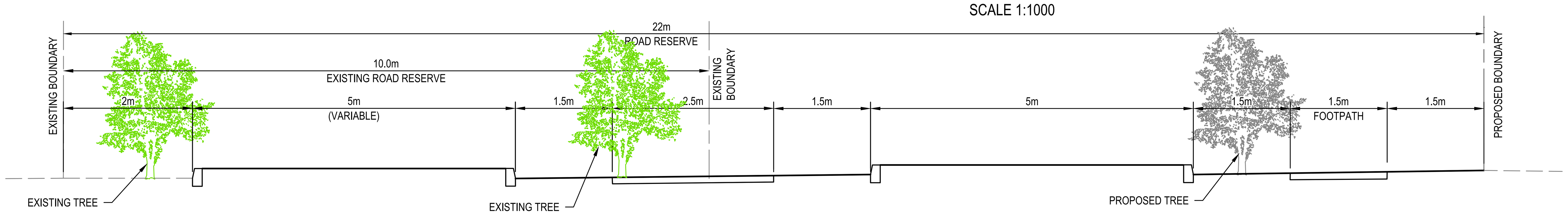


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## LEGEND

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| - - - - | FUTURE FAR NORTH COLLECTOR ROAD |
| — — — | FUTURE FAR NORTH COLLECTOR DRAINAGE |
| | FUTURE BATTER |

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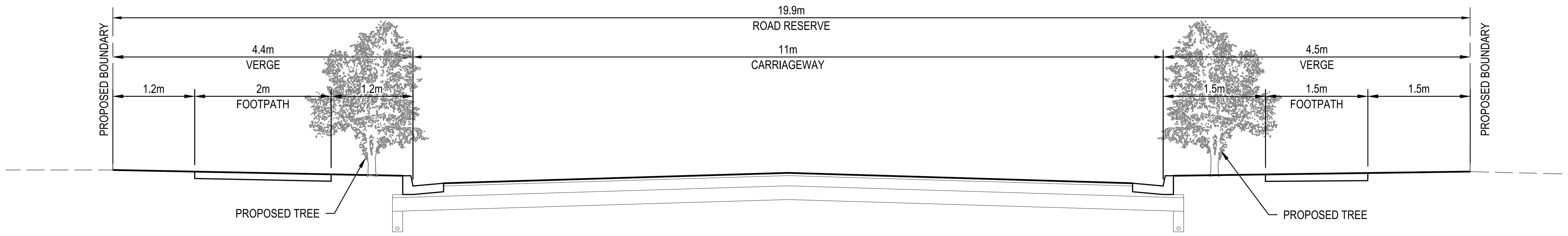


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- FUTURE FAR NORTH COLLECTOR DRAINAGE
- FUTURE BATTER

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

XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Surface; XR-82022134-D-TYP-RD-SECTS
CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK005.dwg

REVISION IN PROGRESS

| Rev. | Date | Description | Des. | Verif. | Appd. |
|---|---|---|---|---|---|
| 1 | | ISSUED FOR INFORMATION ONLY | DAC | JM | BRH |

Shoalhaven City Council



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| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |
| SELF CHECK | | | | |

Drawn DAC — Date
Checked — Date
Designed DAC — Date
Verified JMG — Date
Approved BRH

Client: SHOALHAVEN CITY COUNCIL
Project: TAYLORS LANE
OPTIONS COST ASSESSMENT
Title: OPTION E2 ROAD LAYOUT PLAN

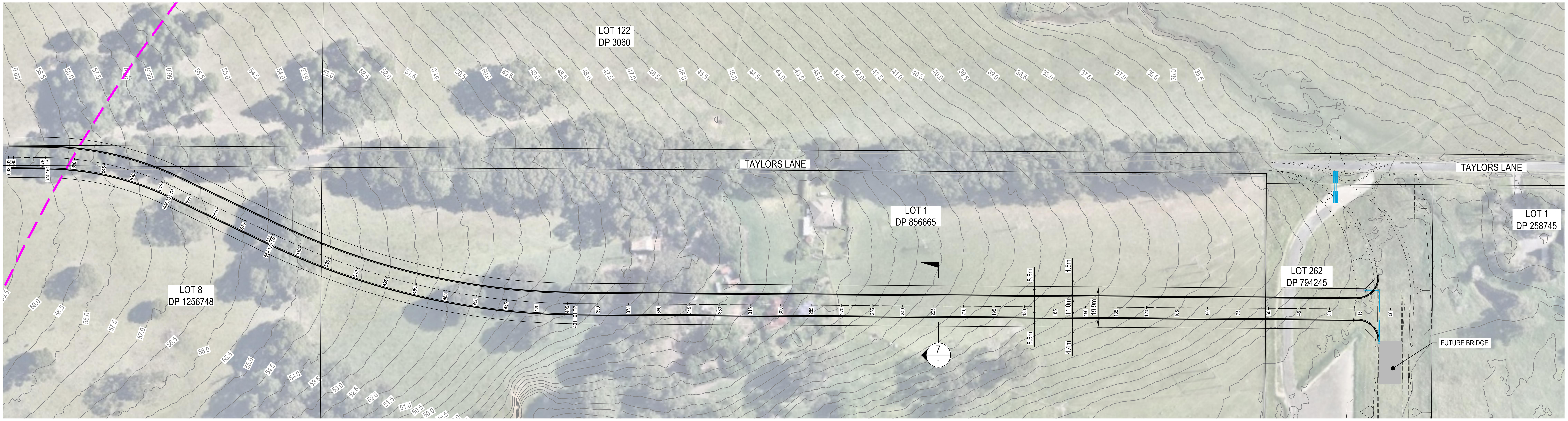
Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

| DATUM | Scale | Size |
|---|---|---|
| AHD | AS SHOWN | A1 |

| Drawing Number | Revision |
|---|---|
| 82022134-01 SK005 | 1 |

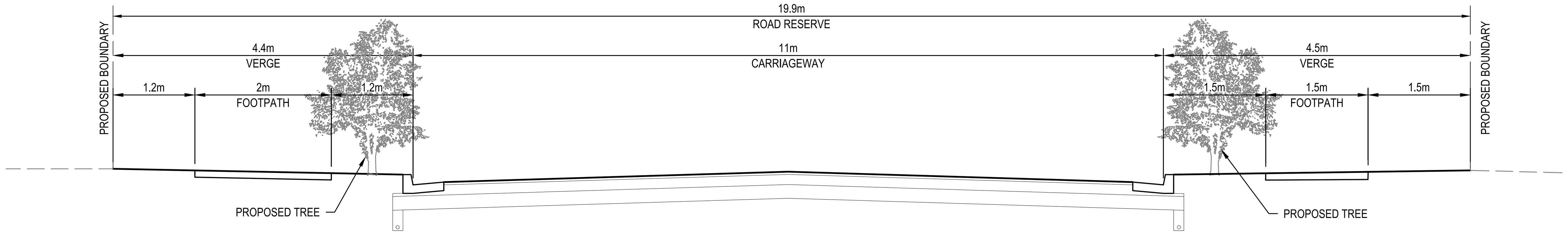
DATE PLOTTED: 12 July 2022 11:35 AM BY : DAMIEN COUNTER

NORTH




OPTION E3 ROAD LAYOUT

SCALE 1:1000




SECTION 7

SCALE 1:50

SK005 SK006 SK007 SK008

LEGEND

- URBAN RELEASE AREA BOUNDARY
- 10.0 EXISTING SURFACE CONTOURS
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE FAR NORTH COLLECTOR DRAINAGE
- FUTURE BATTER

0 1 2 3 4 5m

SCALE 1:50 (A1), 1:100 (A3) @A1

0 20 40 60 80 100m

SCALE 1:1000 (A1), 1:2000 (A3) @A1

XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Surface; XR-82022134-D-TYP-RD-SECTS

CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK006.dwg

REVISION IN PROGRESS

| Rev. | Date | Description | Des. | Verif. | Appd. |
|---|---|---|---|---|---|
| 1 | | ISSUED FOR INFORMATION ONLY | DAC | JM | BRH |

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|---|---|---|---|---|
| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |

SELF CHECK

Drawn DAC | Date
Checked | Date
Designed DAC | Date
Verified JMG | Date
Approved BRH

Client: SHOALHAVEN CITY COUNCIL

Project: TAYLORS LANE
OPTIONS COST ASSESSMENT

Title: OPTION E3 ROAD LAYOUT PLAN

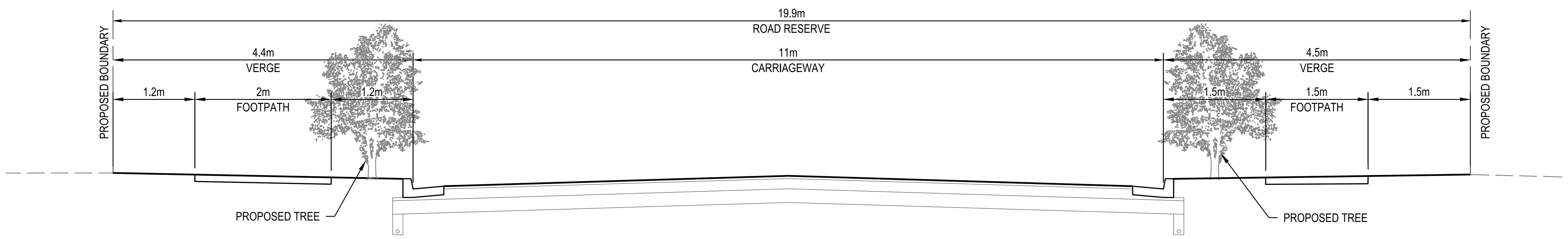
Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DATUM: AHD | Scale: AS SHOWN | Size: A1

Drawing Number: 82022134-01 SK006 | Revision: 1


## OPTION E4 ROAD LAYOUT

SCALE 1:1000




SECTION 7

SCALE 1:50

SK005 SK006 SK007 SK008

## LEGEND

- URBAN RELEASE AREA BOUNDARY
- 10.0 EXISTING SURFACE CONTOURS
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE FAR NORTH COLLECTOR DRAINAGE
- FUTURE BATTER

0 1 2 3 4 5m

SCALE 1:50 (A1), 1:100 (A3) @A1

0 20 40 60 80 100m

SCALE 1:1000 (A1), 1:2000 (A3) @A1

REVISION IN PROGRESS

| Rev. | Date | Description | Des. | Verif. | Appd. |
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| 1 | | ISSUED FOR INFORMATION ONLY | DAC | JM | BRH |

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|---|---|---|---|---|
| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |
| SELF CHECK | | | | |

Drawn DAC — Date
Checked — Date
Designed DAC — Date
Verified JMG — Date
Approved BRH

Client: SHOALHAVEN CITY COUNCIL

Project: TAYLORS LANE
OPTIONS COST ASSESSMENT

Title: OPTION E4 ROAD LAYOUT PLAN

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DATUM: AHD | Scale: AS SHOWN | Size: A1

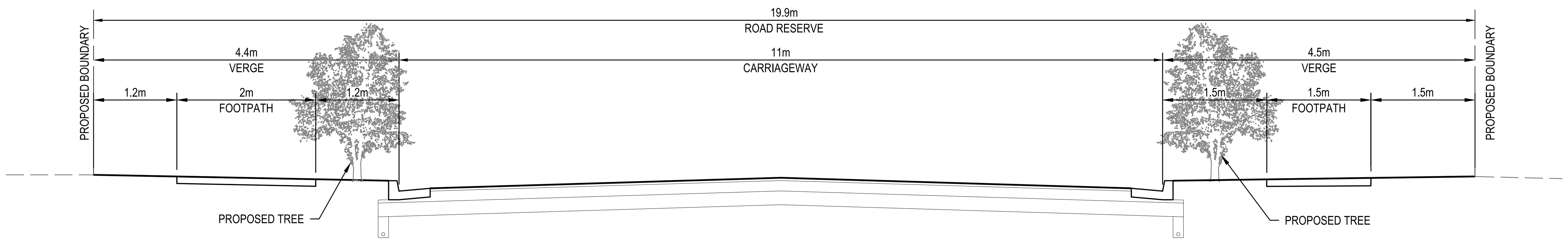
Drawing Number: 82022134-01 SK007 | Revision: 1

DATE PLOTTED: 31 May 2022 5:11 PM BY : DAMIEN COUNTER

XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Surface; XR-82022134-D-TYP-RD-SECTS
CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK007.dwg


## OPTION E5 ROAD LAYOUT

SCALE 1:1000




SECTION 7

SCALE 1:50

SK005 SK006 SK007 SK008

## LEGEND

- URBAN RELEASE AREA BOUNDARY
- 10.0 EXISTING SURFACE CONTOURS
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE FAR NORTH COLLECTOR DRAINAGE
- FUTURE BATTER

0 1 2 3 4 5m

SCALE 1:50 (A1), 1:100 (A3) @A1

0 20 40 60 80 100m

SCALE 1:1000 (A1), 1:2000 (A3) @A1

REVISION IN PROGRESS

| Rev. | Date | Description | Des. | Verif. | Appd. |
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|---|---|---|---|---|
| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |

SELF CHECK

Drawn DAC Date
Checked Date
Designed DAC Date
Verified JMG Date
Approved BRH

Client: SHOALHAVEN CITY COUNCIL

Project: TAYLORS LANE
OPTIONS COST ASSESSMENT

Title: OPTION E5 ROAD LAYOUT PLAN

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum: AHD | Scale: AS SHOWN | Size: A1

Drawing Number: 82022134-01 SK008 | Revision: 1

DATE PLOTTED: 31 May 2022 5:13 PM BY : DAMIEN COUNTER

XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-E-Surface; XR-82022134-G-CADASTRE-2020; XR-82022134-D-TYP-RD-SECTS
CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK008.dwg

APPENDIX

# B

UTILITY LAYOUT SKETCHES

Cardno

now

Stantec

DATE PLOTTED: 6 April 2022 2:28 PM BY : DAMIEN COUNTER

XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Surface; XR-82022134-E-Utilities
CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK009.dwg

NORTH


## OPTION W1 EXISTING SERVICES LAYOUT

SCALE 1:1000

### LEGEND

- EXISTING ELECTRICAL CONDUIT
- EXISTING OVERHEAD ELECTRICAL CONDUIT
- EXISTING OPTUS MAIN
- EXISTING GAS MAIN
- EXISTING SEWER MAIN
- URBAN RELEASE AREA BOUNDARY
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE BATTER

0 20 40 60 80 100m

SCALE 1:1000 (A1), 1:2000 (A3) @A1

REVISION IN PROGRESS

| Rev. | Date | Description | Des. | Verif. | Appd. |
|---|---|---|---|---|---|
| 1 | | ISSUED FOR INFORMATION ONLY | DAC | JM | BRH |

Shoalhaven City Council



CHECK PRINT ONLY

| PRELIMINARY / FINAL | INITIAL | DATE | INITIAL | DATE |
|---|---|---|---|---|
| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |

SELF CHECK

Drawn DAC
Checked
Designed DAC
Verified JMG
Approved BRH

Client: SHOALHAVEN CITY COUNCIL

Project: TAYLORS LANE
OPTIONS COST ASSESSMENT

Title: OPTION W1
EXISTING SERVICES LAYOUT PLAN

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DATUM: AHD | Scale: 1:1000 | Size: A1

Drawing Number: 82022134-01 SK009 | Revision: 1

DATE PLOTTED: 6 April 2022 2:30 PM BY : DAMIEN COUNTER


OPTION W2 EXISTING SERVICES LAYOUT

SCALE 1:1000

## LEGEND

| | |
|---|---|
| E | EXISTING ELECTRICAL CONDUIT |
| E OH | EXISTING OVERHEAD ELECTRICAL CONDUIT |
| OPT | EXISTING OPTUS MAIN |
| G | EXISTING GAS MAIN |
| S | EXISTING SEWER MAIN |
| | URBAN RELEASE AREA BOUNDARY |
| | FUTURE FAR NORTH COLLECTOR ROAD |
| | FUTURE BATTER |

0 20 40 60 80 100m

SCALE 1:1000 (A1), 1:2000 (A3) @A1

REVISION IN PROGRESS

| Rev. | Date | Description | Des. | Verif. | Appd. |
|---|---|---|---|---|---|
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|---|---|---|---|---|
| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |

SELF CHECK

| | |
|---|---|
| Drawn DAC | Date |
| Checked | Date |
| Designed DAC | Date |
| Verified JMG | Date |
| Approved BRH | |

Client: SHOALHAVEN CITY COUNCIL

Project: TAYLORS LANE
OPTIONS COST ASSESSMENT

Title: OPTION W2
EXISTING SERVICES LAYOUT PLAN

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

| DATUM | Scale | Size |
|---|---|---|
| AHD | 1:1000 | A1 |

| Drawing Number | Revision |
|---|---|
| 82022134-01 SK010 | 1 |

XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-E-Surface; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Utilities
CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK010.dwg


## OPTION W3 EXISTING SERVICES LAYOUT
SCALE 1:1000

### LEGEND

- EXISTING ELECTRICAL CONDUIT
- EXISTING OVERHEAD ELECTRICAL CONDUIT
- EXISTING OPTUS MAIN
- EXISTING GAS MAIN
- EXISTING SEWER MAIN
- URBAN RELEASE AREA BOUNDARY
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE BATTER


## OPTION W3A EXISTING SERVICES LAYOUT
SCALE 1:1000

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

REVISION IN PROGRESS

| Rev. | Date | Description | Des. | Verif. | Appd. |
|---|---|---|---|---|---|
| 1 | | ISSUED FOR INFORMATION ONLY | DAC | JM | BRH |

Shoalhaven City Council



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|---|---|---|---|---|
| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |
| SELF CHECK | | | | |

Drawn DAC
Checked
Designed DAC
Verified JMG
Approved BRH

Client SHOALHAVEN CITY COUNCIL
Project TAYLORS LANE OPTIONS COST ASSESSMENT
Title OPTION W3 AND W3A EXISTING SERVICES LAYOUT PLAN

Status FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DATUM AHD | Scale 1:1000 | Size A1
Drawing Number 82022134-01 SK011 | Revision 1

DATE PLOTTED: 6 April 2022 2:32 PM BY : DAMIEN COUNTER

XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Surface; XR-82022134-E-Utilities
CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK011.dwg

DATE PLOTTED: 6 April 2022 2:34 PM BY : DAMIEN COUNTER


OPTION E1 EXISTING SERVICES LAYOUT

SCALE 1:1000

## LEGEND

- EXISTING ELECTRICAL CONDUIT
- EXISTING OVERHEAD ELECTRICAL CONDUIT
- EXISTING OPTUS MAIN
- EXISTING GAS MAIN
- EXISTING SEWER MAIN
- URBAN RELEASE AREA BOUNDARY
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE BATTER


OPTION E1A EXISTING SERVICES LAYOUT

SCALE 1:1000

0 20 40 60 80 100m

SCALE 1:1000 (A1), 1:2000 (A3) @A1

XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-E-Surface; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Utilities

CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK012.dwg

REVISION IN PROGRESS

| Rev. | Date | Description | Des. | Verif. | Appd. |
|---|---|---|---|---|---|
| 1 | | ISSUED FOR INFORMATION ONLY | DAC | JM | BRH |

Shoalhaven City Council



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| PRELIMINARY / FINAL | INITIAL | DATE | INITIAL | DATE |
|---|---|---|---|---|
| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |

SELF CHECK

Drawn DAC Date
Checked Date
Designed DAC Date
Verified JMG Date
Approved BRH

Client SHOALHAVEN CITY COUNCIL

Project TAYLORS LANE
OPTIONS COST ASSESSMENT

Title OPTION E1 AND E1A
EXISTING SERVICES LAYOUT PLAN

Status FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DATUM AHD | Scale 1:1000 | Size A1

Drawing Number 82022134-01 SK012 | Revision 1


OPTION E2 EXISTING SERVICES LAYOUT
SCALE 1:1000

## LEGEND

- EXISTING ELECTRICAL CONDUIT
- EXISTING OVERHEAD ELECTRICAL CONDUIT
- EXISTING OPTUS MAIN
- EXISTING GAS MAIN
- EXISTING SEWER MAIN
- URBAN RELEASE AREA BOUNDARY
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE BATTER

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

DATE PLOTTED: 6 April 2022 2:37 PM BY : DAMIEN COUNTER

XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Surface; XR-82022134-E-Utilities
CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK013.dwg

REVISION IN PROGRESS

| Rev. | Date | Description | Des. | Verif. | Appd. |
|---|---|---|---|---|---|
| 1 | | ISSUED FOR INFORMATION ONLY | DAC | JM | BRH |

Shoalhaven City Council



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| PRELIMINARY / FINAL | INITIAL | DATE | INITIAL | DATE |
|---|---|---|---|---|
| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |

SELF CHECK

Drawn: DAC
Checked:
Designed: DAC
Verified: JMG
Approved: BRH

Client: SHOALHAVEN CITY COUNCIL
Project: TAYLORS LANE
OPTIONS COST ASSESSMENT
Title: OPTION E2
EXISTING SERVICES LAYOUT PLAN
Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
DATUM: AHD
Scale: 1:1000
Size: A1
Drawing Number: 82022134-01 SK013
Revision: 1


# OPTION E3 EXISTING SERVICES LAYOUT

SCALE 1:1000

## LEGEND

| | |
|---|---|
| E | EXISTING ELECTRICAL CONDUIT |
| EOH | EXISTING OVERHEAD ELECTRICAL CONDUIT |
| OPT | EXISTING OPTUS MAIN |
| G | EXISTING GAS MAIN |
| S | EXISTING SEWER MAIN |
| | EXISTING SERVICE EASEMENT |
| | URBAN RELEASE AREA BOUNDARY |
| | FUTURE FAR NORTH COLLECTOR ROAD |
| | FUTURE BATTER |

0 20 40 60 80 100m

SCALE 1:1000 (A1), 1:2000 (A3) @A1

DATE PLOTTED: 12 July 2022 11:36 AM BY : DAMIEN COUNTER

XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Surface; XR-82022134-E-Utilities
CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK014.dwg

REVISION IN PROGRESS

| Rev. | Date | Description | Des. | Verif. | Appd. |
|---|---|---|---|---|---|
| 1 | | ISSUED FOR INFORMATION ONLY | DAC | JM | BRH |

Shoalhaven City Council



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|---|---|---|---|---|
| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |

SELF CHECK

| | | Date |
|---|---|---|
| Drawn | DAC | |
| Checked | | |
| Designed | DAC | |
| Verified | JMG | |
| Approved | BRH | |

Client: SHOALHAVEN CITY COUNCIL

Project: TAYLORS LANE
OPTIONS COST ASSESSMENT

Title: OPTION E3
EXISTING SERVICES LAYOUT PLAN

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

| DATUM | Scale | Size |
|---|---|---|
| AHD | 1:1000 | A1 |

| Drawing Number | Revision |
|---|---|
| 82022134-01 SK014 | 1 |

DATE PLOTTED: 6 April 2022 2:42 PM BY : DAMIEN COUNTER


## OPTION E4 EXISTING SERVICES LAYOUT

SCALE 1:1000

## LEGEND

- EXISTING ELECTRICAL CONDUIT
- EXISTING OVERHEAD ELECTRICAL CONDUIT
- EXISTING OPTUS MAIN
- EXISTING GAS MAIN
- EXISTING SEWER MAIN
- URBAN RELEASE AREA BOUNDARY
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE BATTER

0 20 40 60 80 100m

SCALE 1:1000 (A1), 1:2000 (A3) @A1

| Rev. | Date | Description | Des. | Verif. | Appd. |
|---|---|---|---|---|---|
| 1 | | ISSUED FOR INFORMATION ONLY | DAC | JM | BRH |

REVISION IN PROGRESS

Shoalhaven City Council



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|---|---|---|---|---|
| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |
| SELF CHECK | | | | |

Drawn DAC — Date
Checked — Date
Designed DAC — Date
Verified JMG — Date
Approved BRH

Client: SHOALHAVEN CITY COUNCIL
Project: TAYLORS LANE OPTIONS COST ASSESSMENT
Title: OPTION E4 EXISTING SERVICES LAYOUT PLAN

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DATUM: AHD | Scale: 1:1000 | Size: A1
Drawing Number: 82022134-01 SK015 | Revision: 1

XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Surface; XR-82022134-E-Utilities
CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK015.dwg

DATE PLOTTED: 6 April 2022 2:43 PM BY : DAMIEN COUNTER


## OPTION E5 EXISTING SERVICES LAYOUT

SCALE 1:1000

0 20 40 60 80 100m

SCALE 1:1000 (A1), 1:2000 (A3) @A1

| Rev. | Date | Description | Des. | Verif. | Appd. |
| --- | --- | --- | --- | --- | --- |
| 1 | | ISSUED FOR INFORMATION ONLY | DAC | JM | BRH |

REVISION IN PROGRESS

Shoalhaven City Council



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| PRELIMINARY / FINAL | INITIAL | DATE | INITIAL | DATE |
| --- | --- | --- | --- | --- |
| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |

SELF CHECK

Drawn: DAC
Checked:
Designed: DAC
Verified: JMG
Approved: BRH

Client: SHOALHAVEN CITY COUNCIL

Project: TAYLORS LANE
OPTIONS COST ASSESSMENT

Title: OPTION E5
EXISTING SERVICES LAYOUT PLAN

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DATUM: AHD | Scale: 1:1000 | Size: A1

Drawing Number: 82022134-01 SK016 | Revision: 1

XREF's: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-E-Surface; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Utilities
CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK016.dwg

APPENDIX

# C

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Shoalhaven City Council

# Contour Map Option W

## TAYLORS LANE OPTIONS ASSESSMENT

**Legend**

- Design Option W1
- Design Option W2
- Design Option W3
- Design Option W3A
- North Collector Road
- 1m Contours (LPI LiDAR, 2010)
- Watercourses (LPI)
- Cadastre (NSW SS, 2019)

1:5,500 Scale at A3

m

0 50 100 150 200

N

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (MNL)
Date: 2022-03-15 | Project: 82022134
Coordinate System: GDA2020 MGA Zone 56
Map: 82022134-GS011_ContourMapOptionW.aprx 01
Aerial imagery supplied by MetroMap (November, 2020)


Shoalhaven City Council

# Contour Map Option E

## TAYLORS LANE OPTIONS ASSESSMENT

### Legend

- Design Option E1
- Design Option E1A
- Design Option E2
- Design Option E3
- Design Option E4
- Design Option E5
- North Collector Road
- 1m Contours (LPI LiDAR, 2010)
- Watercourses (LPI)
- Cadastre (NSW SS, 2019)

1:5,000 Scale at A3

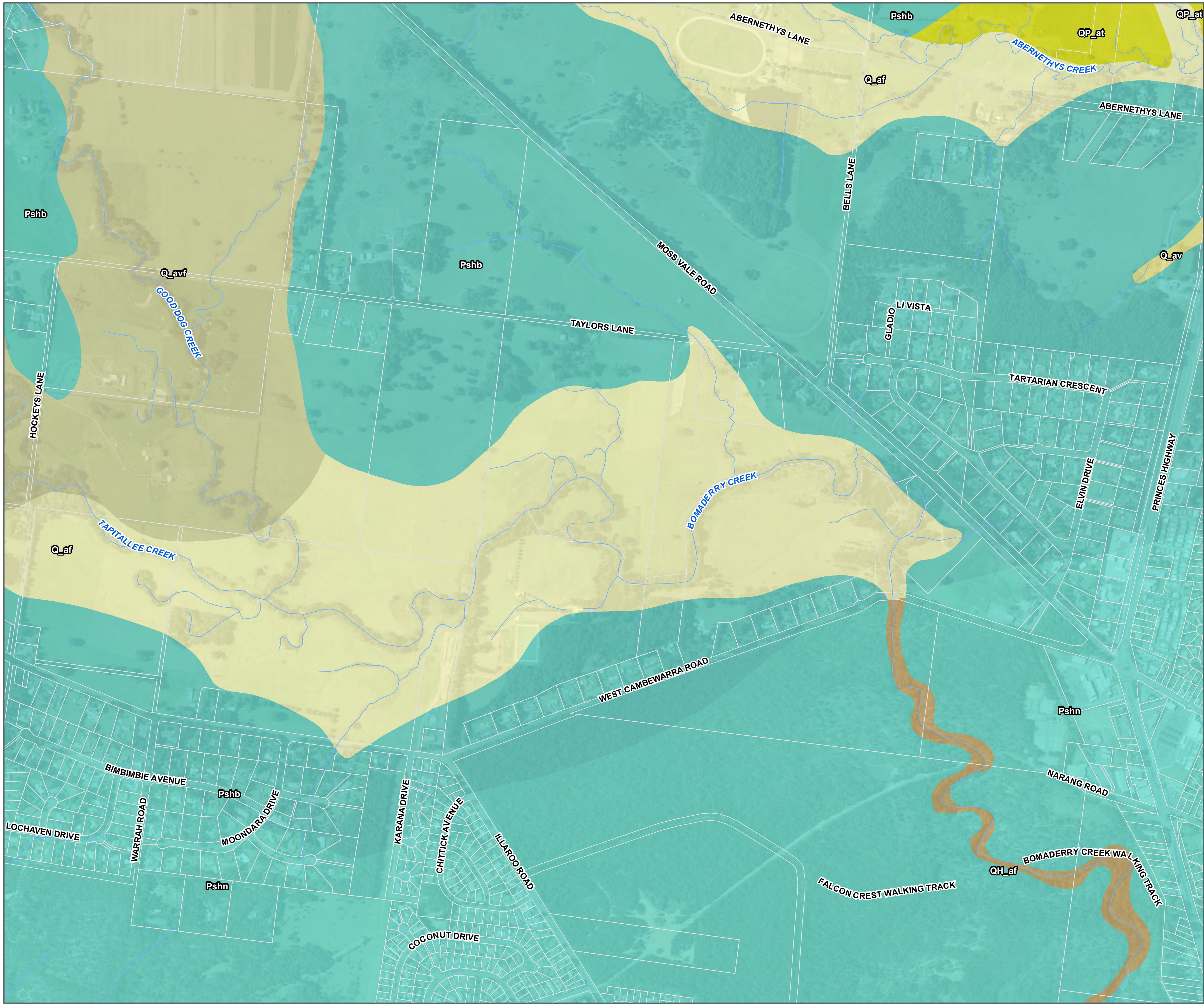
m

0 50 100 150

N

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (MNL)
Date: 2022-03-15 | Project: 82022134
Coordinate System: GDA2020 MGA Zone 56
Map: 82022134-GS010_ContourMapOptionE.aprx 01
Aerial imagery supplied by MetroMap (November, 2020)




Shoalhaven City Council

# Geology Plan

TAYLORS LANE
OPTIONS ASSESSMENT

## Legend

- Watercourses (LPI)
- Cadastre (NSW SS, 2019)

**NSW Seamless Geology (Geoscience NSW)**

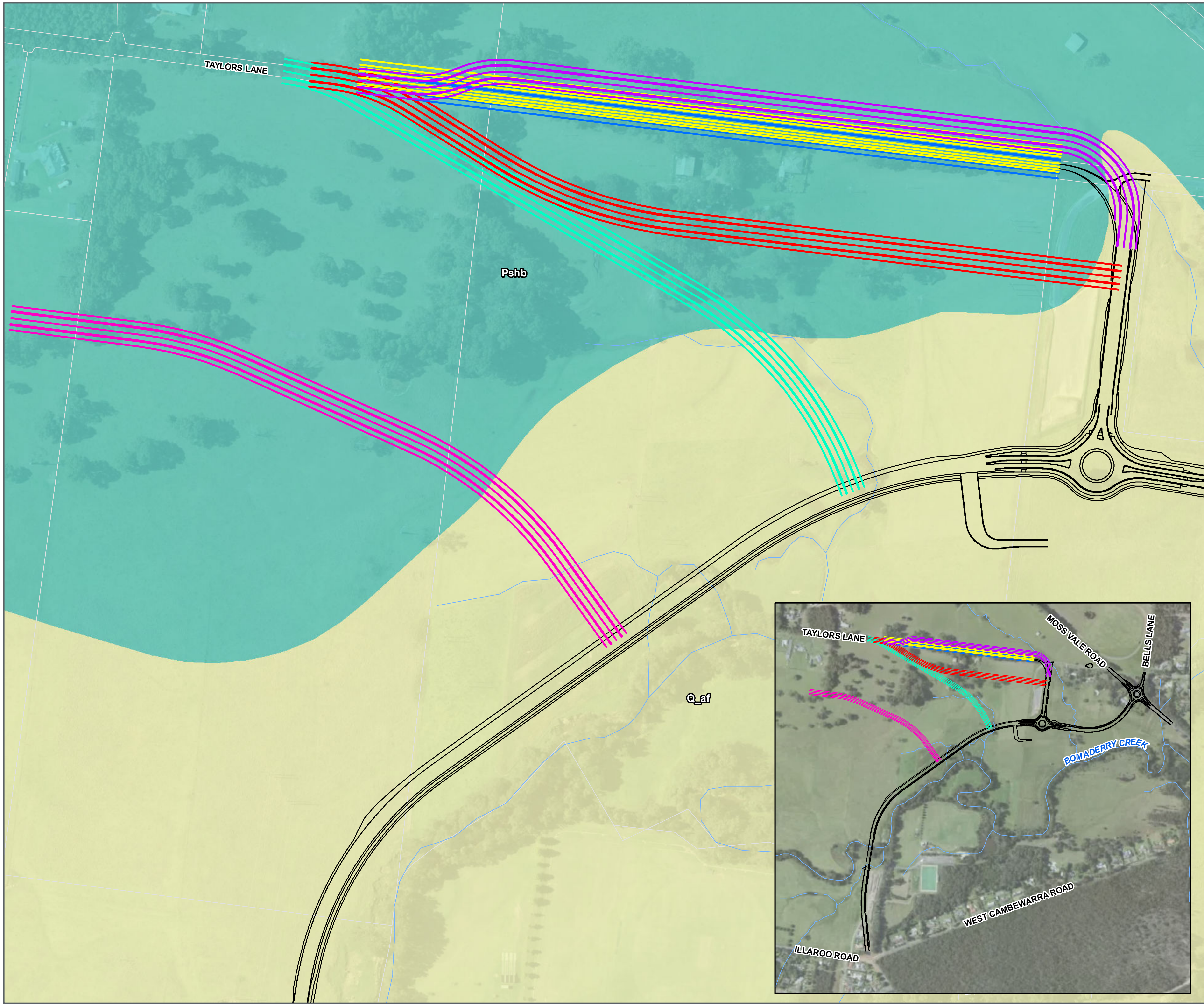
- Alluvial Valley Deposits (QH_af)
- Alluvial Terrace Deposits (QP_at)
- Alluvial Flood Plain Deposits (Q_af)
- Alluvial Valley Deposits (Q_av)
- Alluvial Fan Deposits (Q_avf)
- Berry Siltstone (Pshb)
- Nowra Sandstone (Pshn)

1:10,000 Scale at A3

m
0 100 200 300 400

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2022-02-25 | Project: 82022134
Coordinate System: GDA2020 MGA Zone 56
Map: 82022134-GS001_GeologyPlan.mxd 01
Aerial imagery supplied by MetroMap (November, 2020)




Shoalhaven City Council

# Geology Plan
# Design Options E

TAYLORS LANE
OPTIONS ASSESSMENT

## Legend

- Design Option E1
- Design Option E1A
- Design Option E2
- Design Option E3
- Design Option E4
- Design Option E5
- North Collector Road
- Watercourses (LPI)
- Cadastre (NSW SS,

**NSW Seamless Geology (Geoscience NSW)**

- Alluvial Flood Plain Deposits (Q_af)
- Berry Siltstone (Pshb)

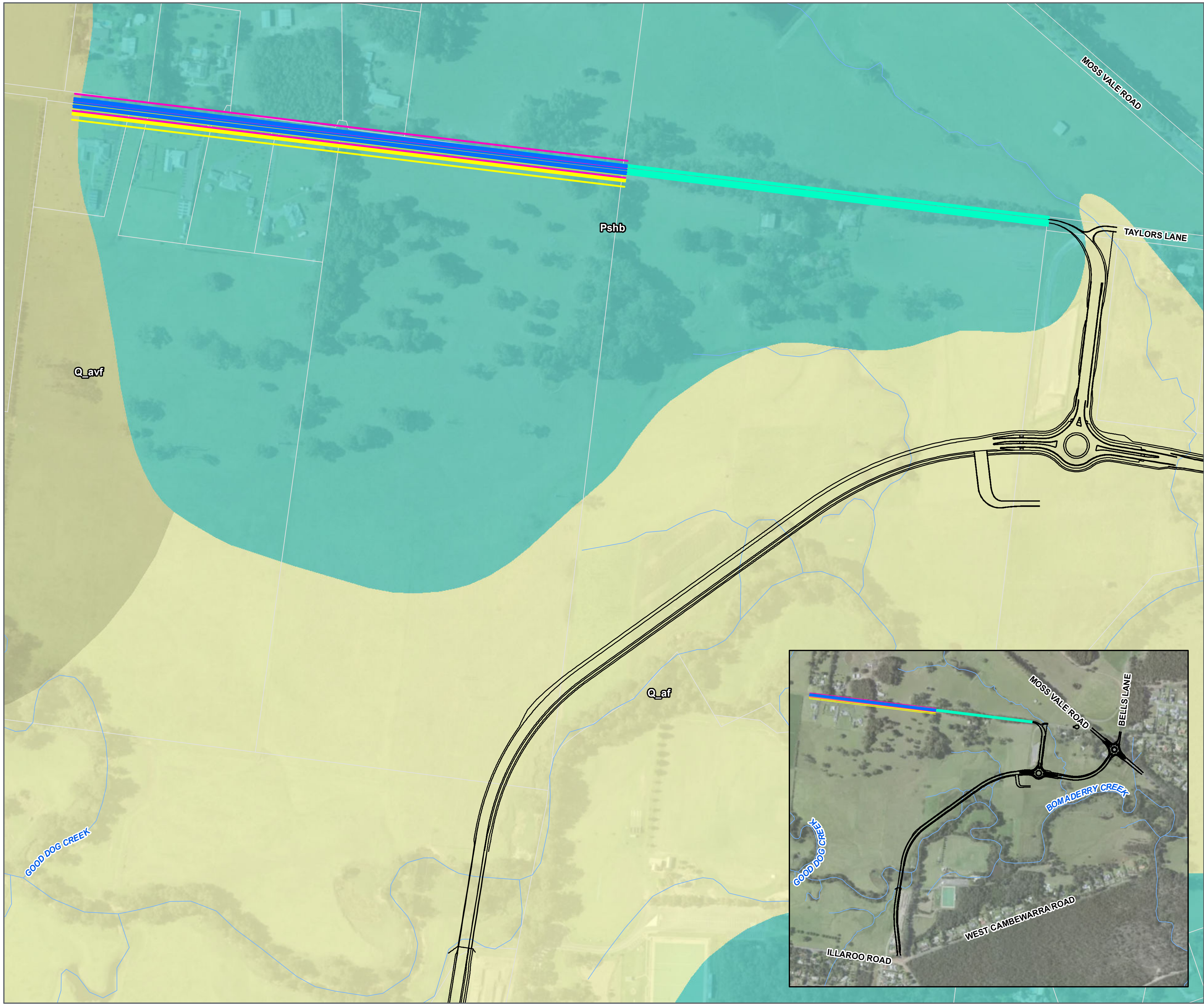
1:3,000 Scale at A3

m
0 50 100 150

N

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2022-03-03 | Project: 82022134
Coordinate System: GDA2020 MGA Zone 56
Map: 82022134-GS002_GeologyPlanOptionE.mxd 01
Aerial imagery supplied by MetroMap (November, 2020)




Shoalhaven City Council

# Geology Plan Design Options W

TAYLORS LANE OPTIONS ASSESSMENT

## Legend

- Design Option W3
- Design Option W1
- Design Option W2
- Design Option W3A
- North Collector Road
- Watercourses (LPI)
- Cadastre (NSW SS, 2019)

**NSW Seamless Geology (Geoscience NSW)**

- Alluvial Flood Plain Deposits (Q_af)
- Alluvial Fan Deposits (Q_avf)
- Berry Siltstone (Pshb)

1:4,000 Scale at A3

m
0 50 100 150 200

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2022-03-03 | Project: 82022134
Coordinate System: GDA2020 MGA Zone 56
Map: 82022134-GS003_GeologyPlanOptionW.mxd 01
Aerial imagery supplied by MetroMap (November, 2020)

**Historic Imagery Review**

<table>
<tr><th>Aerial Image</th><th>Commentary</th></tr>
<tr><td>Year: 1970<br><br>Source: NSW Historical Imagery</td><td>

- Imagery shows the alignment of Taylors Lane is still in the same place as 2022;
- Areas to the north and south of the road are comprised of rural farmland with various channels and tributaries present;
- A slightly forested area directly south of the western half of Taylors Lane; and
- Large trees can be seen along about 50% of the alignment of Taylors Lane.

</td></tr>
</table>

| Aerial Image | Commentary |
| --- | --- |
| Year: 1984<br><br>Source: NSW Historical Imagery | > Site conditions are relatively similar compared with previous image;<br>> Some deforestation has occurred in the area directly south of Taylors Lane; and<br>> Channels and tributaries appear darker and image may have been taken following a wet weather period. |

| Aerial Image | Commentary |
|---|---|
| Year: 1993<br><br>Source: NSW Historical Imagery | > Site conditions are relatively similar as previous image. |

<table>
<tr><th>Aerial Image</th><th>Commentary</th></tr>
<tr><td>Year: 2002<br><br>Source: NSW Historical Imagery</td><td>> Site conditions are relatively similar previous image; and<br>> A two-tiered dam has been constructed on the property to the north of Taylors Lane.</td></tr>
</table>

| Aerial Image | Commentary |
|---|---|
| Year: 2006<br><br>Source: NSW Historical Imagery | > Site conditions are relatively similar to previous image; and<br>> Partially sealed pavement at eastern end of Taylors Lane. |

<table>
<tr><th>Aerial Image</th><th>Commentary</th></tr>
<tr><td>Year: 2016<br><br>Source: Google Earth</td><td>> Site conditions are similar to previous image; and<br>> Appears that sealing of road has extended further to the west.</td></tr>
</table>

| Aerial Image | Commentary |
|---|---|
| Year: 2020<br><br>Source: Metromap | > Site conditions are relatively similar to previous image.<br>> An area cleared and material has been placed in a paddock to the south of Taylors Lane<br>> There also appear the be additional trees along the alignment and other trees along the alignment have increased in size of Taylors Lane from the start of the 1970 imagery to the 2020 imagery. |

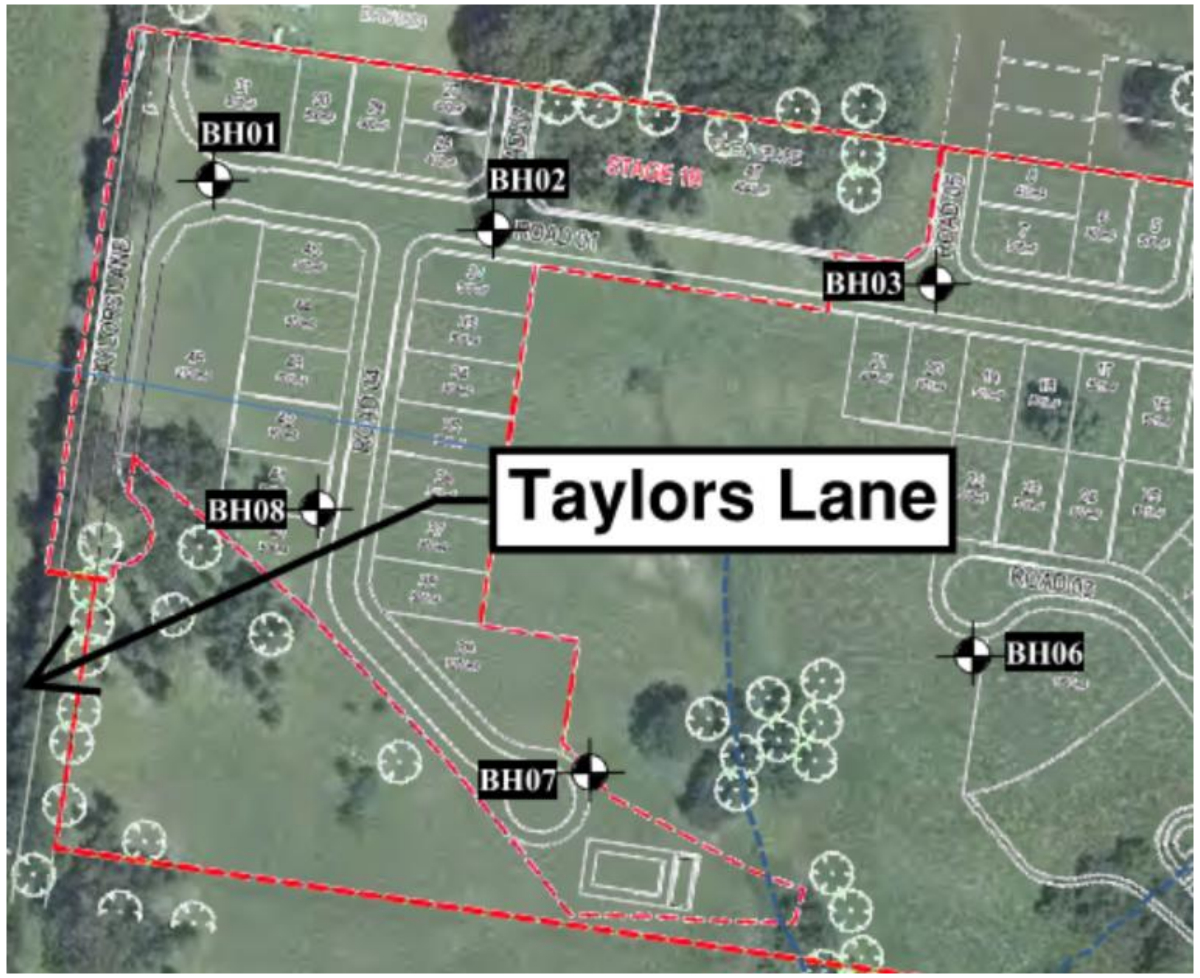
<table>
<tr><th>Aerial Image</th><th>Commentary</th></tr>
<tr><td>Year: 2021 (August)<br>

<br>Source: Google Earth</td><td>

- Extensive subdivision earthworks to the north of Taylors Lane at a site about 730m west of the intersection of Taylors Lane and Moss Vale Road.
- Tree clearing along the Taylors Lane alignments adjacent to the above mentioned subdivision earthworks.
- Stripping of vegetation and placement of soil along the eastern portion of the Far North Collector Road alignment.
- Remainder of site in similar condition to previous image

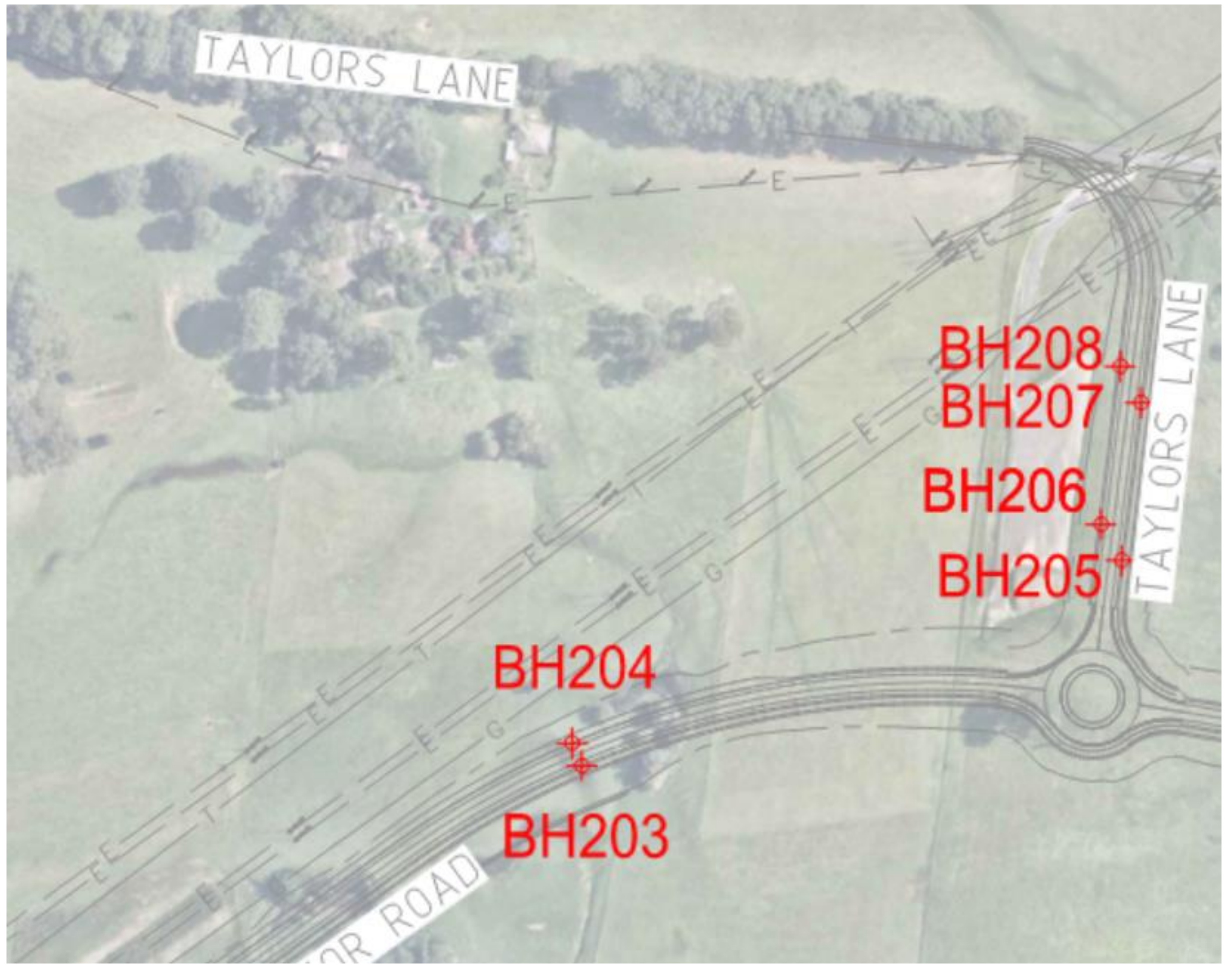
</td></tr>
</table>

## Summarised Geotechnical Reports

| Geotechnical Investigation | Borehole ID, Depths (m), Geological Formation, Strength, Additional comments | |
|---|---|---|
| Lot 1 DP949932 Taylors Lane, Cambewarra NSW “Report on Geotechnical Pavement Investigation” dated the 9th of November by Terra Insight Pty Ltd<br><br>This site is located adjacent to the Taylors Lane Road alignment on the northern side, about 730m west of the intersection of Taylors Lane and Moss Vale Road. | BH01<br>0.00 – 0.15 Sandy Silt, low plasticity, dark brown to brown (Topsoil)<br>0.15 – 0.40 Sandy Clay, low to medium plasticity, brown, firm to stiff (Residual)<br>0.40 – 0.70 CLAY, high plasticity, pale brown with orange-red mottling, stiff (Residual)<br>0.70 – 1.00 Silty CLAY, high plasticity, red and grey, very stiff (Residual)<br>Groundwater not encountered<br>Borehole Terminated at 1.0m<br><br>BH02<br>0.00 – 0.15 Sandy SILT, low plasticity, dark brown to brown (Topsoil)<br>0.15 – 0.30 Sandy CLAY, low to medium plasticity, brown, firm to stiff (Residual)<br>0.30 – 0.80 CLAY, medium plasticity, pale brown with orange-red mottling, stiff (Residual)<br>0.80 – 1.00 Silty CLAY, medium plasticity, red and grey, very stiff (Residual)<br>Groundwater not encountered<br>Borehole Terminated at 1.0m<br><br>BH07<br>0.00 – 0.20 Clayey Sandy SILT, low plasticity, dark brown to brown (Topsoil)<br>0.20 – 0.70 CLAY, medium plasticity, red-orange brown, firm (Residual)<br>0.70 – 1.00 Silty CLAY, medium plasticity, grey and orange, stiff to very stiff (Residual)<br>Groundwater not encountered<br>Borehole Terminated at 1.0m<br><br>BH08<br>0.00 – 0.10 Sandy SILT, low plasticity, dark brown to brown (Topsoil)<br>0.10 – 0.25 Sandy Clay, low to medium plasticity, brown, firm (Residual)<br>0.25 – 0.75 CLAY, medium plasticity, pale brown with orange-red mottling, firm (Residual)<br>0.77 – 1.00 Silty CLAY, medium plasticity, red and grey, stiff (Residual)<br>Groundwater not encountered<br>Borehole Terminated at 1.0m | <br> |

| Geotechnical Investigation | Borehole ID, Depths (m), Geological Formation, Strength, Additional comments | |
|---|---|---|
| North Nowra Collector Road "Stage 2 Geotechnical Investigation" dated the 27th of August 2019 by Construction Sciences Pty Ltd.<br><br>The relevant boreholes in this investigation were conducted along the existing road alignment from the intersection of Taylors Lane and Moss Vale Road to approximately 730m to the west. | BH11<br>0.00 – 0.40 Clayey SAND, fine to coarse grained, dark brown (Fill)<br>0.40 – 0.90 Silty Clay, high plasticity, orange-brown to red-brown, stiff to very stiff (Residual)<br>0.90 – 1.20 Silty CLAY, high plasticity, orange-brown to red-brown and pale grey, very stiff (Residual)<br>Groundwater not encountered<br>Borehole Terminated at 1.20m<br><br>BH12<br>0.00 – 0.03 – Spray Seal<br>0.03 – 0.15 Gravelly SAND, fine to coarse grained, dark grey (Fill)<br>0.15 – 1.10 Gravelly SAND, fine to coarse grained, dark brown (Fill)<br>1.10 – 1.50 Clayey SILT, low plasticity, dark grey, firm (Alluvium)<br>Groundwater not encountered<br>Borehole Terminated at 1.50m<br><br>BH13<br>0.00 – 0.10 Clayey SILT, low plasticity, dark brown (Fill)<br>0.10 – 0.80 Silty CLAY, low to medium plasticity, dark brown (Fill)<br>0.80 – 1.20 Silty CLAY, high plasticity, orange-brown, firm (Alluvium)<br>Groundwater not encountered<br>Borehole Terminated at 1.20m | BH14<br>0.00 – 0.60 Silty CLAY: low to medium plasticity, dark brown (Fill)<br>0.60 – 1.30 Silty CLAY, high plasticity, orange-brown to red-brown and pale grey, very stiff (Residual)<br>Groundwater not encountered<br>Borehole Terminated at 1.30m<br><br>BH15<br>0.00 – 0.20 Sandy SILT, low plasticity, dark brown to brown (Topsoil)<br>0.10 – 0.70 Silty CLAY, high plasticity, orange-brown to red-brown, stiff to very stiff (Residual)<br>0.70 – 1.10 Silty CLAY, high plasticity, orange-brown to pale grey, very stiff to hard (Residual)<br>Groundwater not encountered<br>Borehole Terminated at 1.10m<br><br>BH16<br>0.00 – 0.03 Spray Seal<br>0.03 – 0.20 Gravelly SAND, fine to coarse grained, dark grey (Fill)<br>0.20 – 0.45 Silty CLAY, medium plasticity, brown (Fill)<br>0.450 – 1.20 Silty CLAY, high plasticity, orange-brown to red-brown, very stiff (Residual)<br>Groundwater not encountered<br>Borehole Terminated at 1.2m |

| Geotechnical Investigation | Borehole ID, Depths (m), Geological Formation, Strength, Additional comments | |
|---|---|---|
| Far North Collector Road "Geotechnical Investigation" ref: 10791/P/385 R1 dated the 9th of April 2021 by Construction Sciences<br><br>The relevant boreholes in this investigation were conducted along the proposed Far North Collector Road and Taylors Lane Link road alignments.<br><br>Relevant to proposed eastern design options E3, E4 and E5. | BH203<br>0.00 – 1.80 Silty SAND, fine to medium grained, brown, very loose (Alluvium)<br>1.80 – 3.50 SAND, fine to coarse grained, brown to pale brown, very loose to loose (Alluvium)<br>3.50 – 5.20 GRAVELLY SAND, fine to coarse grained, brown and grey, loose (Alluvium)<br>5.20 – 8.06 SILTSTONE, fine grained, dark grey, high strength (Rock)<br>Groundwater encountered at 2.00m depth.<br>Borehole Terminated at 8.06m<br><br>BH204<br>0.00 – 1.60 Silty SAND, fine to medium grained, brown, very loose (Alluvium)<br>1.60 – 4.00 SAND, fine to coarse grained, brown to pale brown, very loose to loose (Alluvium)<br>4.00 – 4.80 GRAVELLY SAND, fine to coarse grained, brown and grey, loose (Alluvium)<br>Groundwater encountered at 2.20m depth.<br>Borehole Terminated at 4.80m on weathered rock<br><br>BH205<br>0.00 – 0.25 Clayey SILT, low plasticity, dark brown (Topsoil)<br>0.25 – 2.20 CLAY medium to high plasticity, orange-brown and grey, stiff (Alluvium)<br>2.20 – 4.00 CLAY, high plasticity, grey and orange-brown, very stiff (Alluvium)<br>4.00 – 4.50 Sandy CLAY, medium to high plasticity, grey and orange-brown, very stiff to hard (Alluvium)<br>4.50 – 4.85 GRAVELLY SAND, fine to coarse grained, grey and brown, dense (Alluvium)<br>Groundwater encountered at 4.50m depth.<br>Borehole Terminated at 4.85m<br><br>BH206<br>0.00 – 0.30 Clayey SILT, low plasticity, dark brown (Topsoil)<br>0.30 – 2.30 CLAY medium to high plasticity, orange-brown and grey, stiff to very stiff (Alluvium)<br>2.30 – 4.20 CLAY, high plasticity, grey and orange-brown, very stiff (Alluvium)<br>4.20 – 4.60 Sandy CLAY, medium to high plasticity, grey and orange-brown, very stiff to hard (Alluvium)<br>4.60 – 4.90 GRAVELLY SAND, fine to coarse grained, grey and brown, medium dense (Alluvium)<br>4.90 – 7.95 SILTSTONE, fine grained, dark grey, high strength (Rock)<br>Groundwater encountered at 4.60m depth.<br>Borehole Terminated at 7.95m | BH207<br>0.00 – 0.30 SILT, low plasticity, dark brown (Topsoil)<br>0.30 – 1.60 CLAY medium to high plasticity, orange-brown and grey, stiff (Alluvium)<br>1.60 – 3.40 CLAY, high plasticity, dark brown and grey, very stiff (Alluvium)<br>3.40 – 4.20 Sandy CLAY, low to medium plasticity, grey and orange, very stiff to hard (Alluvium)<br>4.20 – 4.80 SAND, fine to coarse grained, grey, medium dense (Alluvium)<br>4.80 – 5.20 GRAVELLY SAND, fine to coarse grained, grey, dense (Alluvium)<br>Groundwater encountered at 4.20m depth.<br>Borehole Terminated at 5.20m on weathered rock<br><br>BH208<br>0.00 – 0.30 SILT, low plasticity, dark brown (Topsoil)<br>0.30 – 1.50 CLAY medium to high plasticity, orange-brown and grey, stiff (Alluvium)<br>1.50 – 3.20 CLAY, high plasticity, dark brown and grey, very stiff (Alluvium)<br>3.20 – 4.10 Sandy CLAY, low to medium plasticity, grey and orange, very stiff to hard (Alluvium)<br>4.10 – 4.70 SAND, fine to coarse grained, grey, medium dense (Alluvium)<br>4.70 – 5.30 GRAVELLY SAND, fine to coarse grained, grey, dense (Alluvium)<br>5.30 – 8.39 SILTSTONE, fine grained, dark grey, high strength (Rock)<br>Groundwater encountered at 4.10m depth.<br>Borehole Terminated at 5.20m on weathered rock |



APPENDIX

# D

COST ESTIMATE

Cardno

now

Stantec

| PRELIMINARY COST ESTIMATE | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Taylors Lane Option** | **W1** | **W2** | **W3** | **W3a** | **E1** | **E1a** | **E2** | **E3** | **E4** | **E5** | **Comment** |
| **Road Length (m)** | **610** | **610** | **610** | **581** | **701** | **684** | **675** | **696** | **598** | **586** | |
| **DEVELOPMENT COSTS** | | | | | | | | | | | |
| Professional Fees (10%) | $ 242,744 | $ 229,657 | $ 117,852 | $ 112,096 | $ 343,333 | $ 386,305 | $ 318,795 | $ 500,733 | $ 612,256 | $ 600,921 | Professional fees taken asl 10% of total construction costs. |
| **TOTAL PROFESSIONAL FEES** | **$ 242,744** | **$ 229,657** | **$ 117,852** | **$ 112,096** | **$ 343,333** | **$ 386,305** | **$ 318,795** | **$ 500,733** | **$ 612,256** | **$ 600,921** | |
| **TOTAL PROFESSIONAL FEES (Round-Up)** | **$ 250,000** | **$ 230,000** | **$ 120,000** | **$ 120,000** | **$ 350,000** | **$ 390,000** | **$ 320,000** | **$ 510,000** | **$ 620,000** | **$ 610,000** | |
| **CIVIL CONSTRUCTION** | | | | | | | | | | | |
| Preliminaries and Establishment (10%) | $ 186,726 | $ 176,659 | $ 90,655 | $ 86,228 | $ 264,102 | $ 297,158 | $ 245,227 | $ 385,179 | $ 470,966 | $ 462,247 | |
| Demolition | $ 100,000 | $ 50,000 | $ - | $ - | $ - | $ - | $ 200,000 | $ - | $ - | $ - | Allowance for pavement demolition and tree removal. |
| Earthworks | $ 50,000 | $ 50,000 | $ - | $ - | $ 150,000 | $ - | $ 100,000 | $ 250,000 | $ 500,000 | $ 450,000 | 3d modelling / bulk earthworks not within scope of this assessment. Allowance has been prescribed absed on asseessment of existing topography and conenction with FNCR. |
| Roadwork Pavement | $ 467,623 | $ 467,623 | $ 197,183 | $ 187,552 | $ 826,361 | $ 1,344,618 | $ 795,501 | $ 819,562 | $ 704,661 | $ 690,790 | Road pavement based on typical pavement profile for collector raod |
| Stormwater | $ 436,489 | $ 436,489 | $ 409,018 | $ 389,040 | $ 501,569 | $ 827,984 | $ 482,838 | $ 497,442 | $ 427,702 | $ 419,282 | |
| Minor Concrete Works | $ 439,541 | $ 439,541 | $ 79,362 | $ 75,485 | $ 399,852 | $ 413,992 | $ 384,920 | $ 396,562 | $ 340,965 | $ 334,253 | |
| Landscape | $ 159,944 | $ 109,275 | $ 7,326 | $ 6,968 | $ 242,717 | $ 122,487 | $ 233,653 | $ 240,720 | $ 206,972 | $ 202,898 | |
| Electrical - lighting | $ 213,666 | $ 213,666 | $ 213,666 | $ 203,230 | $ 245,523 | $ 239,499 | $ 236,354 | $ 243,503 | $ 209,364 | $ 205,243 | |
| Gas - Eastern Gas Pipeline | $ - | $ - | $ - | $ - | $ 224,000 | $ - | $ - | $ 384,000 | $ 320,000 | $ 320,000 | $16,000 / lin.m pipe proection slab including piling assumed. |
| Sewer Protection | $ - | $ - | $ - | $ - | $ 51,000 | $ 23,000 | $ 19,000 | $ 20,000 | $ - | $ - | $1,000 / m concrete encasment assumed |
| Bridge | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ 1,000,000 | $ 2,000,000 | $ 2,000,000 | Allowance for bridge for floodplain management. Indicative only based off FNCR works. Detailed flood modelling required. |
| Civil Contingency (20%) | $ 373,452.67 | $ 353,318.80 | $ 181,311 | $ 172,455 | $ 528,205 | $ 594,316 | $ 490,453 | $ 770,358 | $ 941,933 | $ 924,493 | |
| **TOTAL CONSTRUCTION COSTS** | **$ 2,427,442** | **$ 2,296,572** | **$ 1,178,520** | **$ 1,120,958** | **$ 3,433,330** | **$ 3,863,054** | **$ 3,187,946** | **$ 5,007,326** | **$ 6,122,562** | **$ 6,009,206** | |
| **TOTAL CONSTRUCTION COSTS (Round-Up)** | **$ 2,430,000** | **$ 2,300,000** | **$ 1,180,000** | **$ 1,130,000** | **$ 3,440,000** | **$ 3,870,000** | **$ 3,190,000** | **$ 5,010,000** | **$ 6,130,000** | **$ 6,010,000** | |
| Land Acquisition | $ 521,588 | $ 865,640 | $ - | $ - | $ 1,581,376 | $ 1,029,224 | $ 875,130 | $ 1,551,772 | $ 1,032,212 | $ 961,354 | Land acquisition rates provided by SCC. |
| **TOTAL LAND ACQUISITION COSTS** | **$ 521,588** | **$ 865,640** | **$ -** | **$ -** | **$ 1,581,376** | **$ 1,029,224** | **$ 875,130** | **$ 1,551,772** | **$ 1,032,212** | **$ 961,354** | |
| | | | | | | | | | | | |
| **TOTAL DEVELOPMENT COSTS** | **$ 3,191,775** | **$ 3,391,870** | **$ 1,296,372** | **$ 1,233,054** | **$ 5,358,038** | **$ 5,278,583** | **$ 4,381,871** | **$ 7,059,830** | **$ 7,767,030** | **$ 7,571,480** | |
| **TOTAL DEVELOPMENT COSTS (Round-Up)** | **$ 3,200,000** | **$ 3,400,000** | **$ 1,300,000** | **$ 1,240,000** | **$ 5,360,000** | **$ 5,280,000** | **$ 4,390,000** | **$ 7,060,000** | **$ 7,770,000** | **$ 7,580,000** | |

DATE PLOTTED: 6 April 2022 2:28 PM BY : DAMIEN COUNTER

XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Surface; XR-82022134-E-Utilities
CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK009.dwg

NORTH


OPTION W1 EXISTING SERVICES LAYOUT
SCALE 1:1000

## LEGEND

- E — EXISTING ELECTRICAL CONDUIT
- E OH — EXISTING OVERHEAD ELECTRICAL CONDUIT
- OPT — EXISTING OPTUS MAIN
- G — EXISTING GAS MAIN
- S — EXISTING SEWER MAIN
- URBAN RELEASE AREA BOUNDARY
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE BATTER

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

REVISION IN PROGRESS

| Rev. | Date | Description | Des. | Verif. | Appd. |
|---|---|---|---|---|---|
| 1 | | ISSUED FOR INFORMATION ONLY | DAC | JM | BRH |

Shoalhaven City Council



CHECK PRINT ONLY

| PRELIMINARY ☐ FINAL ☐ | INITIAL | DATE | INITIAL | DATE |
|---|---|---|---|---|
| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |
| SELF CHECK | | | | |

Drawn DAC — Date
Checked — Date
Designed DAC — Date
Verified JMG — Date
Approved BRH

Client: SHOALHAVEN CITY COUNCIL
Project: TAYLORS LANE
OPTIONS COST ASSESSMENT
Title: OPTION W1
EXISTING SERVICES LAYOUT PLAN

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
DATUM: AHD | Scale: 1:1000 | Size: A1
Drawing Number: 82022134-01 SK009 | Revision: 1

DATE PLOTTED: 6 April 2022 2:30 PM BY : DAMIEN COUNTER


OPTION W2 EXISTING SERVICES LAYOUT
SCALE 1:1000

## LEGEND

- EXISTING ELECTRICAL CONDUIT
- EXISTING OVERHEAD ELECTRICAL CONDUIT
- EXISTING OPTUS MAIN
- EXISTING GAS MAIN
- EXISTING SEWER MAIN
- URBAN RELEASE AREA BOUNDARY
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE BATTER

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

REVISION IN PROGRESS

| Rev. | Date | Description | Des. | Verif. | Appd. |
|---|---|---|---|---|---|
| 1 | | ISSUED FOR INFORMATION ONLY | DAC | JM | BRH |

Shoalhaven City Council



CHECK PRINT ONLY

| PRELIMINARY / FINAL | INITIAL | DATE | INITIAL | DATE |
|---|---|---|---|---|
| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |

SELF CHECK

Drawn DAC Date
Checked Date
Designed DAC Date
Verified JMG Date
Approved BRH

Client SHOALHAVEN CITY COUNCIL
Project TAYLORS LANE OPTIONS COST ASSESSMENT
Title OPTION W2 EXISTING SERVICES LAYOUT PLAN

Status FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DATUM AHD | Scale 1:1000 | Size A1
Drawing Number 82022134-01 SK010 | Revision 1

XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-E-Surface; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Utilities
CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK010.dwg

DATE PLOTTED: 6 April 2022 2:32 PM BY : DAMIEN COUNTER

XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Surface; XR-82022134-E-Utilities
CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK011.dwg


OPTION W3 EXISTING SERVICES LAYOUT
SCALE 1:1000


OPTION W3A EXISTING SERVICES LAYOUT
SCALE 1:1000

## LEGEND

- EXISTING ELECTRICAL CONDUIT
- EXISTING OVERHEAD ELECTRICAL CONDUIT
- EXISTING OPTUS MAIN
- EXISTING GAS MAIN
- EXISTING SEWER MAIN
- URBAN RELEASE AREA BOUNDARY
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE BATTER

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

NORTH

REVISION IN PROGRESS

| Rev. | Date | Description | Des. | Verif. | Appd. |
|---|---|---|---|---|---|
| 1 | | ISSUED FOR INFORMATION ONLY | DAC | JM | BRH |

Shoalhaven City Council



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| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |

SELF CHECK

Drawn DAC — Date
Checked DAC — Date
Designed DAC — Date
Verified JMG — Date
Approved BRH

Client: SHOALHAVEN CITY COUNCIL
Project: TAYLORS LANE OPTIONS COST ASSESSMENT
Title: OPTION W3 AND W3A EXISTING SERVICES LAYOUT PLAN

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum: AHD | Scale: 1:1000 | Size: A1
Drawing Number: 82022134-01 SK011 | Revision: 1

DATE PLOTTED: 6 April 2022 2:34 PM BY : DAMIEN COUNTER
XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-E-Surface; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Utilities
CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK012.dwg

NORTH


OPTION E1 EXISTING SERVICES LAYOUT

SCALE 1:1000

## LEGEND

- EXISTING ELECTRICAL CONDUIT
- EXISTING OVERHEAD ELECTRICAL CONDUIT
- EXISTING OPTUS MAIN
- EXISTING GAS MAIN
- EXISTING SEWER MAIN
- URBAN RELEASE AREA BOUNDARY
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE BATTER


OPTION E1A EXISTING SERVICES LAYOUT

SCALE 1:1000

0 20 40 60 80 100m

SCALE 1:1000 (A1), 1:2000 (A3) @A1

| Rev. | Date | Description | Des. | Verif. | Appd. |
|---|---|---|---|---|---|
| 1 | | ISSUED FOR INFORMATION ONLY | DAC | JM | BRH |

REVISION IN PROGRESS

Shoalhaven City Council



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|---|---|---|---|---|
| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |

SELF CHECK

Drawn DAC Date
Checked Date
Designed DAC Date
Verified JMG Date
Approved BRH

Client: SHOALHAVEN CITY COUNCIL

Project: TAYLORS LANE
OPTIONS COST ASSESSMENT

Title: OPTION E1 AND E1A
EXISTING SERVICES LAYOUT PLAN

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DATUM AHD | Scale 1:1000 | Size A1

Drawing Number 82022134-01 SK012 | Revision 1

DATE PLOTTED: 6 April 2022 2:37 PM BY : DAMIEN COUNTER

XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Surface; XR-82022134-E-Utilities
CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK013.dwg

NORTH


OPTION E2 EXISTING SERVICES LAYOUT
SCALE 1:1000

## LEGEND

- EXISTING ELECTRICAL CONDUIT
- EXISTING OVERHEAD ELECTRICAL CONDUIT
- EXISTING OPTUS MAIN
- EXISTING GAS MAIN
- EXISTING SEWER MAIN
- URBAN RELEASE AREA BOUNDARY
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE BATTER

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

REVISION IN PROGRESS

| Rev. | Date | Description | Des. | Verif. | Appd. |
|---|---|---|---|---|---|
| 1 | | ISSUED FOR INFORMATION ONLY | DAC | JM | BRH |

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|---|---|---|---|---|
| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |

SELF CHECK

| | | |
|---|---|---|
| Drawn | DAC | Date |
| Checked | | Date |
| Designed | DAC | Date |
| Verified | JMG | Date |
| Approved | BRH | |

Client: SHOALHAVEN CITY COUNCIL
Project: TAYLORS LANE
OPTIONS COST ASSESSMENT
Title: OPTION E2
EXISTING SERVICES LAYOUT PLAN

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

| DATUM | Scale | Size |
|---|---|---|
| AHD | 1:1000 | A1 |

| Drawing Number | Revision |
|---|---|
| 82022134-01 SK013 | 1 |

DATE PLOTTED: 12 July 2022 11:36 AM BY : DAMIEN COUNTER


## OPTION E3 EXISTING SERVICES LAYOUT

SCALE 1:1000

## LEGEND

| | |
|---|---|
| E | EXISTING ELECTRICAL CONDUIT |
| E OH | EXISTING OVERHEAD ELECTRICAL CONDUIT |
| OPT | EXISTING OPTUS MAIN |
| G | EXISTING GAS MAIN |
| S | EXISTING SEWER MAIN |
| | EXISTING SERVICE EASEMENT |
| | URBAN RELEASE AREA BOUNDARY |
| | FUTURE FAR NORTH COLLECTOR ROAD |
| | FUTURE BATTER |

0 20 40 60 80 100m

SCALE 1:1000 (A1), 1:2000 (A3) @A1

| Rev. | Date | Description | Des. | Verif. | Appd. |
|---|---|---|---|---|---|
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REVISION IN PROGRESS

Shoalhaven City Council



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|---|---|---|---|---|
| MARKUP | | | | |
| BACKDRAFTED / CORRECTED | | | | |
| CONFIRMED | | | | |

SELF CHECK

| | | |
|---|---|---|
| Drawn | DAC | Date |
| Checked | | Date |
| Designed | DAC | Date |
| Verified | JMG | Date |
| Approved | BRH | |

Client: SHOALHAVEN CITY COUNCIL

Project: TAYLORS LANE
OPTIONS COST ASSESSMENT

Title: OPTION E3
EXISTING SERVICES LAYOUT PLAN

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

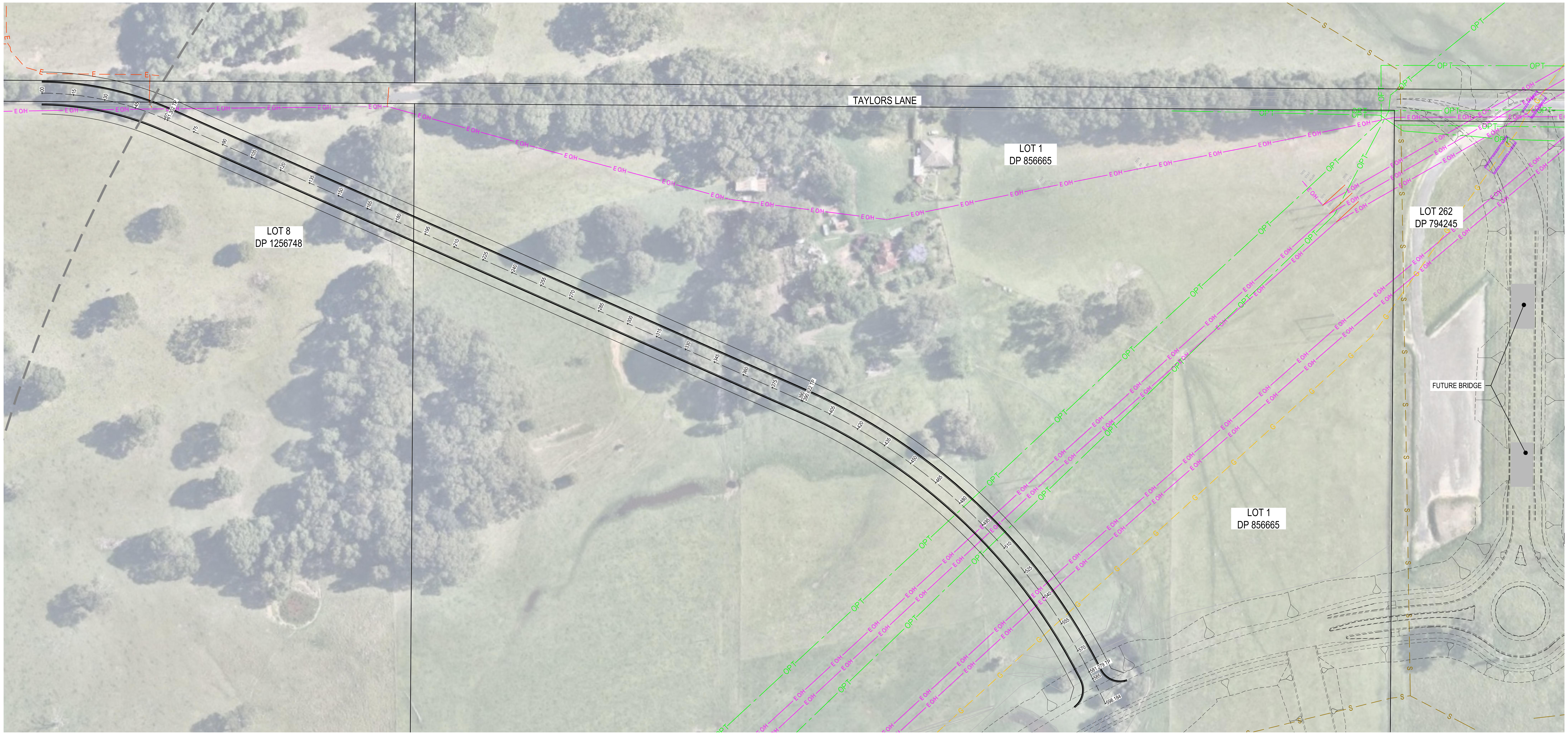
| DATUM | Scale | Size |
|---|---|---|
| AHD | 1:1000 | A1 |

| Drawing Number | Revision |
|---|---|
| 82022134-01 SK014 | 1 |

XREF's: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Surface; XR-82022134-E-Utilities
CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK014.dwg

DATE PLOTTED: 6 April 2022 2:42 PM BY : DAMIEN COUNTER

NORTH




## OPTION E4 EXISTING SERVICES LAYOUT

SCALE 1:1000

## LEGEND

- EXISTING ELECTRICAL CONDUIT
- EXISTING OVERHEAD ELECTRICAL CONDUIT
- EXISTING OPTUS MAIN
- EXISTING GAS MAIN
- EXISTING SEWER MAIN
- URBAN RELEASE AREA BOUNDARY
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE BATTER

0 20 40 60 80 100m

SCALE 1:1000 (A1), 1:2000 (A3) @A1

REVISION IN PROGRESS

| Rev. | Date | Description | Des. | Verif. | Appd. |
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| CONFIRMED | | | | |

SELF CHECK

Drawn DAC — Date
Checked — Date
Designed DAC — Date
Verified JMG — Date
Approved BRH

Client: SHOALHAVEN CITY COUNCIL

Project: TAYLORS LANE
OPTIONS COST ASSESSMENT

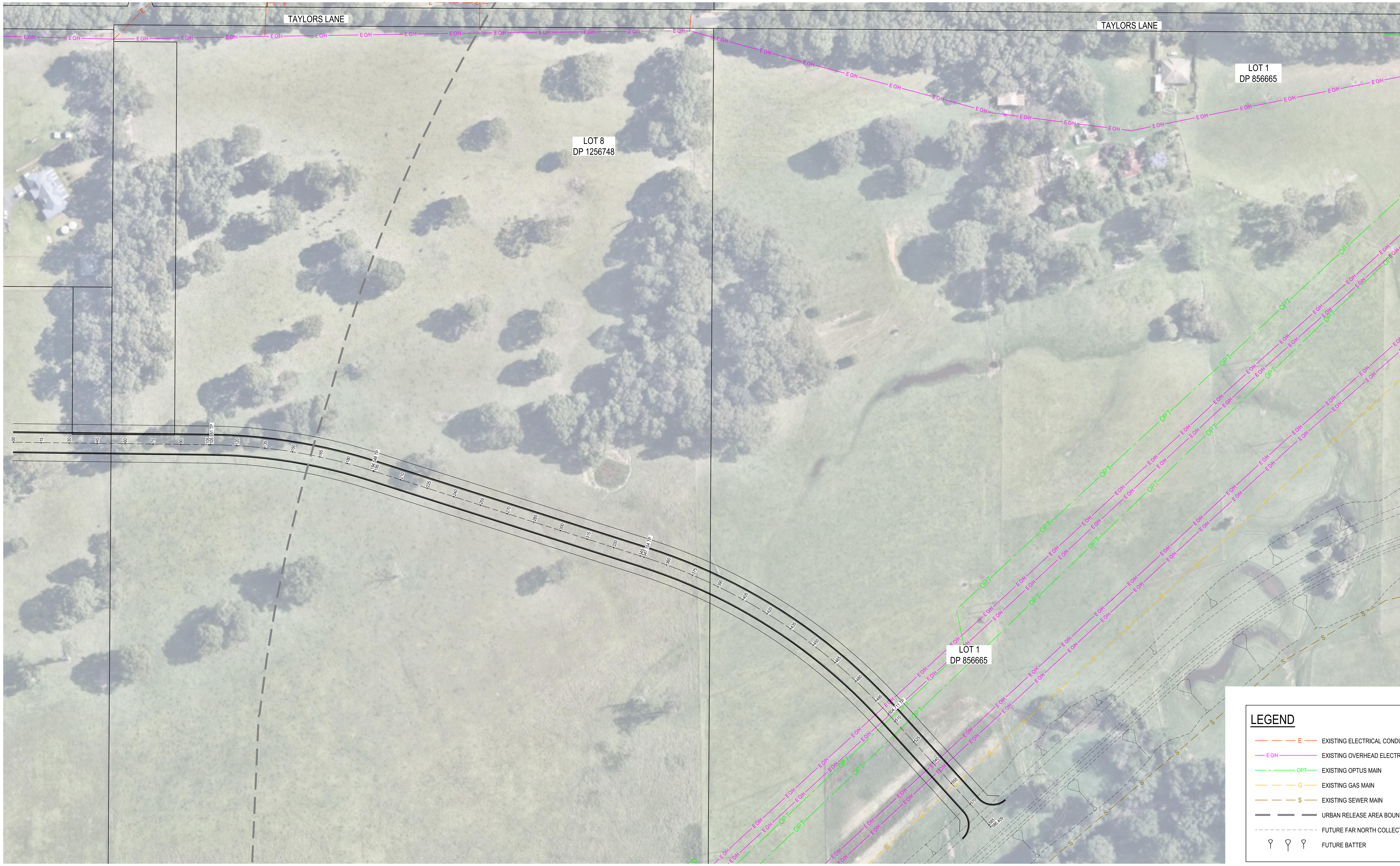
Title: OPTION E4
EXISTING SERVICES LAYOUT PLAN

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DATUM: AHD | Scale: 1:1000 | Size: A1

Drawing Number: 82022134-01 SK015 | Revision: 1

XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Surface; XR-82022134-E-Utilities
CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK015.dwg




## LEGEND

- EXISTING ELECTRICAL CONDUIT
- EXISTING OVERHEAD ELECTRICAL CONDUIT
- EXISTING OPTUS MAIN
- EXISTING GAS MAIN
- EXISTING SEWER MAIN
- URBAN RELEASE AREA BOUNDARY
- FUTURE FAR NORTH COLLECTOR ROAD
- FUTURE BATTER

NORTH

# OPTION E5 EXISTING SERVICES LAYOUT

SCALE 1:1000

0 20 40 60 80 100m

SCALE 1:1000 (A1), 1:2000 (A3) @A1

DATE PLOTTED: 6 April 2022 2:43 PM BY : DAMIEN COUNTER

XREFs: XR-82022134-G-TITLE; XR-82022134-D-Base; XR-82022134-E-Survey; XR-82022134-F-Nth Coll Rd; XR-82022134-G-Aerial image; XR-82022134-G-CADASTRE-2020; XR-82022134-E-Surface; XR-82022134-E-Utilities

CAD File: U:\FY22\134_Taylors Lane Options\Drawings\Build\Sketches\82022134-01 SK016.dwg

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| Rev. | Date | Description | Des. | Verif. | Appd. |
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| CONFIRMED | | | | |

SELF CHECK

Drawn: DAC
Checked:
Designed: DAC
Verified: JMG
Approved: BRH

Client: SHOALHAVEN CITY COUNCIL

Project: TAYLORS LANE
OPTIONS COST ASSESSMENT

Title: OPTION E5
EXISTING SERVICES LAYOUT PLAN

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DATUM: AHD
Scale: 1:1000
Size: A1
Drawing Number: 82022134-01 SK016
Revision: 1