



CIVIL

Concept Flooding and Water Management Report

for

Proposed Seniors Living Village – Newcastle Golf Club

for Principle Living and Newcastle Golf Club

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Acronyms

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ALS	Airborne Laser Survey (LiDAR)
ARI	Average Recurrence Interval
ARR	Australian Rainfall and Runoff 2019
BoM	Bureau of Meteorology
DCP	Development Control Plan
DRAINS	A 1D hydrological and hydraulic model
FPL	Flood Planning Level
LGA	Local Government Area
LiDAR	Light Detection and Ranging (also see ALS)
m	Measure of length / height / distance (metres)
m AHD	Meters above Australian High Datum
m/s	Measure of velocity (metres per second)
m ³ /s	Measure of flow rate (cubic metres per second)
MUSIC	Model for Urban Stormwater Improvement Conceptualisation software
OSD	On-Site Detention
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
PSD	Permissible Site Discharge
PSC	Port Stephens Council (Council)
SES	NSW State Emergency Service
TUFLOW	A 1D and 2D hydraulic modelling software

Introduction

Principle Living are seeking Development Consent for seniors living at Newcastle Golf Club, located at 4A Vardon Road, Fern Bay. The proposal consists of earthworks and construction to carry out alterations and additions to the existing golf course and construction of approximately 173 independent living units and community facilities within the proposed retirement village.

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged to prepare concept stormwater, and floodplain impact assessment Development Application (DA) documentation for the proposed development. This is in response to the pre-DA meeting minutes (dated 13 June 2019) which have been included in Appendix A.

This report covers both the seniors living and golf course improvement works applications.

Included herein is a:

- List of related drawings and documents.
- Description of the subject site and proposed development.
- Outline of Port Stephens Council (Council) requirements.
- Description of the stormwater response.
- Overview of flood impact and mitigation measures.
- Discussion of any departures from Council's policy.

		Date
Prepared by	GB / TvK	18/12/2024
Checked by	AB	05/12/2021
Admin	GB	18/12/2024

Related Reports and Documents

This report is to be read in conjunction with the following reports and documents:

1. Civil Engineering Drawings prepared by Northrop Consulting Engineers (ref NL166557), included in Appendix B.
2. Architectural Drawings prepared by EJE Architecture – DA Submission Issue, included in Appendix C.
3. Flood certificate for the site provided by Port Stephens Council, included in Appendix D.
4. Golf Course Improvement Drawings prepared by Harrison Golf, included in Appendix E.

Subject Site and Proposed Development

Subject Site

The subject site is located on the eastern side of Nelson Bay Road in Fern Bay. It includes the parcels of land at 4A Vardon Road, Fern Bay, otherwise known as Lot 4 DP 823114. The subject site is located within the Port Stephens Local Government Area (LGA). The proposed development is limited to the western portion of the lot which is described below.

The existing improvements on the development site include a golf practice area, and three golf holes. There are three drainage lines which bisect the development area and connect the local catchment to the discharge locations in Nelson Bay Road. Elevations range from less than 1m AHD in the low-lying northern areas to approximately 10m AHD in the south. Vegetated coverage ranges from manicured turf grass to dense wooded vegetation. Characteristics of the area are presented below in Photo 1 to Photo 5.



Photo 1 - Looking south along the existing 17th fairway over the proposed compensatory cut area



Photo 2 - Looking west along the existing drain along the existing 17th fairway



Photo 3 – Dam adjacent to the existing 18th tee



Photo 4 – Looking south along the existing 18th fairway



Photo 5 – Looking west from the existing 18th fairway towards Nelson Bay Road

Proposed Development

The proposal is to develop a Seniors Living Development and operate it under the provisions of the Retirement Villages Act, 1999. The key facilities and features of the retirement village are as follows:

- Site preparation & establishment activities – clearing existing vegetation, demolition of existing golf course via earthworks, bulk earthworks.
- Construction and occupancy of a seniors living development comprising:
 - Three (3) apartment buildings containing 125 serviced self-care dwellings.
 - Forty-seven (47) single storey (villas) serviced self-care dwellings.
- Carparking - 294 spaces across the site with each villa being provided with a double garage (94 spaces) and 202 basement carparking spaces within the three apartment buildings.
- A combined entry / egress driveway connecting to Nelson Bay Road and required intersection works.
- Provision of pedestrian and vehicular access to and from the site.
- Establishment of a Community Centre including games room, pool, cinema, dining room, bar, lounge areas, offices.

- Pickle ball courts, lawn bowls facility, open space, landscaping, picnic shelter, public art, open lawn area for passive recreational activities and formal striking planting.
- Civil works including internal access roads, pedestrian linkages to Nelson Bay Road and the golf club, stormwater infrastructure.
- Connection to Country 'Keeping Place'.
- Extension and enhancement of physical infrastructure utilities as needed.

Architectural plans describing the development are provided in Appendix C.

Council Requirements

The Council requirements have been obtained from Port Stephens Council Local Environmental Plan (LEP 2013, and Development Control Plan (DCP) 2014. These are summarised below in Table 1 and Table 2. Also presented in these tables is a summary of the response for the purposes of this submission.

Table 1 - LEP Requirements

Clause 5.21	Response
(1) The objectives of this clause are as follows	
(a) to minimise the flood risk to life and property associated with the use of land,	On-site refuge is provided within the proposed development above the PMF level.
(b) to allow development on land that is compatible with the flood function and behaviour on the land, taking into account projected changes as a result of climate change,	The development is proposed on land which is largely high hazard flood storage. As part of the development compensatory cut has been proposed and we believe it is compatible with the flood function of the land on this basis.
(c) to avoid adverse or cumulative impacts on flood behaviour and the environment,	This is discussed in the Flood Effects section of this report. Compensatory cut has been proposed to mimic the existing conditions and minimise the likelihood of cumulative impacts of filling in the area. Furthermore, most areas likely to be subject to development have already been filled in this catchment.
(d) to enable the safe occupation and efficient evacuation of people in the event of a flood.	On-site refuge is provided within the proposed development above the PMF level.
(2) Development consent must not be granted to development on land the consent authority considers to be within the flood planning area unless the consent authority is satisfied the development	
(a) is compatible with the flood function and behaviour on the land, and	The development is proposed on land which is largely high hazard flood storage. As part of the development compensatory cut has been proposed and we believe it is compatible with the flood function of the land on this basis.

Clause 5.21	Response
(b) will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties, and	This is discussed in the Flood Effects section of this report. Compensatory cut has been proposed to mimic the existing conditions and minimise the likelihood of cumulative impacts of filling in the area. Furthermore, most areas likely to be subject to development have already been filled in this catchment.
(c) will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood, and	On-site refuge is provided within the proposed development above the PMF level.
(d) incorporates appropriate measures to manage risk to life in the event of a flood, and	On-site refuge is provided within the proposed development above the PMF level.
(e) will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses.	Consideration of this is provided in the Water Quality section of this report.
(3) In deciding whether to grant development consent on land to which this clause applies, the consent authority must consider the following matters	
(a) the impact of the development on projected changes to flood behaviour as a result of climate change,	The 2100 1% AEP has been considered in this assessment.
(b) the intended design and scale of buildings resulting from the development,	The impacts of the proposed development are negligible, and we believe this demonstrates the buildings are of an appropriate scale from a floodplain management perspective.
(c) whether the development incorporates measures to minimise the risk to life and ensure the safe evacuation of people in the event of a flood,	On-site refuge is provided within the proposed development above the PMF level.
(d) the potential to modify, relocate or remove buildings resulting from development if the surrounding area is impacted by flooding or coastal erosion.	There is potential to remove buildings if required. Due to the proposed fill and surrounding development, this is considered unlikely.

Table 2 – DCP requirements

Item	Reference Clause and Document	Requirement	Response
Submission Requirements	DCP B4.1	Development that applies to this part is to provide a stormwater drainage plan and a written description of the proposed drainage system within the SEE.	A stormwater drainage plan is provided in Appendix B.
	DCP B5.8	A Flood Impact and Risk Assessment is required for any fill located within a floodway or flood storage area.	The SEE has been prepared by others. Refer to the Flood Effects section of this report for impact assessment.
OSD	DCP B4.2	On-site detention/ on-site infiltration is required in stormwater requirement areas where:	On-site detention has not been provided within the retirement living lot. This is because the downstream areas are subject to flooding and the provision of detention would not mitigate this flooding.
	DCP B4.3	The post developed flow rate or volume exceeds the pre-developed flow rate or volume; or,	Refer to the Discussion section of this report for further details.
	DCP B4.4	- Impervious surfaces exceed the total percentage of site area listed under Figure BC; or, - It is identified under Section D Specific Areas of the DCP.	

Item	Reference Clause and Document	Requirement	Response
Water Quality	DCP B4.5	Development is to provide stormwater quality improvement devices (SQIDs) in accordance with Figure BE: Water Quality table.	Refer to the Water Quality section of this report.
	DCP B4.6		
	DCP B4.7	Stormwater quality improvement devices (SQIDs) are designed to be taken off-line from minor and major drainage systems.	
		Development submits the evidence of how the water quality targets have been achieved.	
		On-site detention/ on-site infiltration may not be required for dual occupancy development if the water quality requirements under Figure BE for sites less than 2,500m ² have been satisfied.	
Construction Water Quality	DCP B4.9	Erosion and sediment measures are provided during the construction phase in accordance with the issued conditions of consent.	A concept Erosion and Sediment Control Plan is provided in Appendix B.
Drinking Water Catchment	DCP B4.10	Development that, in the opinion of the Council, has the potential to significantly adversely affect the water quality of the drinking water catchment will be referred to Hunter Water under section 51 of the Hunter Water Act 1991. Development or activities which pose unacceptable risks to a drinking water catchment are not likely to be supported by Hunter Water.	This does not apply to this development.

Item	Reference Clause and Document	Requirement	Response
Flood Adaptation	DCP B5.9	For residential accommodation, subdivision, commercial premises, industrial premises, garages, open car parking spaces and carports, a reduced planning horizon of 50 years from the date of determination will be accepted where the design facilitates ongoing flood adaptation (i.e. the future raising of the building).	This does not apply to this development. Proposed floor levels are set above the Flood Planning Level.
Alterations and Additions	DCP B5.10	Where proposed alterations and additions to existing residential accommodation is less than 40% of the gross floor area of the existing residential accommodation, and does not involve a net increase in the number of bedrooms Council will consider a FFL lower than the flood planning level (FPL), but not lower than the existing floor level. Any additional flood risk must include mitigation measures to reduce the overall flood risk of the development.	This does not apply to this development.
Driveway Access	DCP B5.11 DCP B5.12	Access from the building envelope to the public road is to have a minimum finished access level of; • The flood immunity of the connecting public road; or, • The current day 1% AEP flood event level for the site. Earthworks for driveways and access must satisfy the objectives of B3.D of the DCP and LEP.	The site access is rising from Nelson Bay Road, which satisfies this criterion. Furthermore, basement carpark areas have been protected to a minimum of the current 1% AEP level.

Item	Reference Clause and Document	Requirement	Response
Subdivision	DCP B5.13	Subdivision that creates the ability to erect additional dwellings is to indicate building envelopes above the FPL and comply with the requirements of B5.11, B5.12 and B5.14 of this Part.	The proposed subdivision creates the lot for the seniors living village and all finished floor levels are above the flood planning level.
Emergency onsite flood refuge	DCP B5.14	If evacuation egress from residential accommodation, a commercial premises, an industrial premises, fill or development vulnerable to emergency response and critical infrastructure to flood free areas cannot be achieved via a route that is flood free in the current day 1% AEP flood event or is a low hazard flood area, an onsite flood refuge must be provided.	An area of on-site refuge is provided which meets the criteria outlined in this clause. No structural certification is required as this area is located above the PMF level.
Overland Flow Path	DCP B5.15	A site based overland flow report must be submitted for development located within a designated overland flow path.	Refer to the Existing Flood Behaviour and Developed Flood Behaviour and Impacts.
Development in Floodway	DCP B5.16 DCP B5.17	Development other than farm buildings and/or fill is not supported on land identified as either low hazard floodway or high hazard floodway. Fencing in a floodway should not include non-permeable materials or fencing types that could restrict or redirect flood waters.	No floodway on-site. This is not applicable to the proposed development.

Item	Reference Clause and Document	Requirement	Response
Performance Based Solutions	DCP B5.18	The proposed land use is consistent with Figure BI, which shows suitable land uses by flood hazard category (as identified on a flood certificate) and the proposed development incorporates adequate measures to manage risk to human life from flooding. The proposed development will not increase the potential individual or cumulative flood impacts on other development or properties that are likely to occur in the same floodplain. The proposed development must be compatible with the flood hazard category of the land (as identified on a flood certificate) or include mitigation measures or offsets to reduce the flood risk.	Performance based solutions are not required in this instance because the development is suitable per Table BI.
	DCP B5.19		
	DCP B5.20		

Water Quality

Methodology

Stormwater quality modelling has been undertaken using the Model for Urban Stormwater Improvement and Conceptualization (MUSIC) V6.3 to estimate the efficiency of the proposed Stormwater Quality Improvement Devices (SQIDs). MUSIC serves as a planning and decision support system that is used to estimate the efficiency of SQIDs at capturing common stormwater pollutants (i.e. Total Suspended Solids (TSS), Total Nitrogen (TN), Total Phosphorus (TP) and Gross Pollutants (GP)) from stormwater runoff. Modelling involves the use of historical or synthesized long-term rainfall data and algorithms that can simulate the performance of stormwater treatment measures to determine stormwater pollution control.

As part of the Development Application for Newcastle Golf Course, Subdivision and Seniors Living village, a concept MUSIC model was developed. This model covers the proposed residential development areas and assesses the water quality run-off from the development.

Figure 1 below contains a schematic of the MUSIC model.

To more accurately predict the likely concentration and loads of pollutants from the proposed development, catchment areas were separated into road reserve, duplex/ unit lots, community facilities and apartment buildings.

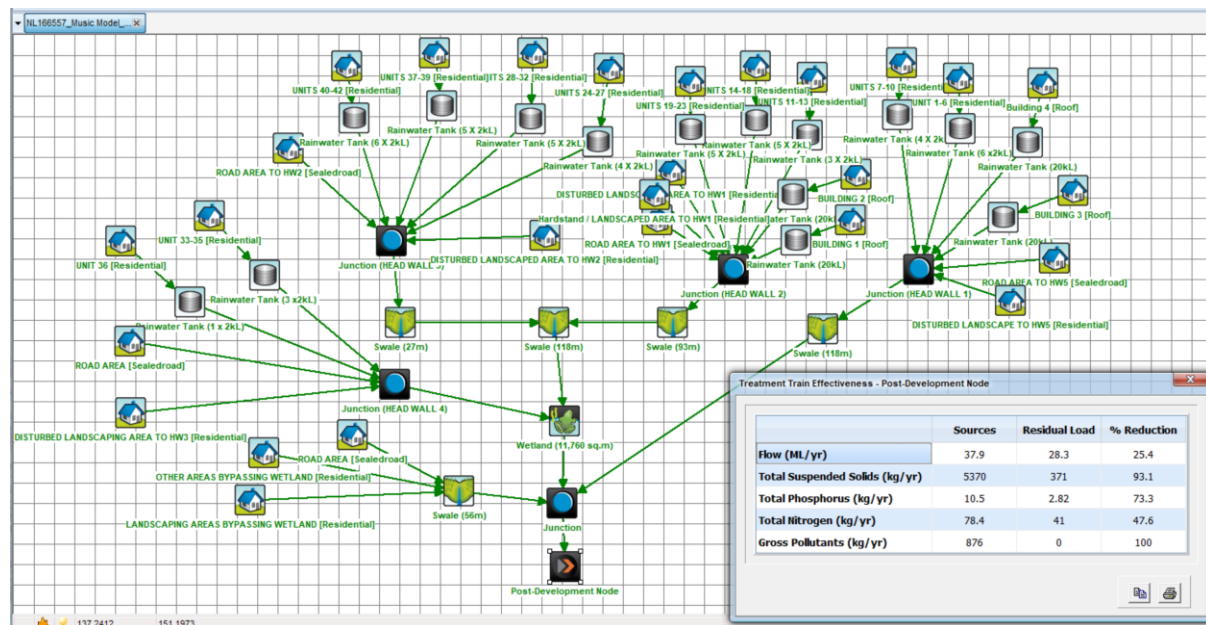


Figure 1 - Schematic of MUSIC Model

The total impervious area across the road reserve areas were conservatively taken to be 70%, whilst 70% was also determined to be representative of the impervious fraction of the lots and was applied to the lot areas. The Port Stephens Council MUSIC-Link was used, with the hydrological model set by Council and with parameters in line with Council's recommended parameter range.

Other key input details used for the source nodes are contained in the MUSIC LINK report located in Appendix F. The MUSIC model can be provided to Council upon request.

As a result of the expected pollution concentrations/ loads, the size and location of various SQIDs were modelled in order to meet the required targets outlined in Council's DCP. The design went through a series of iterations before reaching the treatment train detailed below.

Treatment Train Layout

The preferred treatment train layout utilises three key treatment devices being a wetland, vegetated swales, and rainwater tanks. The following stormwater quality improvement devices are proposed for the development:

- 5 x Vegetated swales conveying water from the pit and pipe network to the wetland and swale.
- 1 x 2kL rainwater tank per unit (4kL per Duplex). Reticulated internally for toilet flushing and externally for landscape watering.
- 1 x 20kL Minimum Rainwater reuse tank for apartment building 1, 2, 3 and 4. Reticulated internally for toilet flushing and externally for landscape irrigation.
- 1 x Wetland with 11,760m² surface area, 0.2m Extended Detention Depth.

The preferred treatment train relies on the heightened treatment of some catchments to offset some smaller catchments which do not have treatment devices installed, in order to achieve the required targets overall.

Treatment nodes were created within the MUSIC model to represent each SQID.

Wetland

A wetland has been proposed as an end of line tertiary treatment measure. The wetland system is shallow, extensively vegetated water bodies that use enhanced sedimentation, fine filtration and biological uptake processes to remove pollutants from stormwater. The proposed wetland will generally consist of an inlet zone and macrophyte zone. Detail design of the wetland will need to show consideration to the landscape, plant species selection, nominal detention time and hydrodynamic basin function and this shall be undertaken at the detailed design phase prior to Construction Certificate.

Vegetated Swale Function

Trapezoidal shaped open channels are provided within the eastern boundary of the proposed development to convey and treat stormwater runoff from the outlets of the pit and pipe networks. The swale drains filter this runoff through vegetation to assist in the removal of coarse sediment and uptake of nutrients. Pollutant removal efficiency parameters were selected in accordance with the Port Stephens Music Link and NSW MUSIC Modelling guidelines.

Results

The results calculated by the MUSIC model are shown in Table 3 below. These results are the pollutant load and removal efficiency for the proposed site.

Table 3 – Newcastle Golf Course Pollutant Removal Efficiency Results

Parameter	Source Load	Residual Load	% Reduction	Complies
TSS (kg/yr)	5370	371	93.1	Yes
TP (kg/yr)	10.5	2.82	73.3	Yes
TN (kg/yr)	78.4	41	47.6	Yes
GP (kg/yr)	876	0	100	Yes

As shown in Table 3 above, the calculated pollutant removal efficiencies meet or exceed the pollutant removal efficiency targets outlined in Port Stephens DCP. Additional treatment beyond that assessed in the MUSIC model will be provided via grassed buffer strips which were not included in the water quality model, however, will provide filtration to runoff around buildings, the community centre and the four apartment buildings.

Construction Water Quality

A concept sediment and soil erosion plan and details are presented in Appendix B.

Flood Model Setup

A flood model has been developed to consider flooding from the local catchment. Information for the Hunter River flooding has been obtained from the Williamtown Salt Ash Flood Study.

Detailed two-dimensional hydraulic modelling was undertaken using the TUFLOW hydrodynamic modelling software. The TUFLOW model extent, downstream boundaries and topography are shown in Figure A1.

Hydrology

Direct Rainfall (rainfall-on-grid) model has been used for this assessment. As per the latest AR&R 2019 guidelines, initial loss, continuing loss, burst rainfall have been considered as part of this study. The hydrology input data used are summarised below in Table 4 to Table 6.

Table 4 - Loss parameters

Parameter	Value	Comment
Pervious initial loss (mm)	Variable	Probability Neutral Burst Initial Loss (Table 5)
Pervious continuing loss (mm/hr)	1.12	Factored by 0.4 from ARR data hub values
Impervious initial loss (mm)	1.5	
Impervious continuing loss (mm/hr)	0.0	

Table 5 - Probability Neutral Burst Initial Loss (mm)

min (h)	%AEP					
	50	20	10	5	2	1
360 (6.0)	6.2	3.9	3.5	4.3	5.4	2.8
720 (12.0)	7.6	5.3	4.8	5	5.1	3.4
1080 (18.0)	8.4	5.7	5.3	5.4	6	4.1
1440 (24.0)	8.9	6.4	6.2	5.8	7.9	4.5
2880 (48.0)	10.4	8	7.9	7	7.7	5.3

Table 6 - IFD Rainfall Depths

Duration	5%AEP	1%AEP	1%AEP 2100 Climate Change
6 hr	124	177	212.4
9 hr	145	207	248.4
12 hr	161	232	278.4
18 hr	187	271	325.2
24 hr	207	300	360.0
30 hr	224	324	388.8
36 hr	238	343	411.6
48 hr	260	373	447.6

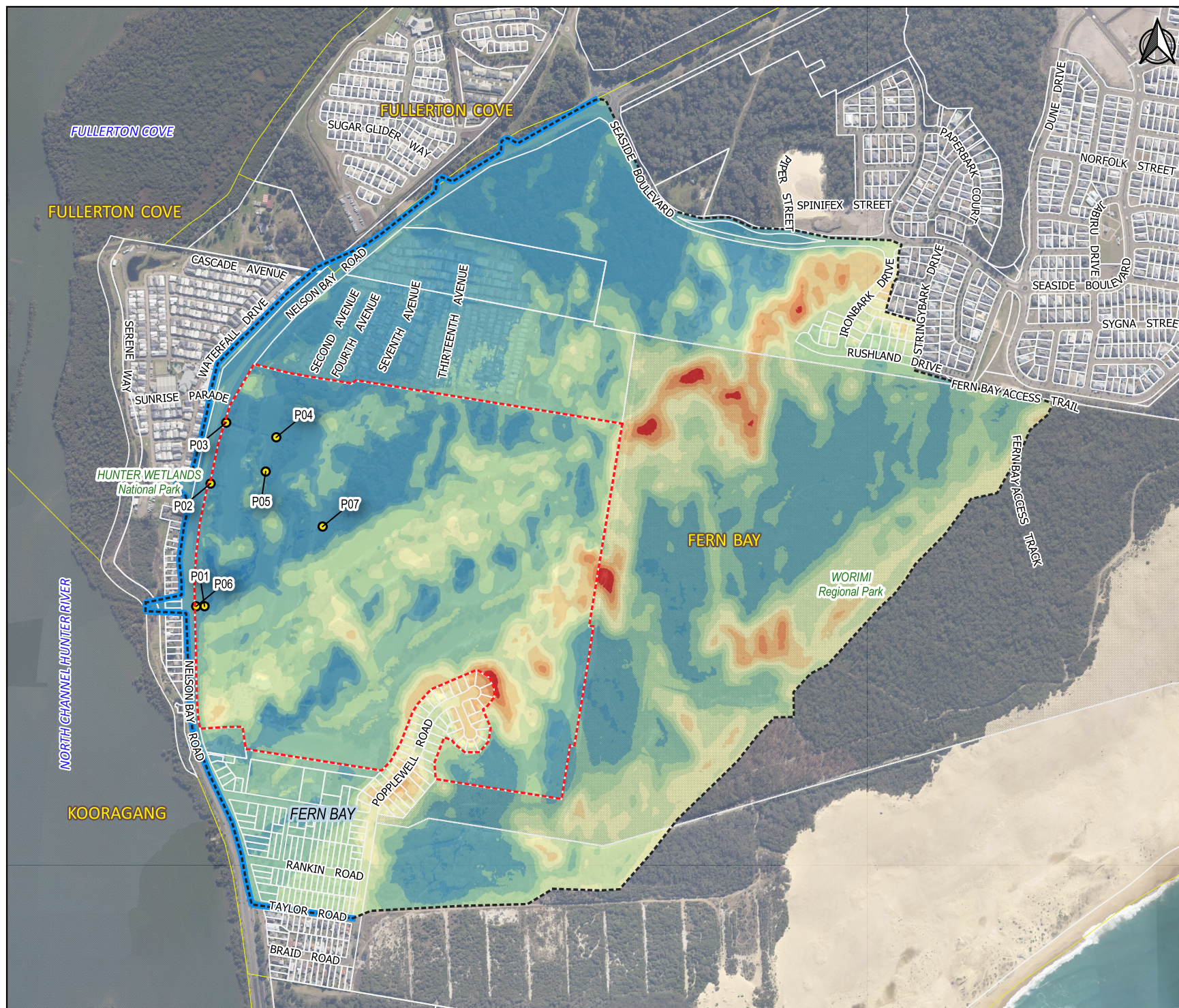
Hydraulics

The TUFLOW modelling parameters are as follows:

- TUFLOW version 2020-01-AA with HPC GPU module was used.
- 2014 LiDAR survey was incorporated for the local catchment with a 1m grid resolution.
- LiDAR elevations along drainage channels were manually rectified where the point cloud classification is inaccurate due to high density vegetation.
- Manning's roughness was estimated based on recent aerial photography. Roughness values are summarised below in Table 7.
- A grid size of 2 metre with Sub-Grid-Sampling distance of 1 metre was used.
- Pit and pipe network is based on data observed during site visit and detailed survey. 25% blockage factor was adopted for all pipes and culverts in the model.
- Fences around the subject site were represented as a layered flow constriction with adopted blockage factor ranging from 10 to 25 percent.

Table 7 - Roughness values

Surface	Value
Residential	0.050
Water Bodies	0.018
Sealed Roads	0.020
Grass	0.035
Buildings	0.300
Medium Density Bush	0.080
High Density Bush	0.150



Legend

- - - Subject Site
- TUFLOW Model Extent
- Downstream Boundary
- Water Level -
- Reporting Locations

Landform(mAHD)

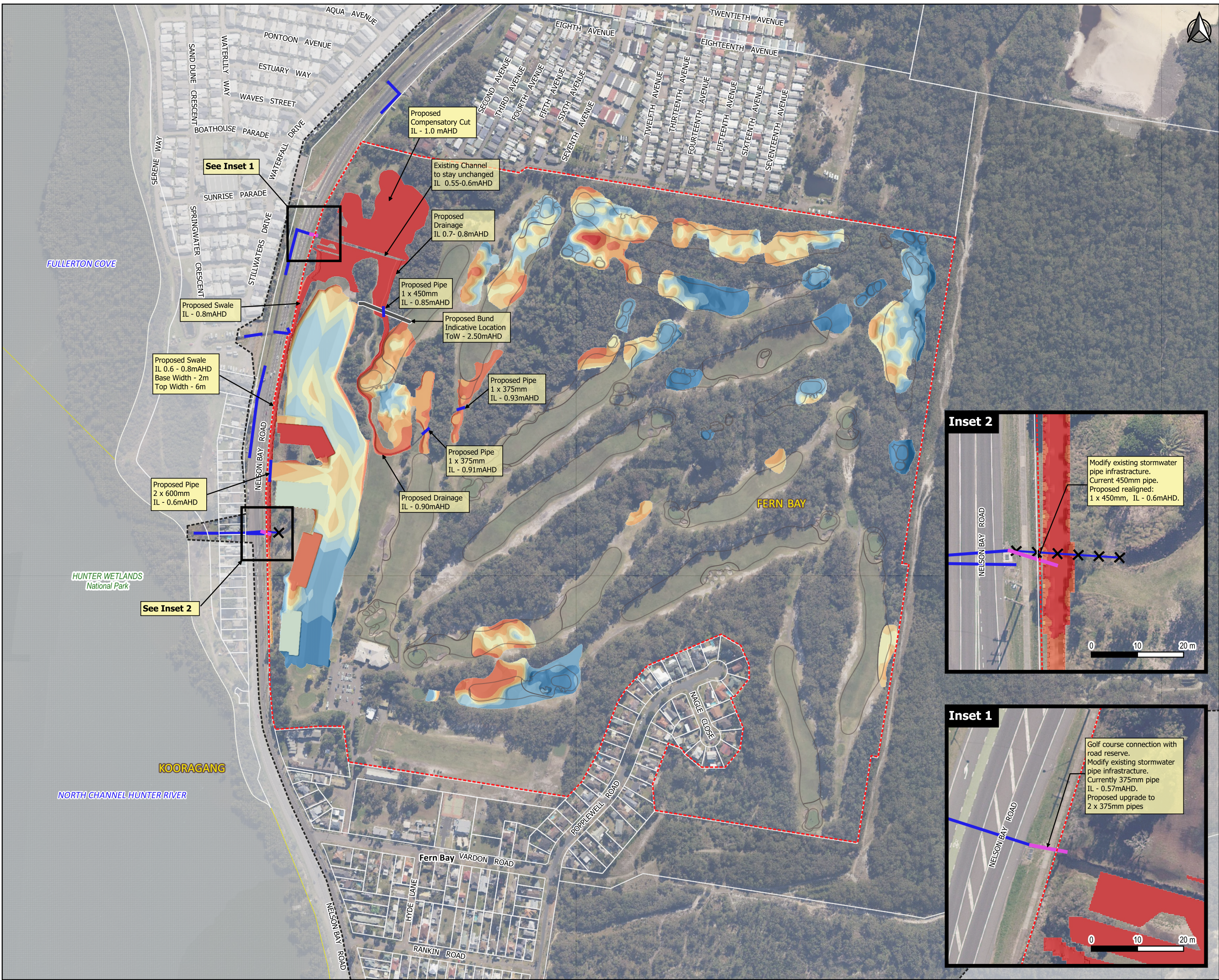
- ≤ 1.00
- 1.00 - 2.00
- 2.00 - 3.00
- 3.00 - 5.00
- 5.00 - 7.00
- 7.00 - 9.00
- 9.00 - 11.00
- 11.00 - 13.00
- 13.00 - 15.00
- 15.00 - 17.00
- > 17.00

0 200 400 Metres
1:12,000

Figure A1
Subject Site and
2D Model Setup

Newcastle Golf Club
Fern Bay





Legend

- Golf Field Boundaries
- Existing and Proposed Pipes
- Culvert Modifications
- Proposed Bund

Proposed Landform (mAHd)

- <= 1.0
- 1.0 - 2.0
- 2.0 - 2.5
- 2.5 - 2.9
- 2.9 - 3.1
- 3.1 - 3.4
- 3.4 - 3.9
- 3.9 - 5.0
- > 5.0

0 80 160 Metres
1:5,000

Figure A2
Proposed Development
Concept Option

Newcastle Golf Club
Fern bay



Existing Flood Behaviour

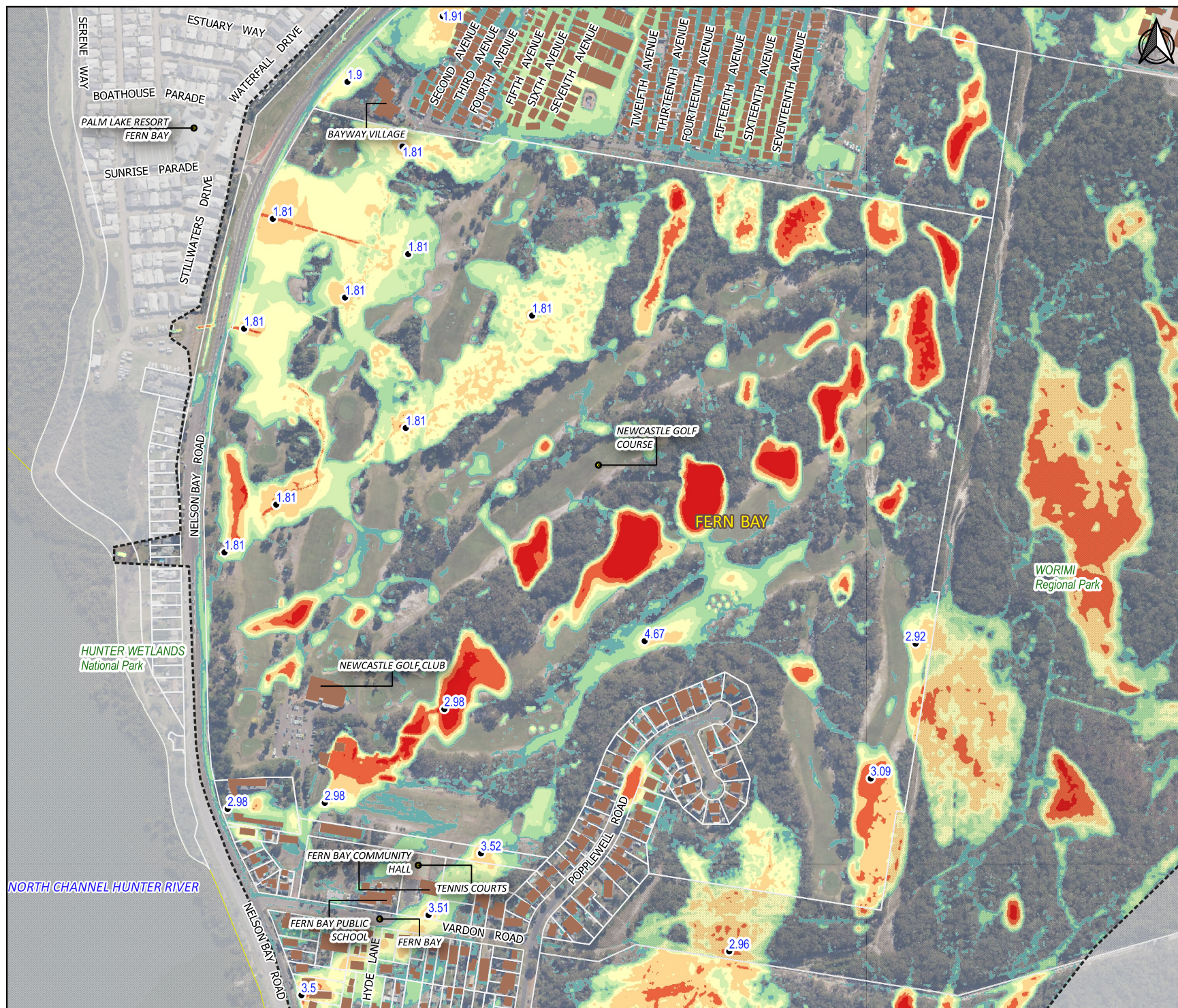
Flooding of the subject site and vicinity is derived from two mechanisms being local catchment overland flow and Hunter River flooding. Peak flood levels are summarised in Table 8 below.

Figures showing the existing flood behaviour for the local catchment overland flow are presented in Figures B1-B4 overleaf.

The Flood Information Certificate, provided by Port Stephen Council, indicates that portions of the golf site are considered to be high hazard flood storage.

Table 8 - Existing flood levels

Flood Event	Flood Level (m AHD)	Flood Mechanism	Source
Current 1%AEP	1.6	Hunter River	Flood Certificate
Local 1%AEP	1.81	Local Catchment	Flood model
Local 1% AEP 2100	1.95	Local Catchment	Flood model
PMF	5.1	Hunter River	Flood Certificate
Flood Planning Level	2.9	N/A	Flood Certificate



- Legend**
- TUFLOW Model Extent
 - Buildings
 - Water Elevation(mAHD)

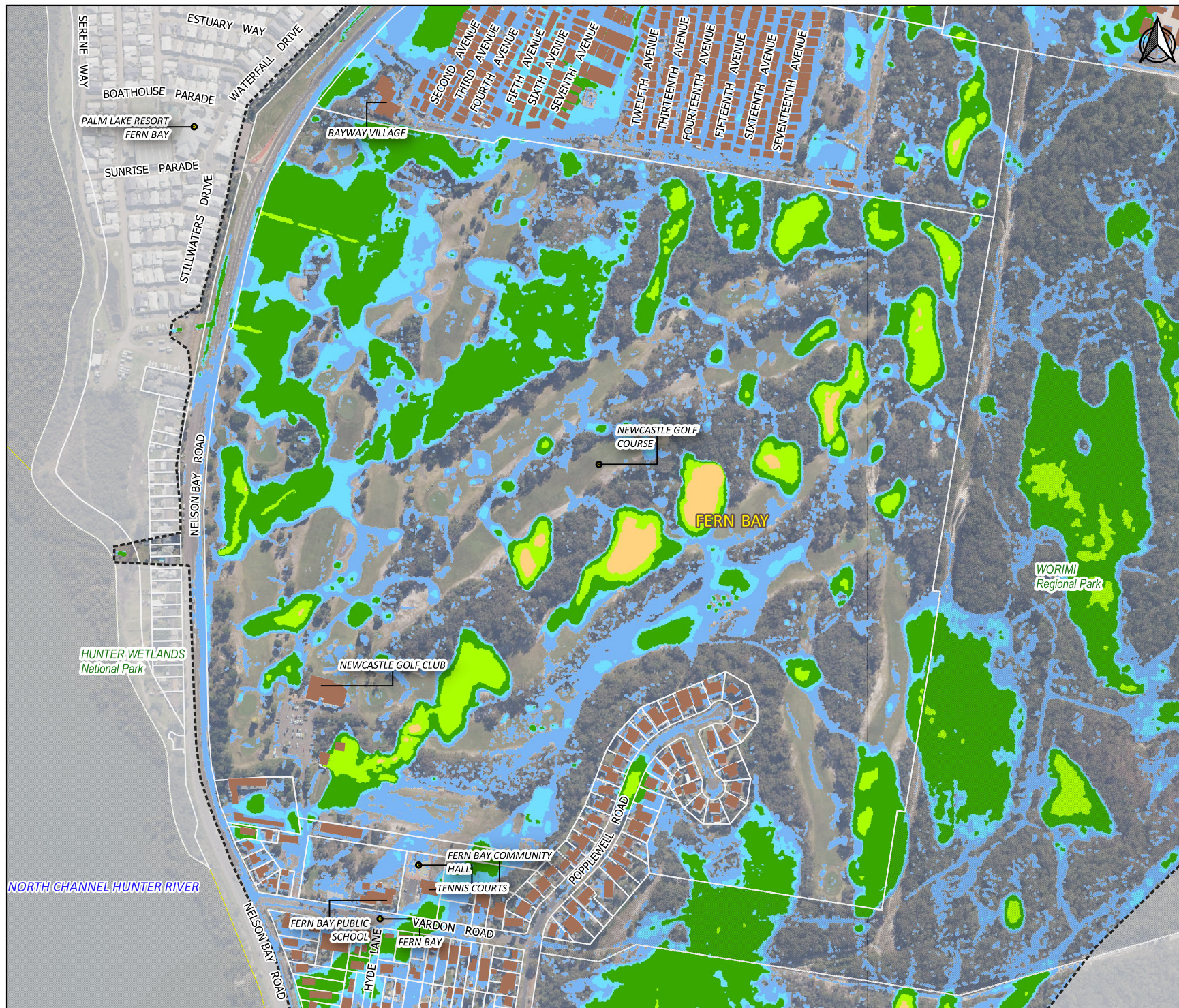
- Depth(m)**
- < 0.01
 - 0.01 - 0.10
 - 0.10 - 0.30
 - 0.30 - 0.50
 - 0.50 - 0.70
 - 0.70 - 1.00
 - 1.00 - 1.50
 - 1.50 >

0 100 200 Metres
1:6,500

Figure B1
1% AEP Depth and
Elevation
Local Catchment Flooding
Existing Conditions

Newcastle Golf Club
Fern Bay





Legend

 TUFLOW Model Extent

Buildings

Hazard Category

H1

H2

H3

H4

H5

H6

0 100 200 Metres

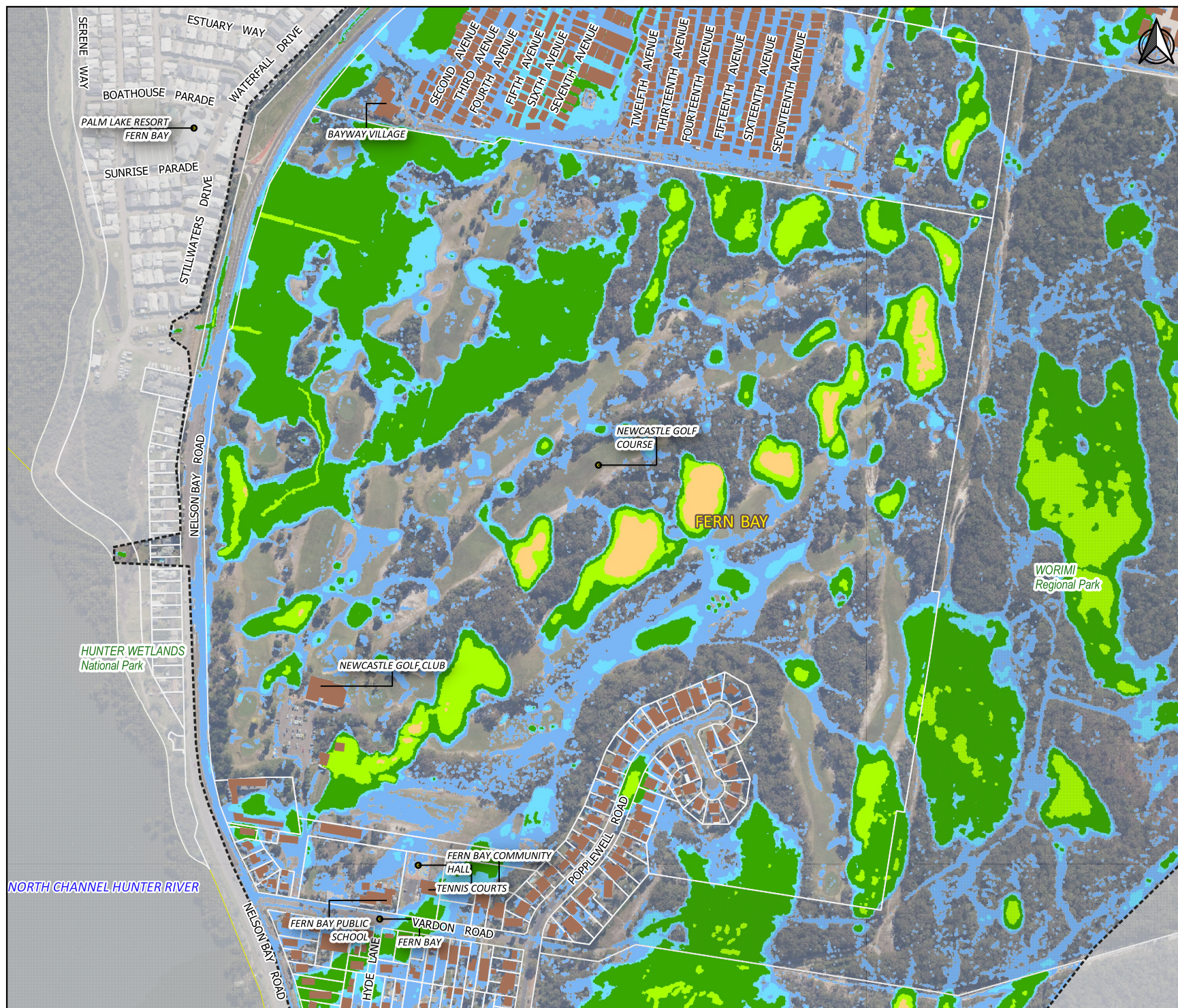
1:6,500

Figure B2

1% AEP Flood Hazard
Local Catchment Flooding
Existing Conditions

Newcastle Golf Club
Fern Bay





Legend

TUFLOW Model Extent

Buildings

Hazard Category

H1

H2

H3

H4

H5

H6

0 100 200 Metres

1:6,500

Figure B4

1% AEP 2100 Flood Hazard
Local Catchment Flooding
Existing Conditions

Newcastle Golf Club
Fern Bay



Developed Flood Behaviour and Impacts

Developed Flood Behaviour

Figures representing the developed flood behaviour are presented in Figures C1 to C4 overleaf.

Flood Effects

In the local catchment 1% AEP event, there is a decrease in the water surface level in the flood storage area to the north of the subject site. Decreases are also observed in the Nelson Bay Road reserve and downstream drainage corridor.

For the 1% AEP 2100 event sensitivity analysis, there is a similar decrease in the water surface level in the flood storage area, and downstream of Nelson Bay Road.

Increases on the northeastern portion of the course are commensurate with those approved as part of the golf course modification DA.

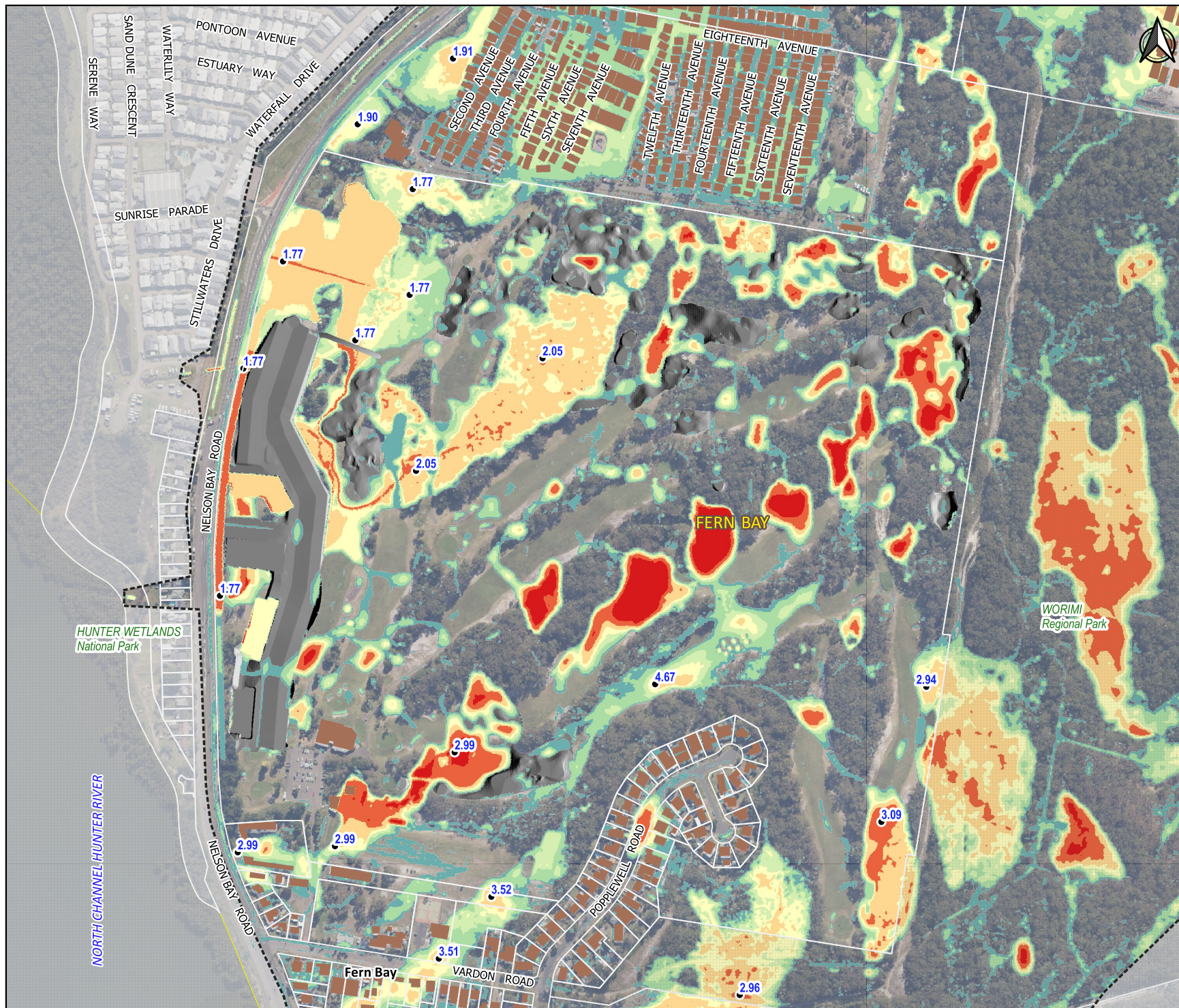
Flood level comparisons are presented overleaf in Figures D1 and D2.

Floor Levels

Floor levels have been adopted as a minimum of 2.9m AHD which represents the Flood Planning Level. This represents approximately 1.05m freeboard to the current 1% AEP and is considered compliant with Council's requirements.

Basement Carpark Protection

A bund has been included on the western side of the development to protect the basement carparking to at least the current 1% AEP event. This is compliant with Council's DCP requirement.



- Legend**
- TUFLOW Model Extent
 - Buildings
 - Proposed Landform
 - Water Elevation(mAHD)

- Depth(m)**
- < 0.01
 - 0.01 - 0.10
 - 0.10 - 0.30
 - 0.30 - 0.50
 - 0.50 - 0.70
 - 0.70 - 1.00
 - 1.00 - 1.50
 - 1.50 >

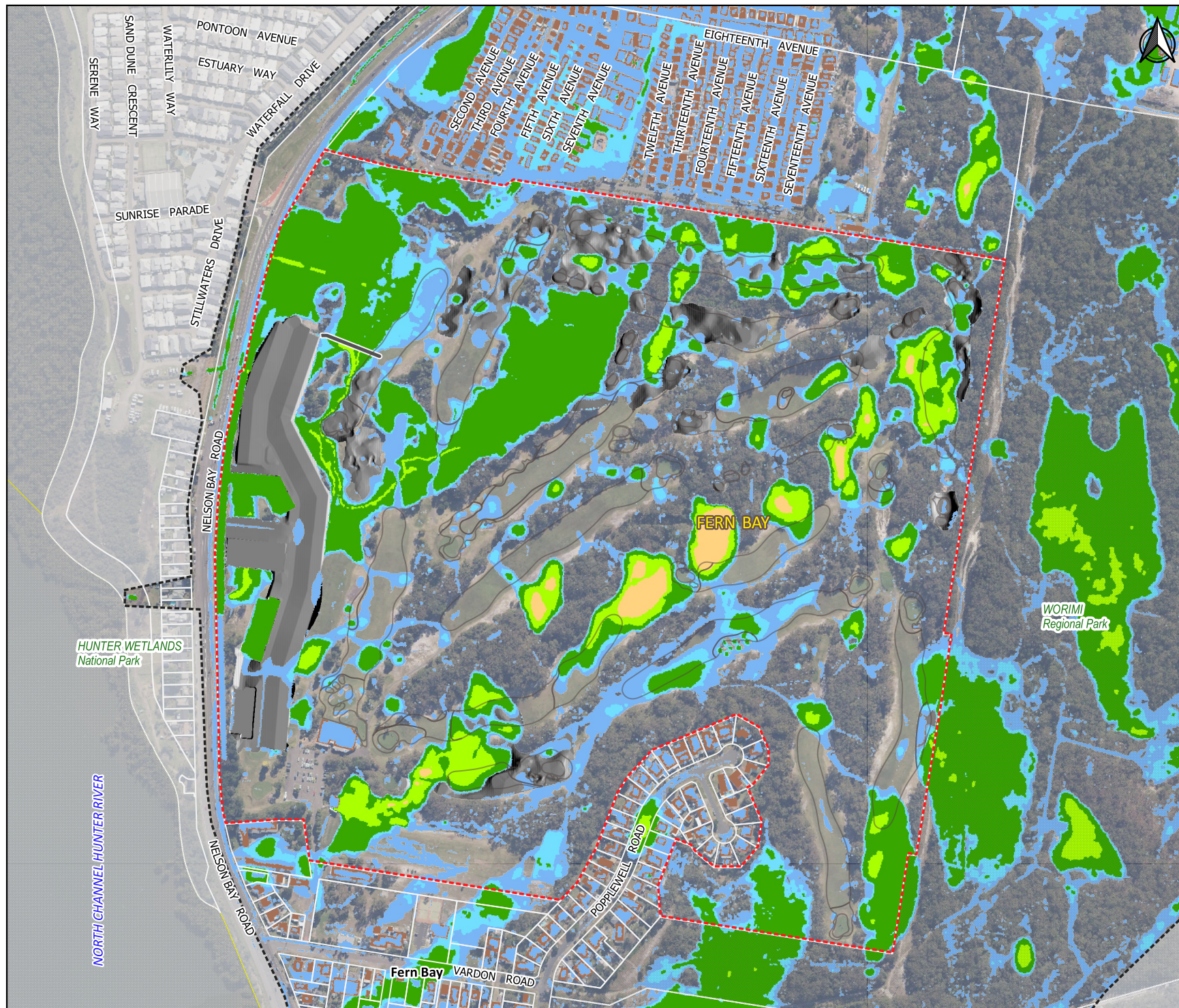
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1:6,500

Figure C1
 1% AEP Depth and
 Elevation
 Local Catchment Flooding
 Developed Conditions

Newcastle Golf Club
 Fern Bay





Legend

- TUFLOW Model Extent
- Buildings
- Proposed Landform

Hazard

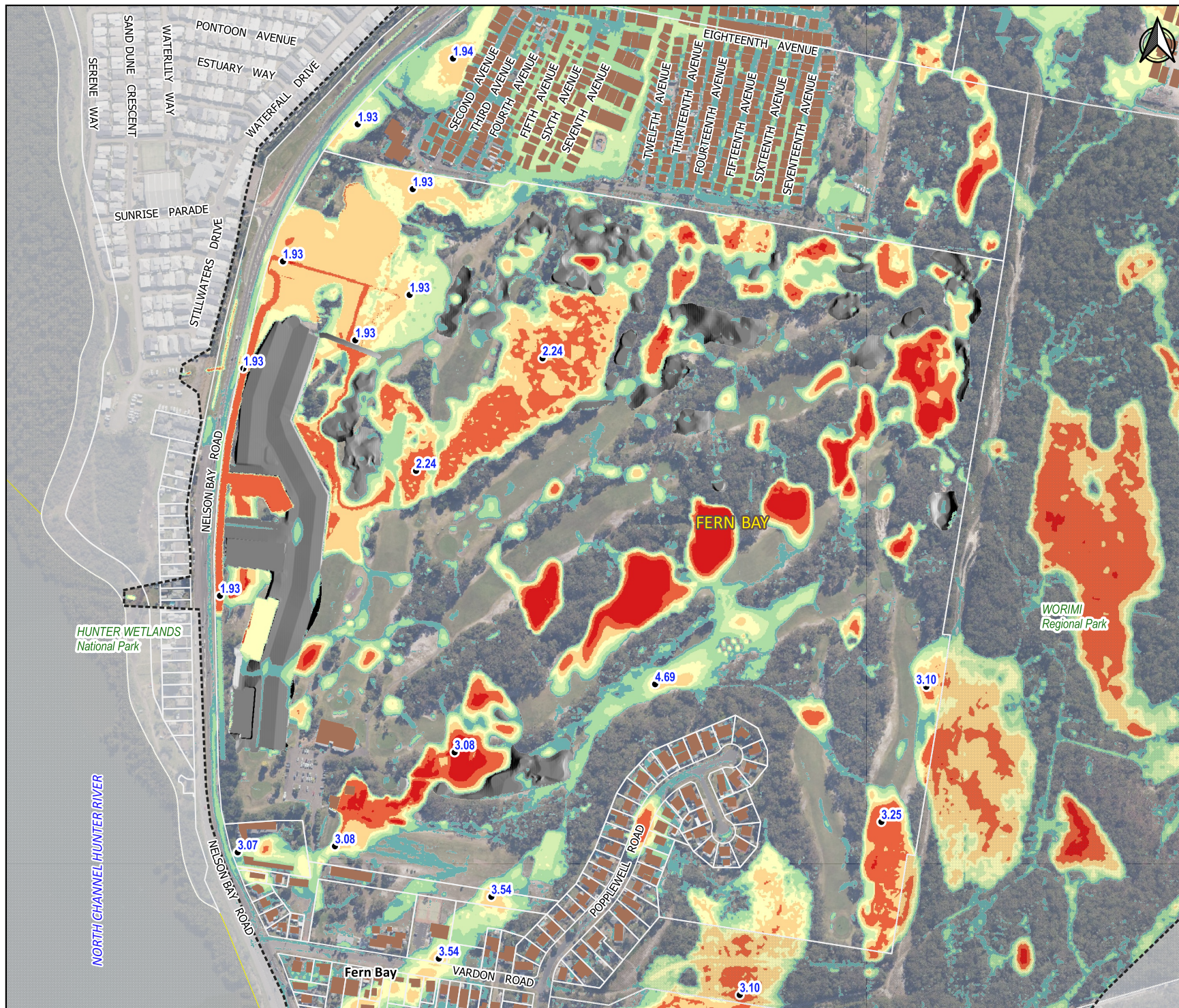
- H1
- H2
- H3
- H4
- H5
- H6

0 100 200 Metres
1:6,500

Figure C2
1% AEP Hazard
Local Catchment Flooding
Developed Conditions

Newcastle Golf Club
Fern Bay





- Legend**
- TUFLOW Model Extent
 - Buildings
 - Proposed Landform
 - Water Elevation(mAHD)

- Depth(m)**
- < 0.01
 - 0.01 - 0.10
 - 0.10 - 0.30
 - 0.30 - 0.50
 - 0.50 - 0.70
 - 0.70 - 1.00
 - 1.00 - 1.50
 - 1.50 >

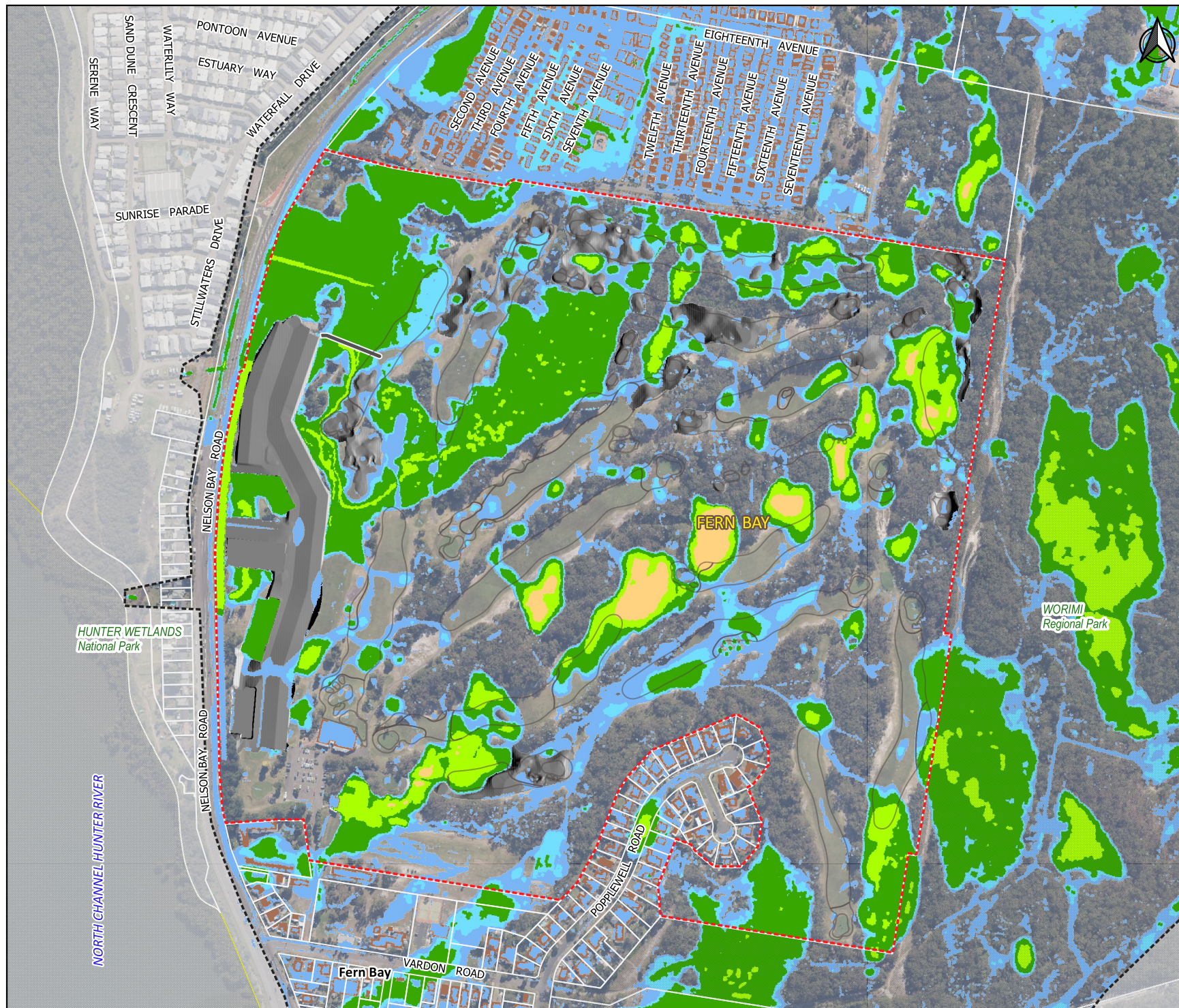
0 100 200 Metres

1:6,500

Figure C3
1% AEP 2100 Depth and Elevation
Local Catchment Flooding
Developed Conditions

Newcastle Golf Club
 Fern Bay





Legend

[Dashed Red Line] TUFLOW Model Extent
 [Brown] Buildings
 [Grey] Proposed Landform

Hazard

[Light Blue] H1
 [Medium Blue] H2
 [Green] H3
 [Yellow-Green] H4
 [Orange] H5
 [Red] H6

0 100 200 Metres

1:6,500

Figure C4
 1% AEP 2100 Hazard
 Local Catchment Flooding
 Developed Conditions

Newcastle Golf Club
 Fern Bay





Legend

- Subject Site
- - - TUFLOW Model Extent
- Buildings
- Proposed Landform
- Water Elevation(mAHD)

Difference(m)

- <-0.10
- 0.10 - -0.05
- 0.05 - -0.03
- 0.03 - -0.01
- Less than +/-10mm
- 0.01 - 0.03
- 0.03 - 0.05
- 0.05 - 0.10
- >0.10

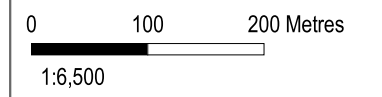
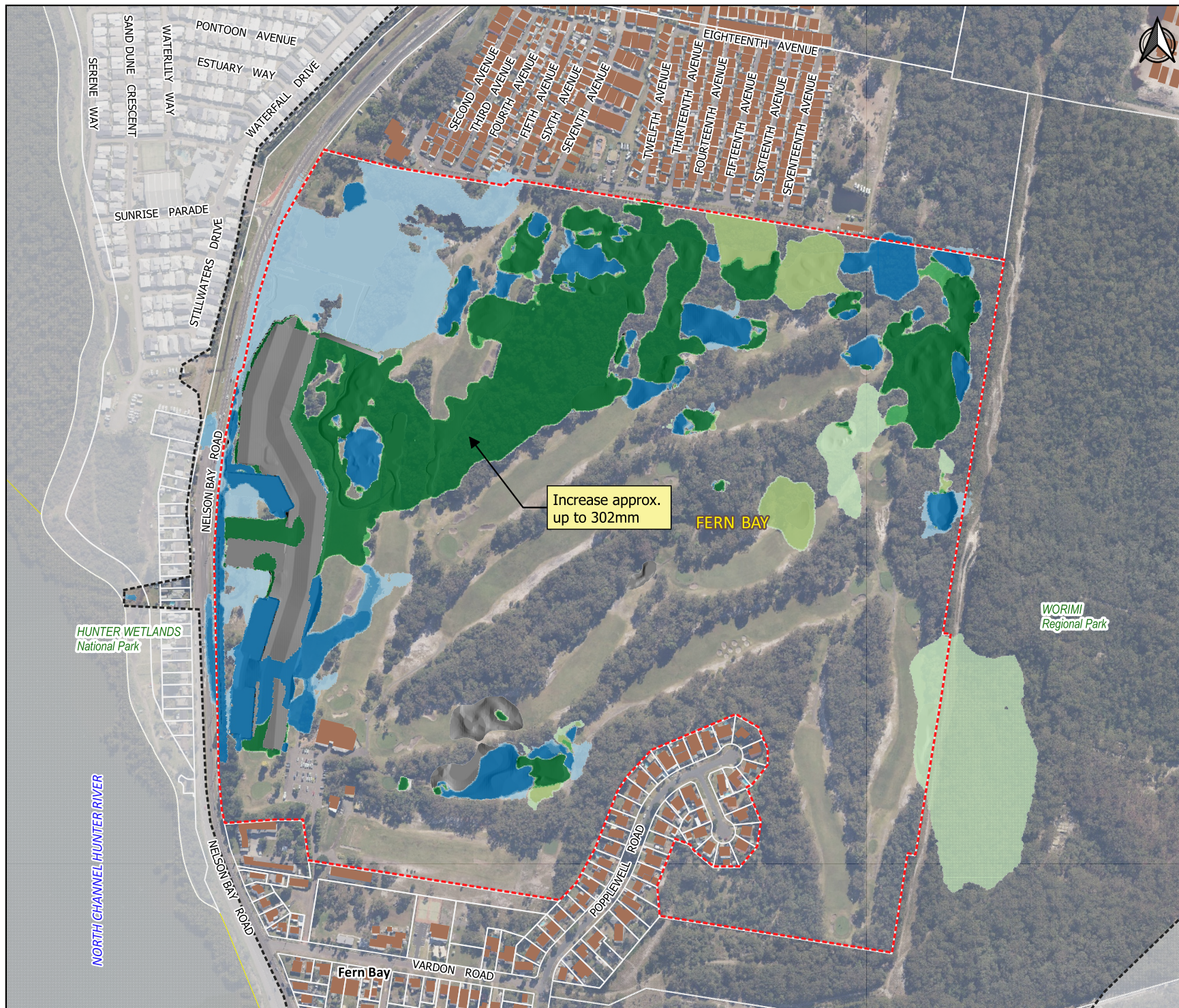


Figure D1
1% AEP Depth and Elevation
Local Catchment Flooding
Developed Conditions

Newcastle Golf Club
 Fern Bay





Legend

- Subject Site
- - - TUFLOW Model Extent
- Buildings
- Proposed Landform
- Water Elevation(mAHD)

Difference(m)

- <-0.10
- -0.10 - -0.05
- -0.05 - -0.03
- -0.03 - -0.01
- Less than +/-10mm
- 0.01 - 0.03
- 0.03 - 0.05
- 0.05 - 0.10
- >0.10

0 100 200 Metres
1:6,500

Figure D2
1% AEP 2100 Depth and
Elevation
Local Catchment Flooding
Developed Conditions

Newcastle Golf Club
Fern Bay



Discussion

Flood Storage and Compensatory Measures

The subject site forms a flood storage area in the existing case. Compensatory cut has been provided to offset the storage lost in the development fill pad. Furthermore, a bund has been proposed upstream of the compensatory cut to provide further flood storage at a higher level. This shifts the potential impacts away from the adjoining development to the north, and Nelson Bay Road, to the existing golf course. Impacts are limited to existing low-lying areas of the golf course and playing surfaces raised behind the bund to minimise the impacts in a 1% AEP event.

Flood storage volumes and change in the events considered is presented below in Table 9. These have been calculated within the site boundary from the wider model extent.

Table 9 - Flood storage volumes

	Existing (m ³)	Developed (m ³)	Change (m ³ , (%))
1% AEP	174,596	179,641	+5,045 (+2.8%)
1% AEP 2100	210,537	215,520	+4,983 (+2.3%)

The time required for the flood storage in the critical duration event is presented below in Figure 2 to

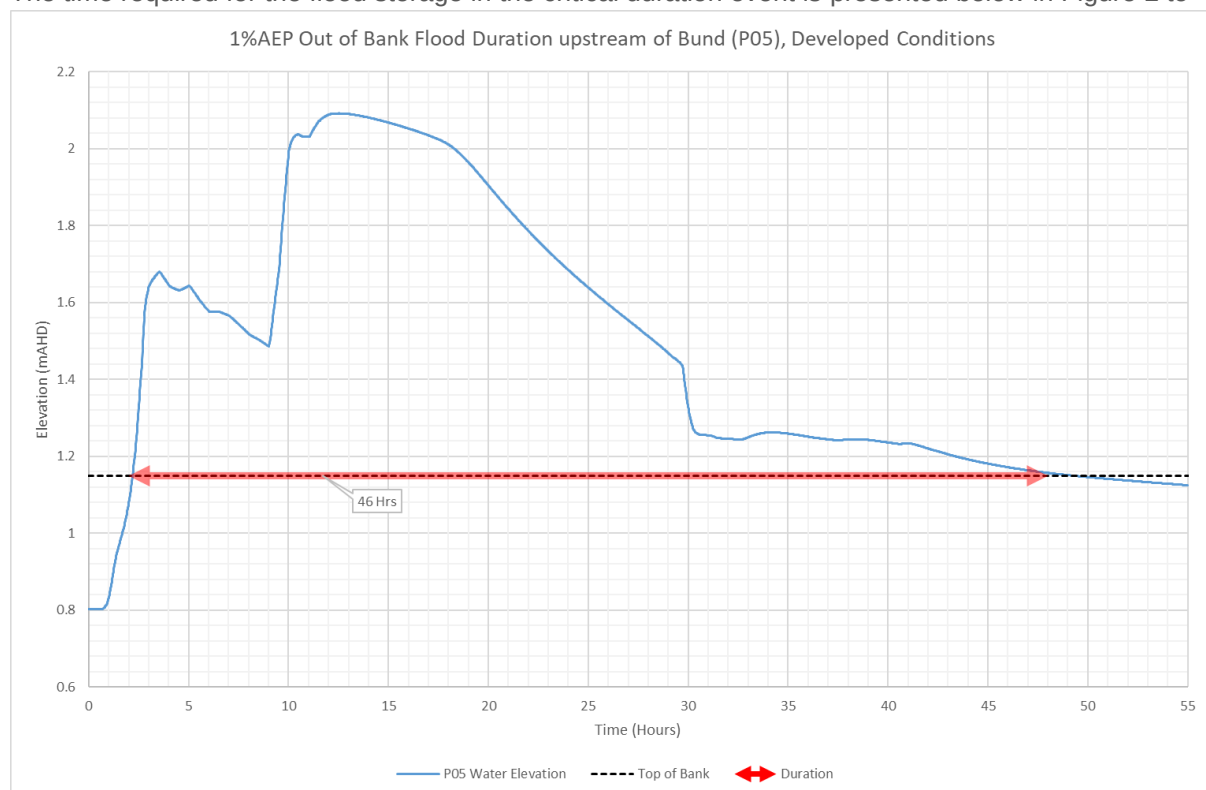


Figure 4. Reporting points are located in the following places, shown on Figure A1:

- **P03.** Upstream of northern culverts under Nelson Bay Road.
- **P05.** Upstream of the proposed bund.

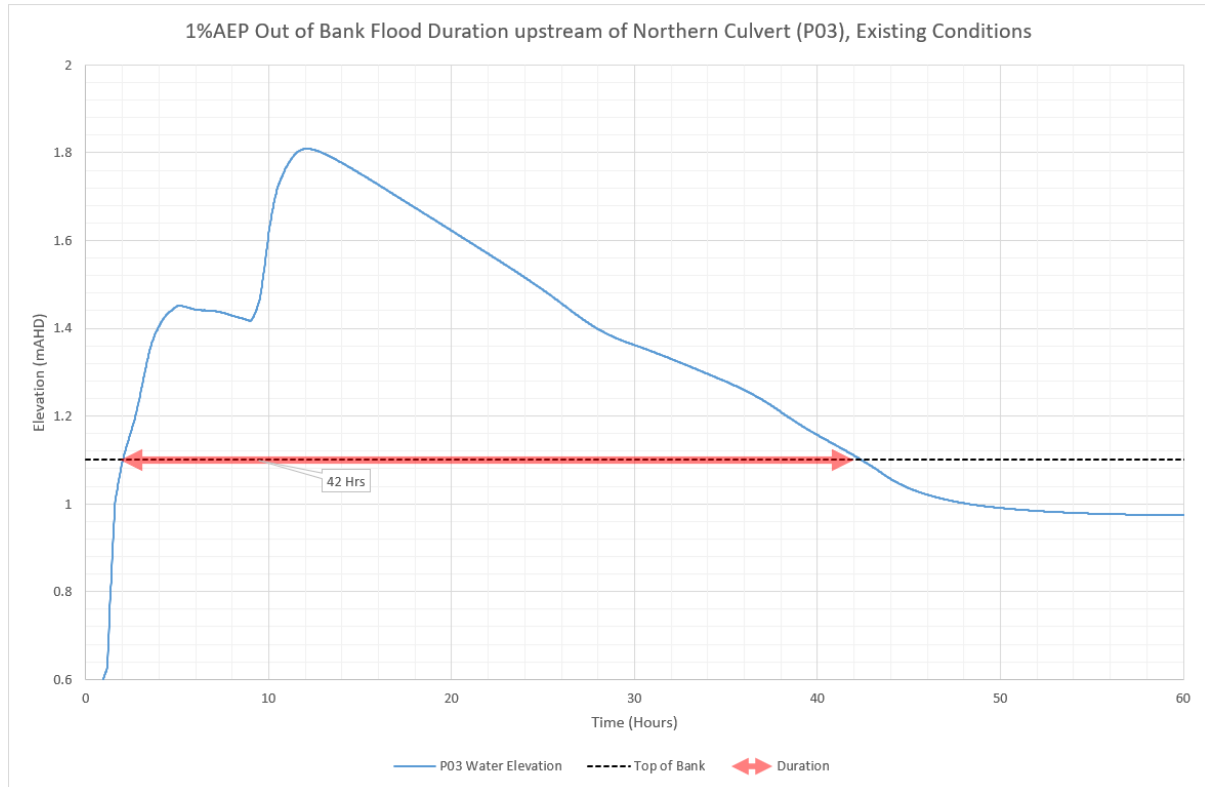


Figure 2 - Out of bank duration existing scenario 1% AEP

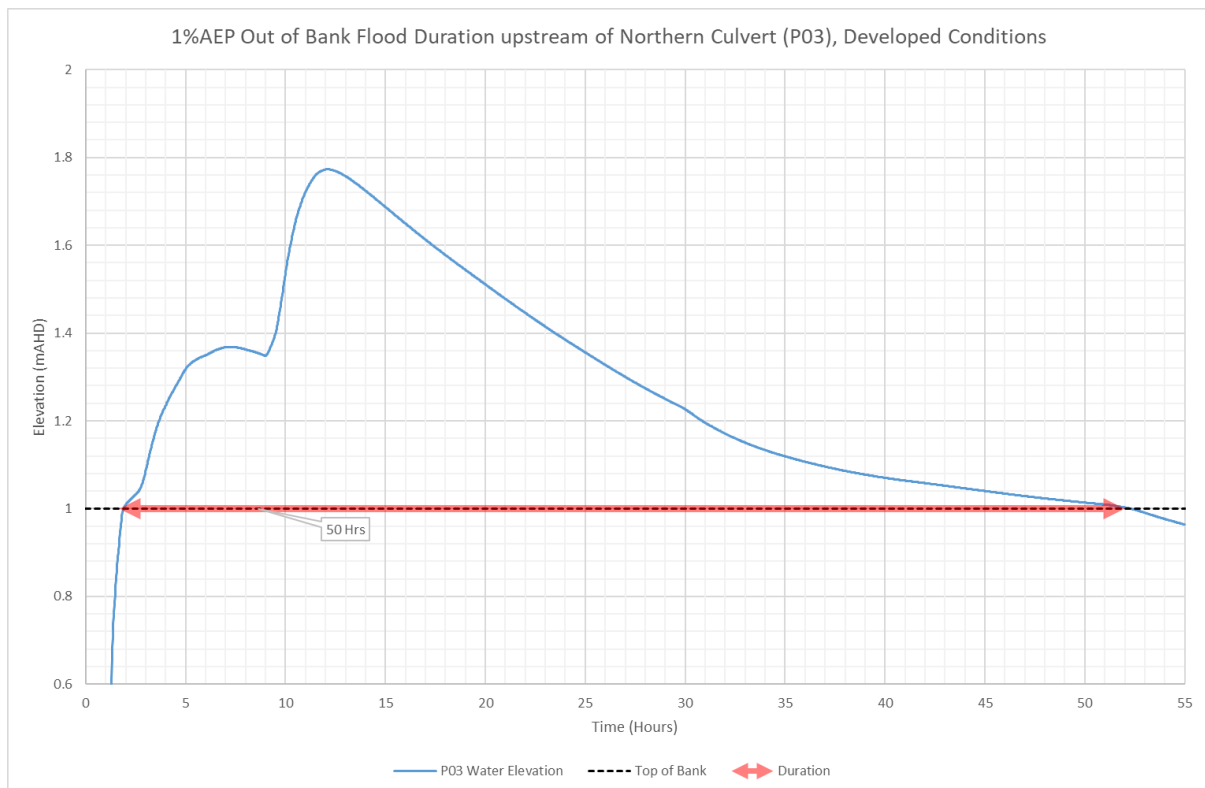


Figure 3 - Out of bank duration developed scenario 1% AEP

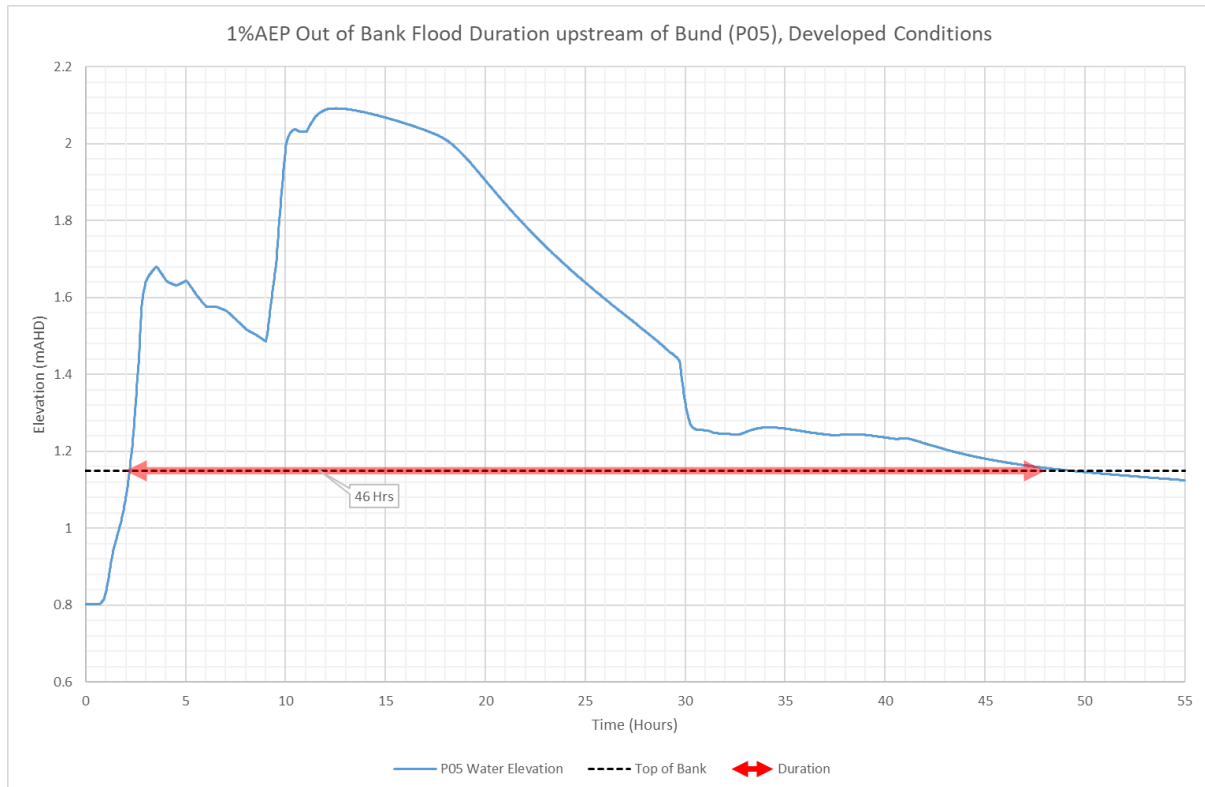


Figure 4 - Out of bank duration developed scenario 1% AEP upstream of bund

This demonstrates the flood storage area will drain within two days from rainfall ceasing even in this very rare local catchment event.

On-Site Detention

On-site detention has not been proposed for the subject site. There is limited benefit in providing detention above a flood prone area as the problem is less flow rate based, and more volume based. In this instance, additional volume for flood storage has been provided in a compensatory cut area, and behind a small bund on the golf course. Flood modelling has demonstrated a reduction off-site in the 1% AEP event and because of this, we believe the omission of on-site detention for the development is reasonable, and upstream/ downstream impacts have been mitigated.

Cumulative Impacts of Filling

The cumulative impact of filling in the floodplain has not been considered because compensatory cut is proposed as part of the development and as outlined above in Table 9, there is an increase in flood storage in the developed case. Furthermore, several adjacent sites have already filled to their full potential, minimising the chance for further impact from filling.

Conclusions

Northrop Consulting Engineers were engaged by Principle Living and Newcastle Golf Club to complete Development Application documentation for the proposed construction, and use of, a Seniors Living village at 4A Vardon Road, Fern Bay.

It was concluded from the assessment the following items are in accordance with Council's requirements:

- Submission requirements.
- Developed water quality.
- Stormwater infrastructure.
- Flood effects.
- Floor levels.

Variations to Council's policy are sought for the following items:

- Omission of on-site detention.

Discussion as to the reasons for variance have been provided and it was concluded this variation was appropriate when considering the site in the context of the regional catchment.

AS noted above and in the Flood Information Certificate, we note that portions of the golf course site are considered to be high hazard flood storage.

We submit these findings to Port Stephens Council for their consideration.

Limitation Statement

Northrop Consulting Engineers Pty Ltd (Northrop) has been retained to prepare this report based on specific instructions, scope of work and purpose pursuant to a contract with its client. It has been prepared in accordance with the usual care and thoroughness of the consulting profession for the use by Principle Living and Newcastle Golf Club. The report is based on generally accepted practices and standards applicable to the scope of work at the time it was prepared. No other warranty, express or implied, is made as to the professional advice included in this report.

Except where expressly permitted in writing or required by law, no third party may use or rely on this report unless otherwise agreed in writing by Northrop.

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Document Register

Rev	Status	Prepared	Approved	Date
1	Draft	GB	AB	2 July 2021
2	Revised Draft	GB	AB	2 August 2021
3	Revised Draft	GB	AB	1 December 2021
A	For Approval	GB	AB	10 December 2021
B	Amended For Approval	AB	AB	17 May 2022
C	Amended For Approval	GB / TVK	AB	25 October 2023
D	Amended For Approval	GB / TVK	AB	5 December 2023
E	Amended For Approval	GB/ TVK	AB	18 December 2024

Appendix A – Pre - DA Meeting Minutes

PROPERTY DETAILS

Property Address	4A Vardon Road FERN BAY
Lot and DP	LOT: 4 DP: 823114
Current Use	Golf course and club house
Zoning	RE2 PRIVATE RECREATION
Legislation/Policy	State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004; Port Stephens Local Environmental Plan 2013; and Port Stephens Development Control Plan 2014.
Site Constraints	Bushfire prone land; Acid sulfate soils, class 2, 3 and 4; Koala Habitat Planning Map; Endangered Ecological Communities; SEPP (Coastal Management) 2018; Notifiable Noxious Weeds; Combined Corridor Map; RAAF Base Williamtown, height trigger map (45m); RAAF Base Williamtown, bird strike group A and B; Biodiversity Values Map.

MEETING DETAILS

Date:	13 June 2019		
Time:	2pm		
Proposed Development:	Newcastle Golf Course - Proposed golf hole relocation and seniors retirement living village		
Council Officer(s):	<i>Name</i>	<i>Contact No.</i>	<i>Position</i>
	Amy Ryan	4988 0129	PDR Coordinator
	Ryan	4988 0562	Senior Development

Pre-Lodgement Meeting Minutes

	Falkenmire	Planner
	Emmilia Johnstone	4988 0263 Development Planner
	Bryn Cotterill	4988 0376 Senior Development Engineer
	Ashley Bacales	4988 0423 Senior Ecological Planner
Applicant/ Proponent(s):		
	Ben Johnson	Stevens Group
	Ben Isenhood	Stevens Group
	Mark Kelso	Principle Living
	Jordan Hoey	Northrop Engineers
	Craig Anderson	AEP Environmental
	Michael Rogers	EJE Architecture
	Alan McKelvey	Newcastle Golf Club – Sparke Helmore
	Christian Gillott	Newcastle Golf Club
	Bob Harrison	Harrison Golf
	Scott Champion	Harrison Golf

NOTE

- 1) These minutes identify key issues discussed between Council staff and the proponent and do not seek to represent the full discussion undertaken;
- 2) The views expressed may vary once detailed plans and documentation are submitted and formally assessed, or as a result of issues contained in submissions by other parties; and
- 3) Amending the request/proposal will require further assessment.

Development Proposal

The proposed development is for alterations and addition to an existing golf course and clubhouse. The proposal includes golf hole relocation and a seniors retirement living village.

The proposal will include subdivision (2 into 2 lot) of the existing allotments, resulting in the seniors living village on a separate allotment to the golf course, inclusive of 21 golf course residences, 56 duplexes (over 28 allotments), and 64 apartments (2 x 4 storey buildings).

Issues Discussed

Proposal:

The development is a joint venture between Principle Living and Newcastle Golf Club, for a redevelopment of the golf course and senior living development to increase investment, income and interest within the Club. The development will comprise of 2 development applications as outlined below:

- (1) Development application for relocation/reconfiguration of golf course and holes;
- (2) Development application for 2 into 2 lot Torrens title subdivision, and Seniors Living Development.

Site Compatibility Certificate (SCC)

The Applicant was advised that a site compatibility certificate (SCC) was required, and an SCC is to be obtained prior to lodgement of a development application for Seniors Living. Please see the attached flowchart in Appendix A, of which details the SCC process.

The applicant was advised to contact Council's Principle Strategic Planner – William Oxley (4988 0251) should they wish to discuss the SCC and associated processes with a Council representative, however generally Council does not have involvement in the SCC process until the certificate is lodged with the Department of Planning (DoP). The SCC will then be referred to Council's Strategic Planning Team for comment as part of the DoP assessment process.

Development Application (1) – Alterations/additions to existing golf course – additional golf holes

A detailed cost summary report will need to be submitted to Council, outlining a genuine cost of works estimate (noted by the applicant as being approximately \$5million). There are no development specific triggers for determination by the Joint Regional Planning Panel under Schedule 7 of the *State Environmental Planning Policy (State and Regional Development) 2011*.

The additional golf holes (specifically holes 7, 15 and 16) will result in clearing of significant vegetation and will trigger the need for a BDAR and offsetting. See advice on Ecology matters, specific to both of the proposed DAs, listed below.

There are also potential likely impacts to Aboriginal Cultural Heritage. An Aboriginal Cultural Heritage Assessment Report will be required and the applicant was advised to contact Nicole Davis from OEH. The DA is likely to trigger integrated referral requirements to OEH on this basis.

Development Application (2) - Subdivision – two into two lot subdivision to facilitate the leasing of land to accommodate the seniors housing proposal.

The subject site currently comprises two lots, one of which is undersize. The application proposes a 2 into 2 lot subdivision, to relocate the boundary of Lot: 105 DP: 614883 (4 Vardon Road Fern Bay) to be situated adjacent to Nelson Bay road. The subdivision will also result in an undersized allotment (approx. 6ha in area) for the purpose of Seniors Living, with the large lot containing the existing Golf Course to remain above the minimum lot size requirements (approx. 76ha in area).

The Applicant was advised that a comprehensive cl.4.6 variation would be required and that any variation over 10% would usually be reported to Council. A comprehensive cl.4.6 assessment should be provided to support the proposed lot size variation.

It is noted that the development application (inclusive of subdivision and Seniors Living) has an estimated cost of works over \$30million, and therefore requires determination by the JRPP in any case, as outlined under Schedule 7 of the *State Environmental Planning Policy (State and Regional Development) 2011*.

Development Application (2) – Seniors Living

The Applicant was advised that they need to comply with SEPP Seniors (including access to services / facilities and site slope) and SEPP 65 (proposed RFBs). It is recommended the applicant approach the Urban Design Consultative Group (UDCG) for design advice prior to the lodgement of the development applications. Port Stephens Council is currently in the process of organising our own UDCG of which should be in effect by the second half of the year. If the applicant requires a meeting prior to PSC having their own panel, it is recommended the applicant approach Newcastle City Council UDCG to arrange.

The site is flood prone and there are local drainage issues which require address under any future application. It is likely that significant earthworks will be undertaken to address flood affected land and site slope – a benching levelling plan and details of retaining would be necessary to submit with a future DA. Consideration should be given to any potential flooding impacts to Nelson Bay Road and compliance with Chapter B5 of Council's Development Control Plan 2014 will need to be demonstrated. It is recommended the applicant obtain a flood certificate, or determine existing flood planning levels for the site, if not already done so.

Access is proposed from Nelson Bay Road (left in/left out). The applicant has had discussions with the RMS and it was noted that an integrated referral to RMS would be required.

The site is also bushfire prone and requires lodgement of a bushfire assessment report and integrated referral to RFS.

Natural Resources and Ecology – Applicable considerations for both applications

Key constraints

There are a number of ecological constraints within the proposal area(s). Key matters for consideration include:

- Endangered Ecological Communities (Swamp Sclerophyll Forest)
- Koala habitat including preferred Koala Habitat and habitat buffers (Koala habitat planning map 2000). Implications with the PSC CKPoM including compliance with the performance criteria for development applications (Appendix 4 of the CKPoM).
- Biodiversity Values Map – A BDAR is required to be submitted for each application.
- *State Environmental Planning Policy (Coastal Management) 2018*
 - Coastal environment
 - Coastal use
 - Coastal Wetlands Proximity Area (southwestern corner)
- Threatened species
- Flood planning level - if fill is required, investigation into how altered hydrology may impact on ground water dependent ecosystems i.e. indirect impacts to swamp sclerophyll forest EEC
- Consideration of the area of LEP mapped wetland in north of site.

Meeting discussion points

There are obviously complexities when it comes to demonstrating the 'avoid, minimise and offset' component of the assessment. Key points for consideration may include:

- Avoidance of areas of highest biodiversity value, relative to what occurs on site.
- Establishing a timeline of assessment/design, and/or options assessments i.e. demonstration that the ecological assessment has informed the design of the proposal.

Similarly with the CKPoM, the performance criteria for development applications in Appendix 4 of the CKPoM requires the proponent to demonstrate that impacts to areas of koala habitat have been minimised. Key points for consideration may include:

- Avoidance of areas where there is the highest density of koala feed trees, or largest/most heavily utilised koala feed trees.
- Retention of connectivity

As was also discussed briefly with regards to compensatory koala feed tree offset planting (in accordance with the CKPoM and Tree Technical Specification), Council would expect the assessment to demonstrate that the required koala feed tree offsetting can be achieved, either on site, or potentially offsite. It should be noted that where offsite offsetting is proposed, it is preferable that it occurs within the area local to the impact.

Engineering – Stormwater and flooding

The development application should be supported with appropriate civil plans inclusive of water quality and quantity controls, as outlined in Chapter B4 of Councils Development Control Plan 2014. Flooding impacts will need to be addressed as per Chapter B5 of the Councils Development Control Plan 2014, with consideration given to evacuation plans and access for elderly. It was noted that the proposed community facility is likely to be deemed as flood refuge, and is to sit

Pre-Lodgement Meeting Minutes

above the probable maximum flood level (PMF) through the use of fill. Proposed dwellings are currently proposed at the flood planning level (FPL).

The applicant will need to address any proposed fill or earthworks, and how this may impact the interface of the site with Nelson Bay Road.

Direct access to Nelson Bay Road will be subject to RMS referral for comment. Consideration should be given to centralising access via Vardon Road.

Any future application should utilise the most up to date Australian Rainfall Runoff Guidelines.

DA Lodgement

The applicant is advised that any future development application must be lodged with supporting information in accordance with Schedule 1 of the *Environmental Planning and Assessment Regulations 2000*, inclusive of the following:

	DEVELOPMENT TYPE	Dwelling House (1 storey)	Dwelling House (2+ storey)	Semi-Detached Dwelling	Secondary Dwelling	Dual Occupancy	Attached Dwellings	Multi-Dwelling Housing	Residential Flat Building	Alterations / Additions	Outbuildings (i.e. pergolas)	Pools	Commercial / Retail / Office	Change of Use	Industrial	Home Business / Home Industry	Community Facility	Tourism	Signage	Demolition	Earthworks	Temporary Event / Land Use	Subdivision
SUPPORTING DOCUMENTATION PLANS	Elevation Plans	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Erosion Sedimentation Plan	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	✓	✓	DCP
	Floor Plans	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Landscape Plan					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	DCP
	Notification Plan (A4)		✓	✓	✓	✓	✓	✓	✓	2**	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	DCP
	Sections	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Signage Plan																	✓					
	Site Plan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Site Analysis Plan*	B	B	✓	✓	✓	✓	✓	✓	B	B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Stormwater Drainage Plan	B	B	✓	✓	✓	✓	✓	✓	B	B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Survey Plan/Reference Levels	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	BASIX Certificate	✓	✓	✓	✓	✓	✓	✓	✓	C	C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Subdivision Plan																						✓
REPORTS	Demolition Plan																		✓				
	Statement of Environmental	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Waste Management Plan	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B

- ✓ Mandatory. Application will not be accepted without this documentation.
- * Can be incorporated on site plan
- 2** For 2+ Storey Structure
- C BASIX certificate is also required for residential alteration/additions with a value greater than \$50,000 and pools with more than 40,000 litres.
- B Beneficial. It will facilitate and speed up the assessment process. May be requested during assessment if not provided at lodgement
- DCP The DCP contains specific lodgement requirements for these documents and development types. Please refer to the relevant section of the DCP.

Other documentation required based on other conditions

Document/Plan	Condition
Bushfire Assessment Report	For development on bushfire prone land
Cut and Fill Plan	Where proposal includes cut/fill and/or retaining walls
Detailed Cost Report	When the estimated cost of the development is over \$3 million. Must be signed by a Quantity Surveyor.
Flora and Fauna Survey	Development located on land or in proximity to areas of environmental significance (see DCP)
Biodiversity Assessment Report	Where triggered by the <i>Biodiversity Conservation Act 2018</i> .
Flood Study	Development in flood planning area or below the flood planning level (FPL) (see DCP)
Geotechnical Report	Significant bulk excavation works are proposed and for major subdivisions
Shadow Diagrams	Where residential development proposed is two storeys in height and/or potentially overshadows neighbours

NOTE: The completeness and quality of the application can impact upon the assessment time. Further, any incomplete or insufficient applications may not be accepted. Council required development applications to be lodged in digital format to facilitate a more efficient electronic assessment process while minimising paper and the impact on the environment. For electronic lodgement, please visit the Port Stephens Council Website and follow the guidelines described. If you choose to lodge the application in paper form, you must provide only one paper copy of all the supporting documentation. A scanning fee will apply for applications lodged in paper form.

Relevant Documentation and Website Links

Development Application Requirements and Process

<http://www.portstephens.nsw.gov.au/grow/development-applications>

Port Stephens Local Environmental Plan 2013

<http://www.portstephens.nsw.gov.au/grow/development-controls-plans-and-strategies/planning-controls>

Port Stephens Development Control Plan 2014

<http://www.portstephens.nsw.gov.au/grow/development-controls-plans-and-strategies/dcp>

Apartment Design Guide

<https://www.planning.nsw.gov.au/Policy-and-Legislation/Housing/Apartment-Design-Guide>

Joint Regional Planning Panel

<https://www.planningpanels.nsw.gov.au/>

Site Compatibility Certificates

<https://scc.planningportal.nsw.gov.au/>

Appendix B – Civil Drawings

NELSON BAY ROAD, FERN BAY, NSW 2259
CIVIL ENGINEERING PACKAGE - DEVELOPMENT APPLICATION

[illegible]

LEGEND

DENOTES DEVELOPMENT PROPERTY BOUNDARY

DENOTES PROPERTY BOUNDARY

EXISTING CONTOURS (0.5m INTERVALS)

DENOTES EXTENT OF COMPENSATORY CUT AREA FOR FLOOD MANAGEMENT



DRAWN: J. STAUB
DESIGNED: B. BROWN
JOB MANAGER: A. BROWN
VERIFIER: A. BROWN

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
B	ISSUED FOR APPROVAL	JR	AB	JH	22.07.24
C	AMENDED FOR APPROVAL	RG	AB	JH	18.12.24

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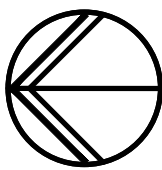
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Ph (02) 4943 1777 Email newcastle@northrop.com.au

ABN 81 094 433 100

PROJECT

APPERLY VILLAGE
NELSON BAY ROAD, FERN
BAY. NSW. 2259.

DRAWING TITLE

GENERAL ARRANGEMENT PLAN



APPROVAL

JOB NUMBER

NL166557

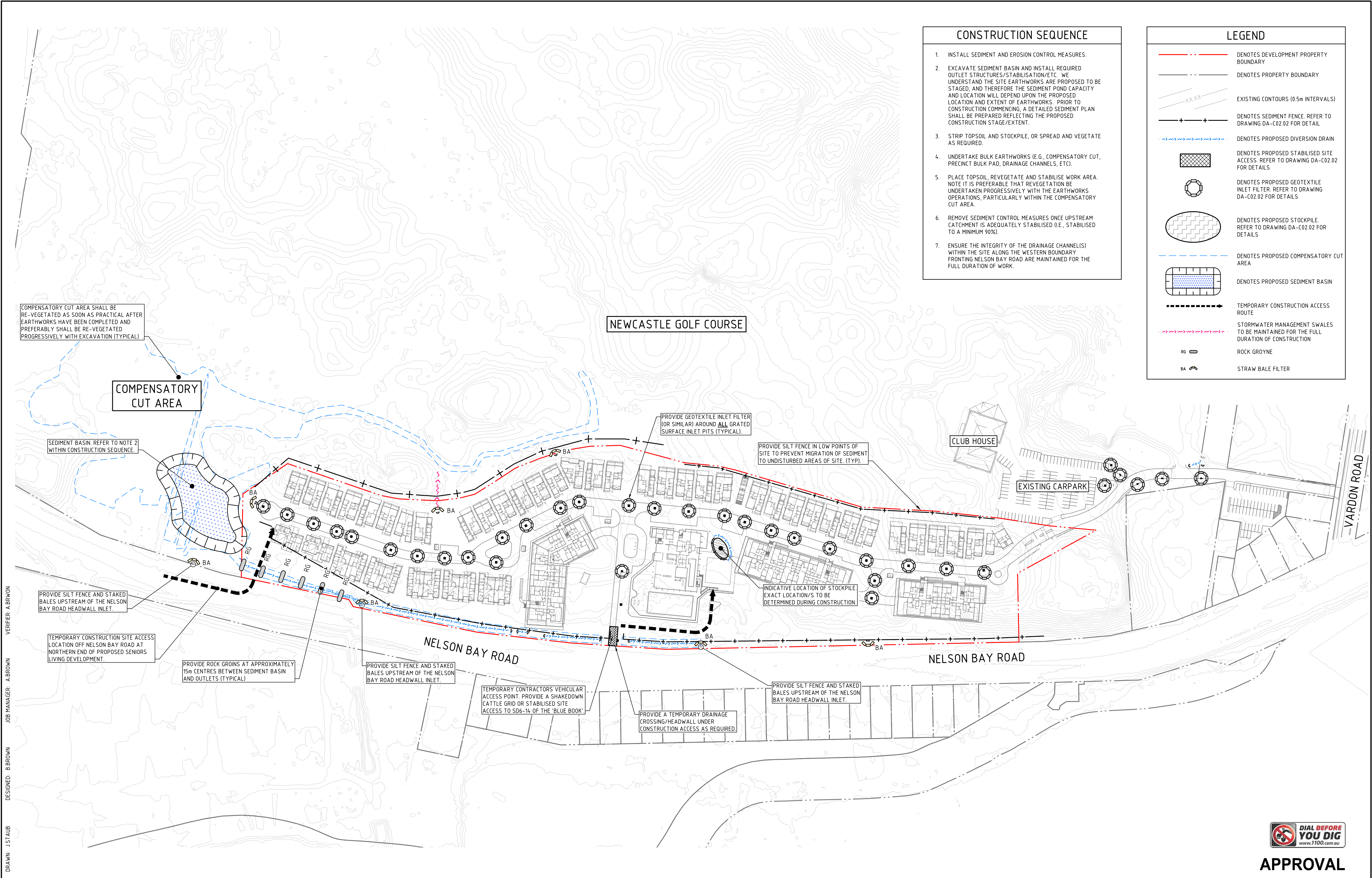
DRAWING NUMBER

DA-C01.21

REVISION

C

DRAWING SHEET SIZE = A1



VERIFIER: A.BROWN
JOB MANAGER: A.BROWN
DESIGNED: B.BROWN
DRAWN: J.STAUB

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
G	ISSUED FOR APPROVAL	JR	AB	JH	22.07.24
H	AMENDED FOR APPROVAL	RG	AB	JH	18.12.24

PRINCIPLE LIVING

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ARCHITECT

EJE architecture

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SCALE 1:2000 @ A1

0 20 40 60 80 100m

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Newcastle

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ABN 81 094 433 100

PROJECT

APPERLY VILLAGE

NELSON BAY ROAD, FERN BAY. NSW. 2259.

DRAWING TITLE

EROSION AND SEDIMENT CONTROL PLAN

DIAL BEFORE YOU DIG
www.1100.com.au

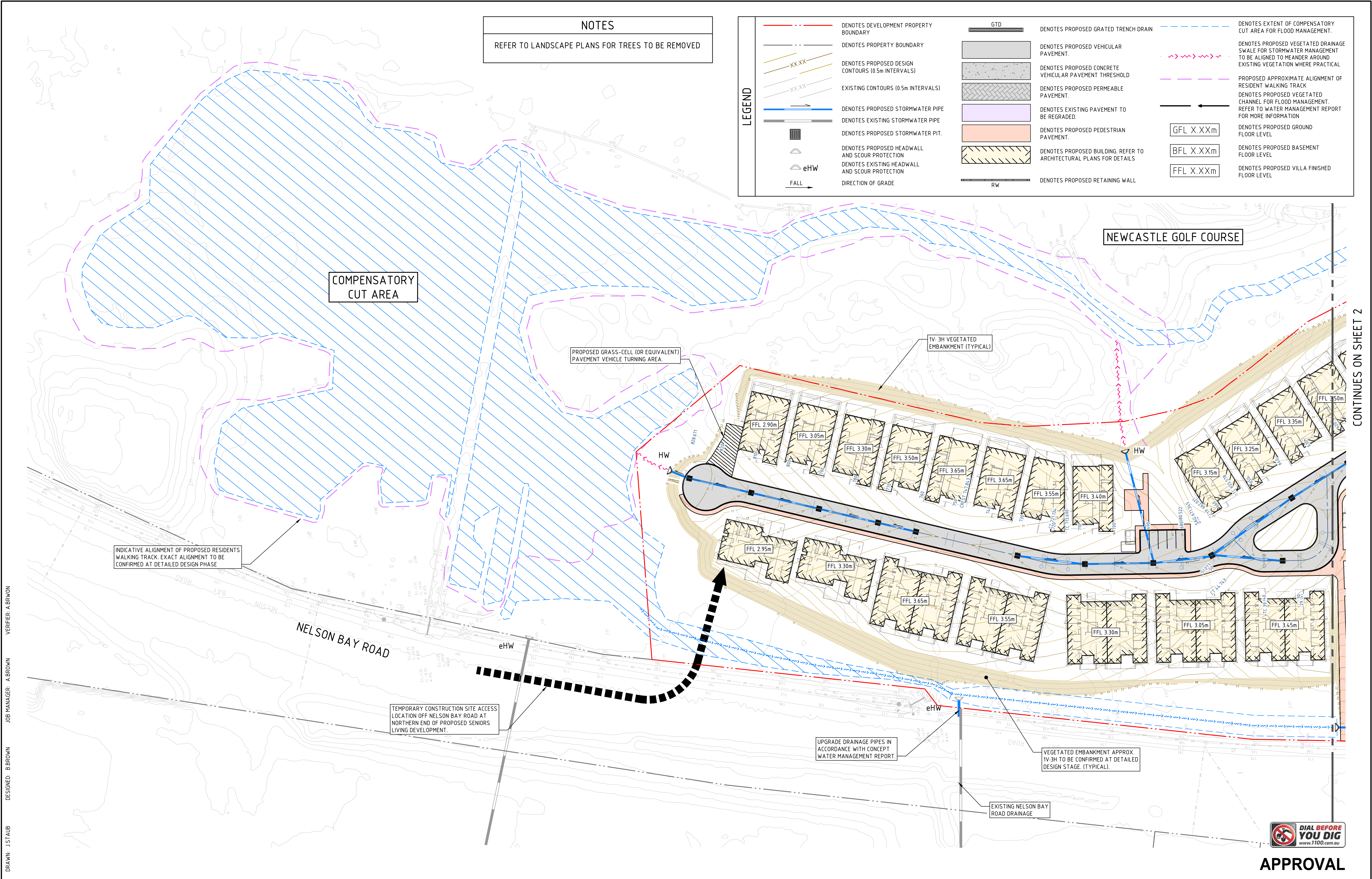
APPROVAL

JOB NUMBER
NL166557

DRAWING NUMBER
DA-C02.01

REVISION
H

DRAWING SHEET SIZE = A1



REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE	CLIENT	ARCHITECT	PROJECT	DRAWING TITLE	JOB NUMBER
G	ISSUED FOR APPROVAL	JR	AB	JH	22.07.24	PRINCIPLE LIVING	EJE architecture	APPERLY VILLAGE	NELSON BAY ROAD, FERN BAY. NSW. 2259.	NL166557
H	AMENDED FOR APPROVAL	RG	AB	JH	18.12.24					
						DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED	THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD	SCALE 1:500@A1	STORMWATER MANAGEMENT AND LEVELS PLAN - SHEET 1	DRAWING NUMBER DA-C03.01
								ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY. THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.		
								NORTHROP Newcastle Level 1, 215 Pacific Hwy, Charlestown NSW 2290 Ph (02) 4943 1777 Email newcastle@northrop.com.au ABN 81 094 433 100		
								PROJECT		
								DRAWING TITLE		
								JOB NUMBER		
								REVISION		
								DRAWING SHEET SIZE = A1		

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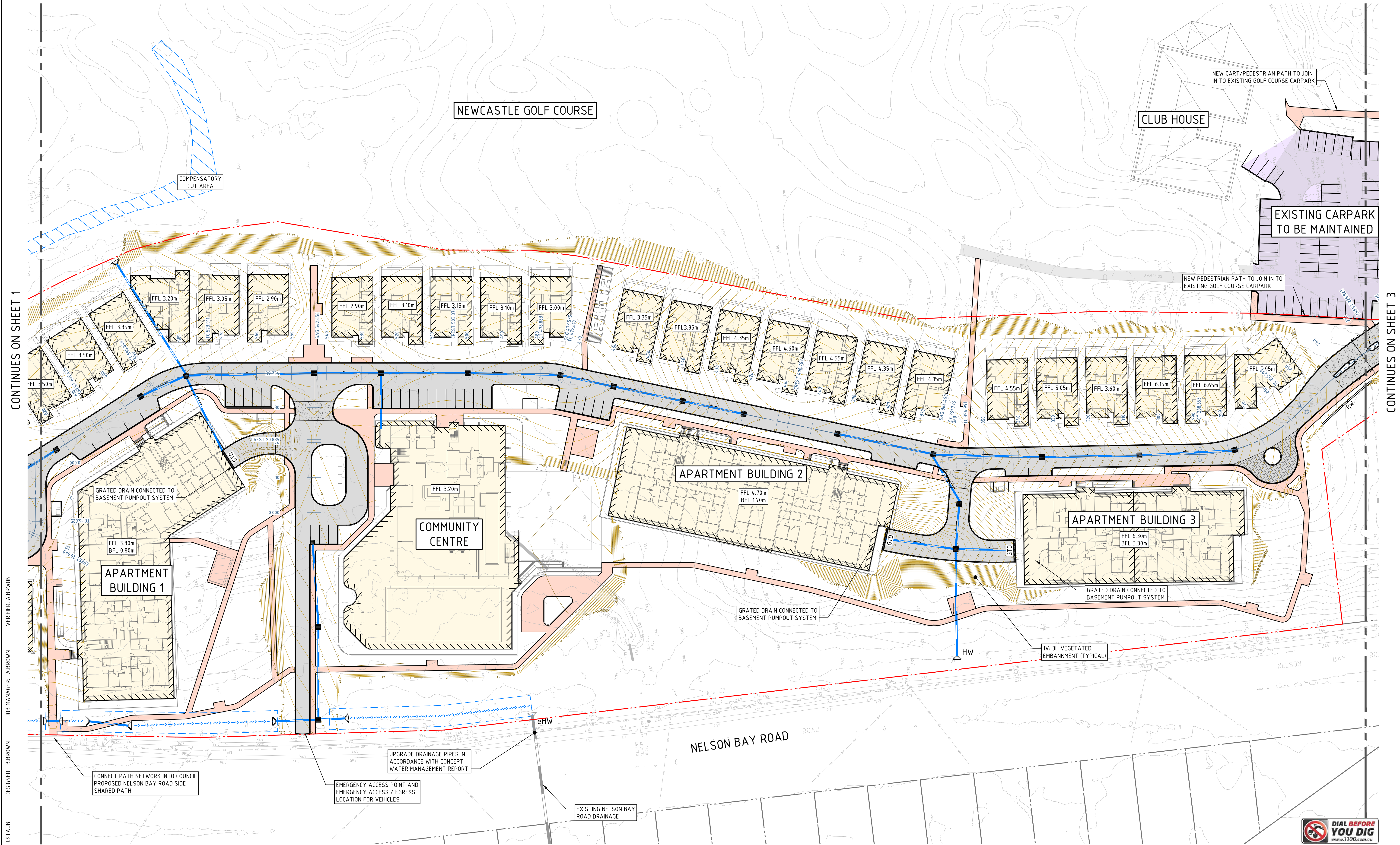
VERIFIER: A.BROWN

JOB MANAGER: A.BROWN

DESIGNED: B.BROWN

DRAWN: J.STAUB

CONTINUES ON SHEET 3



APPROVAL

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
E	ISSUED FOR APPROVAL	JR	AB	JH	22.07.24
F	AMENDED FOR APPROVAL	RG	AB	JH	18.12.24

Date: 18.12.2024 11:42 AM Plotted by: ROBERT GRIEVE Pinned: c:\p\pre-july 24 projects\newcastle\year 2016\p\NL166557\p\drawings\CIVIL\DRAWINGS\da - aged carpark\166557_DA-C03.02 - SW MANAGEMENT1.dwg

PRINCIPLE LIVING

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ARCHITECT

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SCALE 1:500@A1

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ABN 81 094 433 100

PROJECT

APPERLY VILLAGE
NELSON BAY ROAD, FERN BAY. NSW. 2259.

DRAWING TITLE

STORMWATER MANAGEMENT AND LEVELS PLAN - SHEET 2

JOB NUMBER

NL166557

DRAWING NUMBER

DA-C03.02

REVISION

F

DRAWING SHEET SIZE = A1

DRAWN: J.STAUB DESIGNED: B.BROWN JOB MANAGER: A.BROWN VERIFIER: A.BROWN



NL166557

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SCALE 1:500@ A1 	

PROJECT

APPERLY VILLAGE

**NELSON BAY ROAD, FERN
BAY. NSW. 2259.**

JOB NUMBER	
NL166557	
DRAWING NUMBER	REVISION
DA-C03.03	A
DRAWING SHEET SIZE = A1	

**DRAWING
REMOVED**

DRAWN: J. STAUB DESIGNED: B. BROWN JOB MANAGER: A. BROWN VERIFIER: A. BROWN

APPROVAL

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE	CLIENT	ARCHITECT	ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY. THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.		PROJECT	DRAWING TITLE	JOB NUMBER
D	ISSUED FOR APPROVAL	JR	AB	JH	22.07.24	PRINCIPLE LIVING	EJE architects	NORTHROP Newcastle Level 1, 215 Pacific Hwy, Charlestown NSW 2290 Ph (02) 4943 1777 Email newcastle@northrop.com.au ABN 81 094 433 100	APPERLY VILLAGE NELSON BAY ROAD, FERN BAY. NSW. 2259.	DRAWING REMOVED	NL166557	
E	AMENDED FOR APPROVAL	RG	AB	JH	18.12.24						DRAWING NUMBER	REVISION
											DA-C03.11	E
						DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED	THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD	SCALE 1:150 @ A1 01.534.5677.5m				DRAWING SHEET SIZE = A1

**DRAWING
REMOVED**

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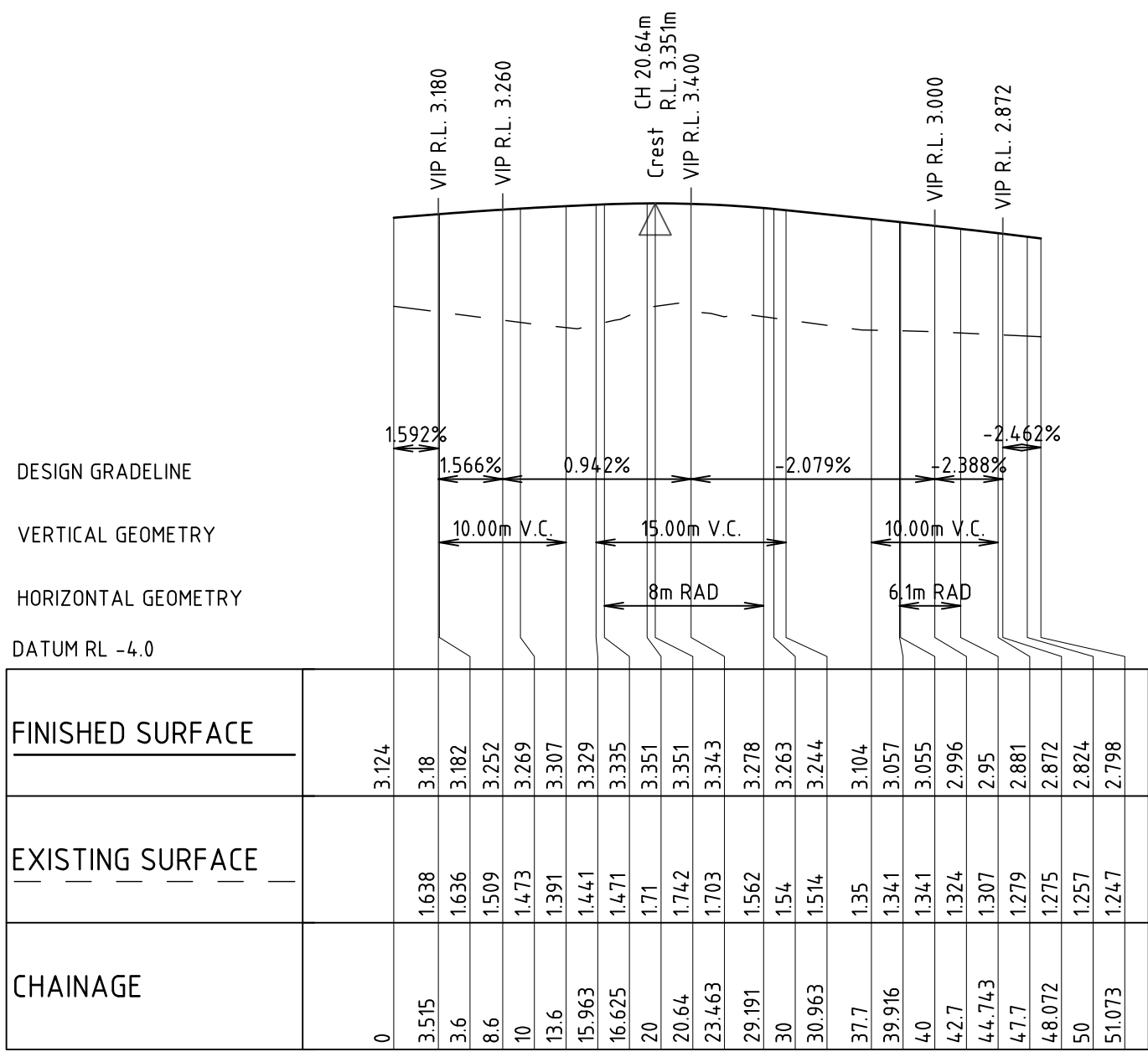
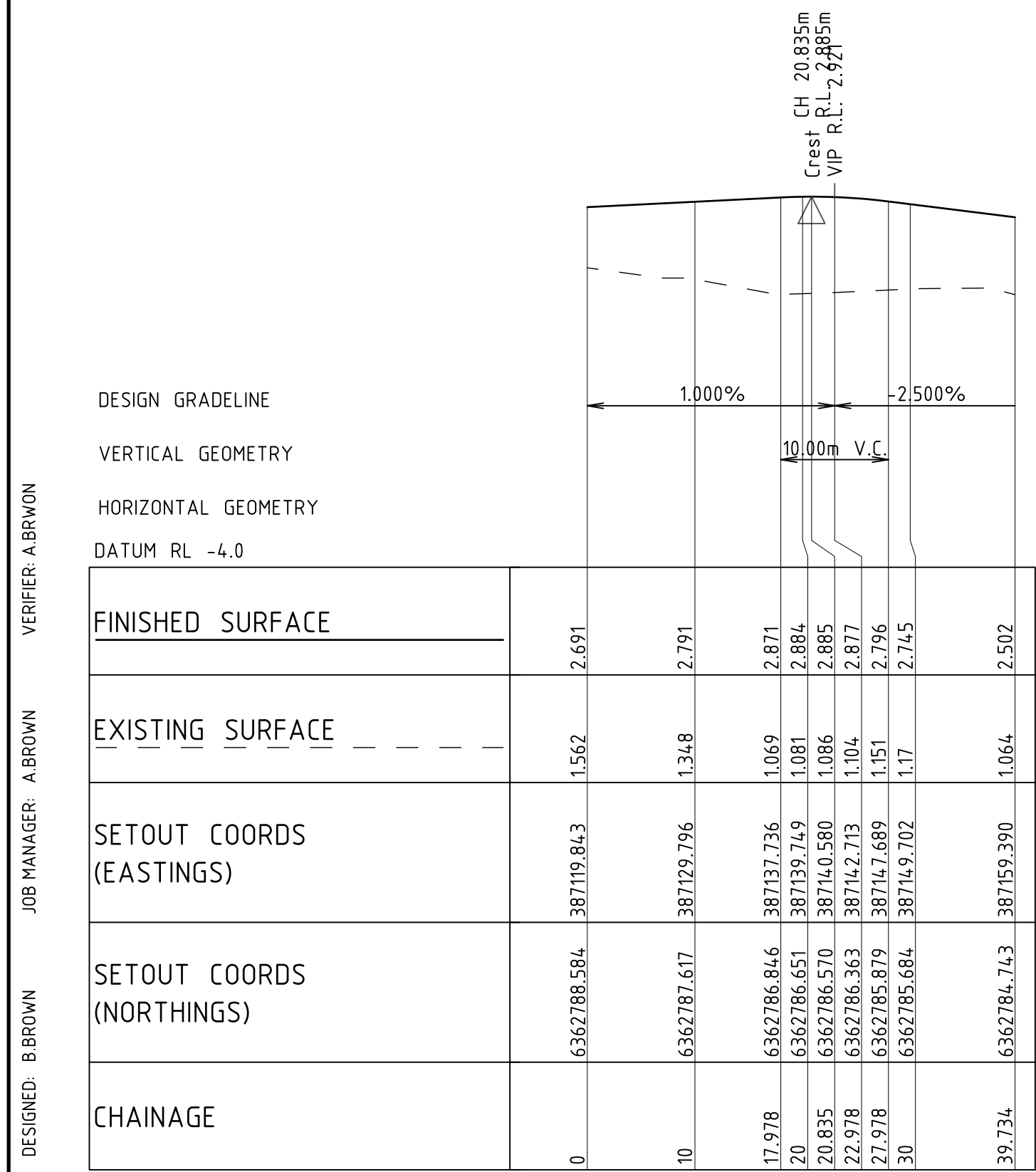
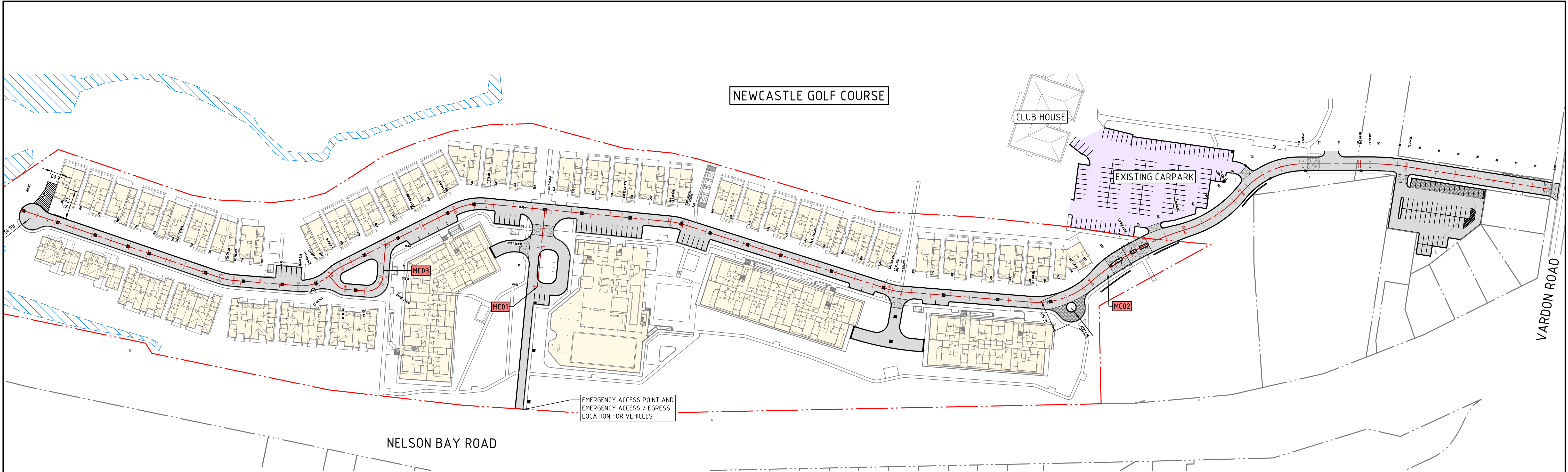
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B	ISSUED FOR APPROVAL	JR	AB	JH	22.07.24			 Newcastle Level 1, 215 Pacific Hwy, Charlestown NSW 2290 Ph (02) 4943 1777 Email newcastle@northrop.com.au ABN 81 094 433 100	APPERLY VILLAGE	NELSON BAY ROAD, FERN BAY. NSW. 2259.	NL166557		
C	AMENDED FOR APPROVAL	JR	AB	18.12.24	 Level 1, 215 Pacific Hwy, Charlestown NSW 2290 Ph (02) 4943 1777 Email newcastle@northrop.com.au ABN 81 094 433 100							NELSON BAY ROAD, FERN BAY. NSW. 2259.	DA-C03.12
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											DRAWING SHEET SIZE = A1		

VERIFIER: A.BRWON

JOB MANAGER: A. BROWN

DESIGNED: B.BROWN

DRAWN: J.STAUB



LEGEND

- DENOTES DEVELOPMENT PROPERTY BOUNDARY
- DENOTES PROPERTY BOUNDARY
- DENOTES PROPOSED VEHICULAR PAVEMENT.
- DENOTES CONTROL LINE AND CHAINAGE.

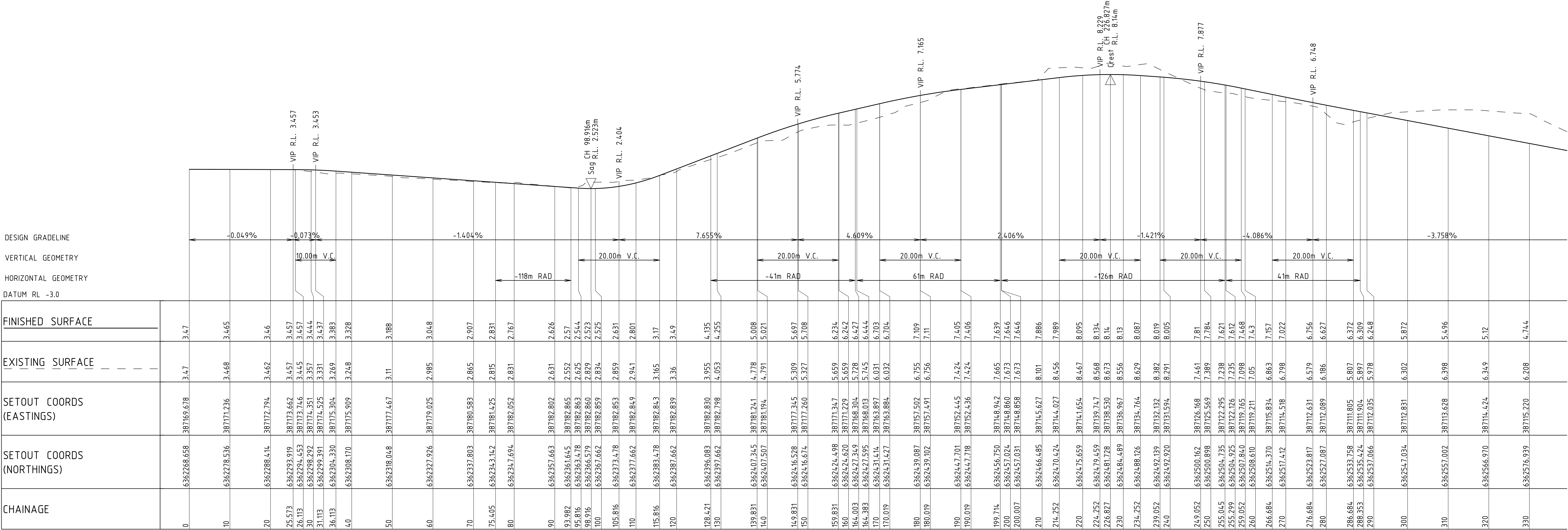
DRAWN: J.STAUB

DESIGNED: B.BROWN

JOB MANAGER: A.BROWN

VERIFIER: A.BROWN

DESIGN GRADELINE
VERTICAL GEOMETRY
HORIZONTAL GEOMETRY
DATUM RL -3.0



LONGITUDINAL SECTION ALONG MC02

HORIZONTAL SCALE 1:500@A1
VERTICAL SCALE 1:100@A1

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
G	ISSUED FOR APPROVAL	JR	AB	JH	22.07.24
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SCALE 1:100 @ A1
SCALE 1:500 @ A1

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ABN 81 094 433 100

PROJECT

APPERLY VILLAGE
NELSON BAY ROAD, FERN
BAY. NSW. 2259.

DRAWING TITLE

ROAD LONG SECTIONS -
MC02 - SHEET 1

JOB NUMBER
NL166557

DRAWING NUMBER
DA-C03.22

REVISION
H

DRAWING SHEET SIZE = A1

DRAWN: J STAUB

DESIGNED: B BROWN

JOB MANAGER: A BROWN

VERIFIER: ABRWON

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	AMENDED FOR APPROVAL	RG	AB	JH	18.12.24

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SCALE 1:100 @ A1

SCALE 1:500 @ A1

012345m

0510152025m

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PROJECT

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NELSON BAY ROAD, FERN
BAY. NSW. 2259.

DRAWING TITLE

ROAD LONG SECTIONS -
MC02 - SHEET 2

JOB NUMBER

NL166557

DRAWING NUMBER

DA-C03.23

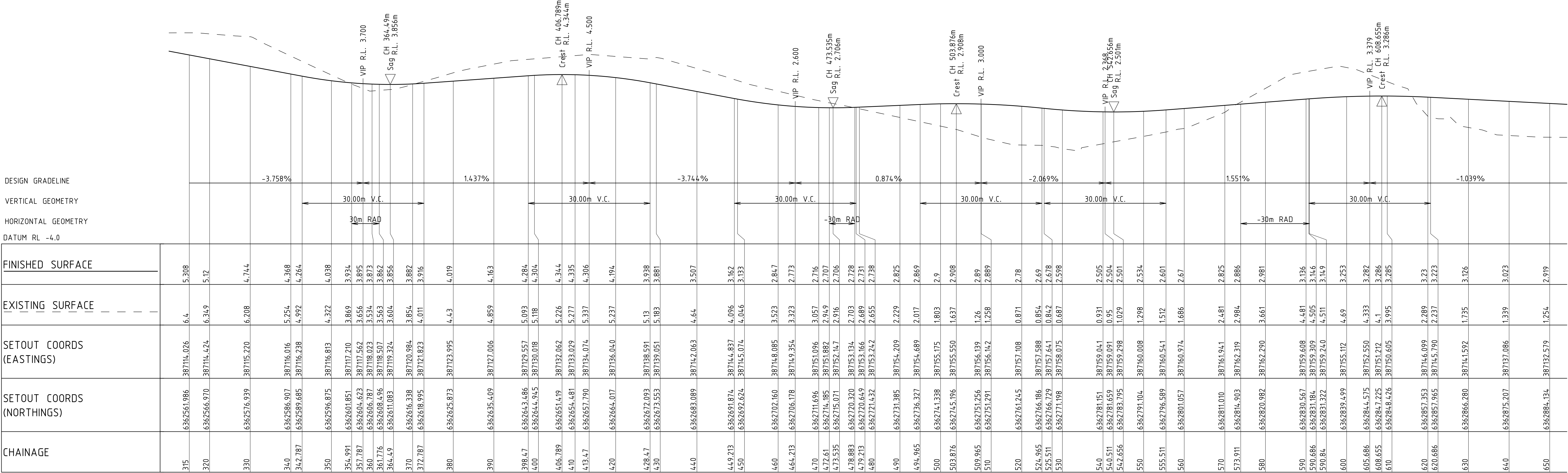
REVISION

A

DRAWING SHEET SIZE = A1

LONGITUDINAL SECTION ALONG MC02 (cont)

HORIZONTAL SCALE 1:500@A1
VERTICAL SCALE 1:100@A1



APPROVAL

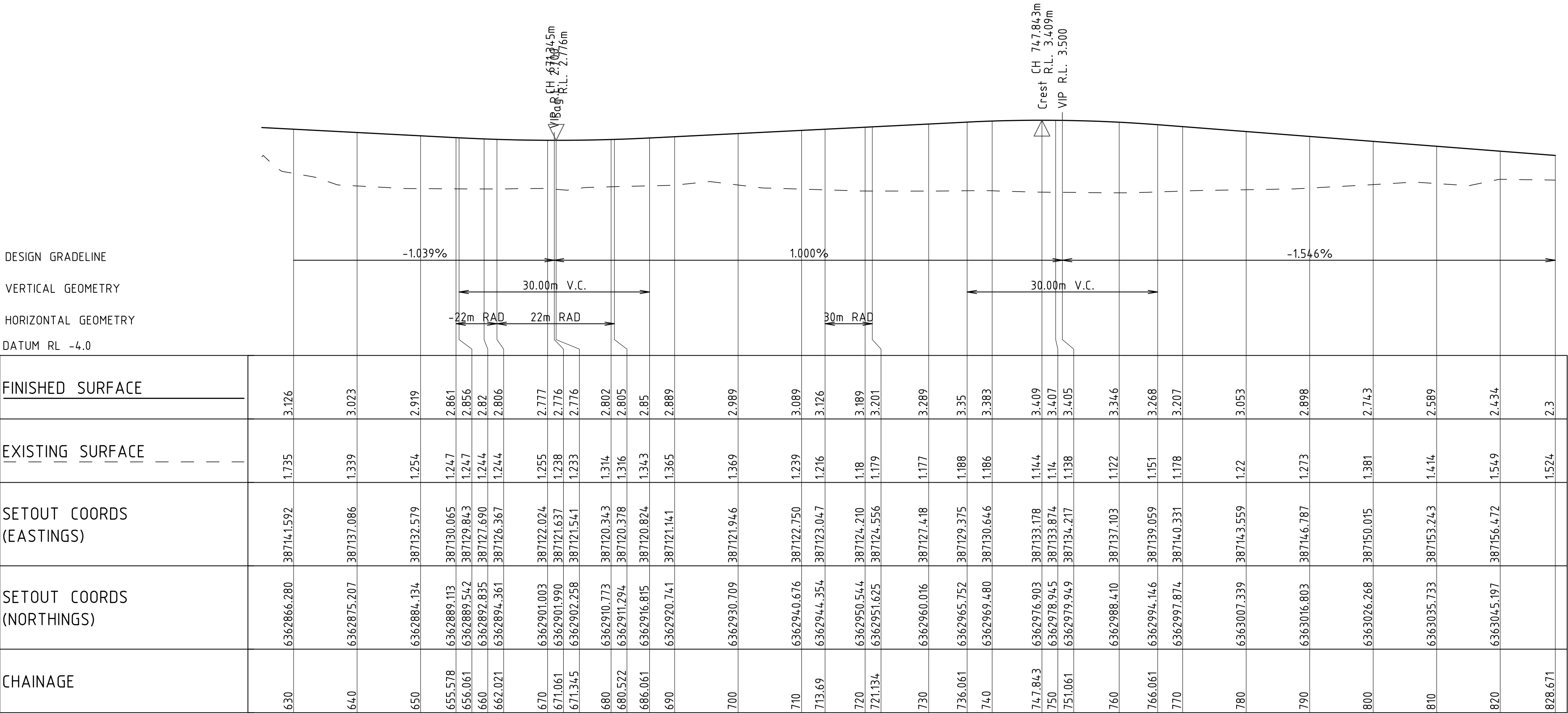
DRAWN: J.STAUB

DESIGNED: B.BROWN

JOB MANAGER: A.BROWN

VERIFIER: A.BROWN

DESIGN GRADELINE
VERTICAL GEOMETRY
HORIZONTAL GEOMETRY
DATUM RL -4.0



LONGITUDINAL SECTION ALONG MC02 (cont)

HORIZONTAL SCALE 1:500@A1
VERTICAL SCALE 1:100@A1

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	AMENDED FOR APPROVAL	RG	AB	JH	18.12.24

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SCALE 1:100 @ A1
SCALE 1:500 @ A1

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ABN 81 094 433 100

PROJECT

APPERLY VILLAGE
NELSON BAY ROAD, FERN
BAY. NSW. 2259.

DRAWING TITLE

ROAD LONG SECTIONS -
MC02 - SHEET 3

JOB NUMBER

NL166557

DRAWING NUMBER

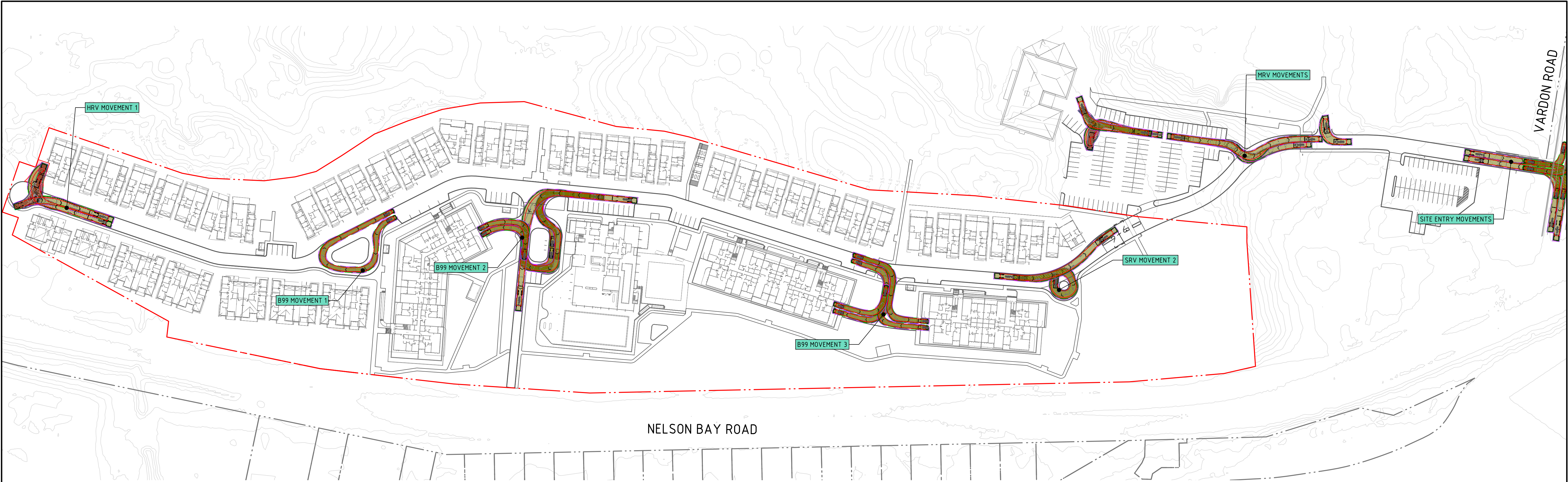
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REVISION

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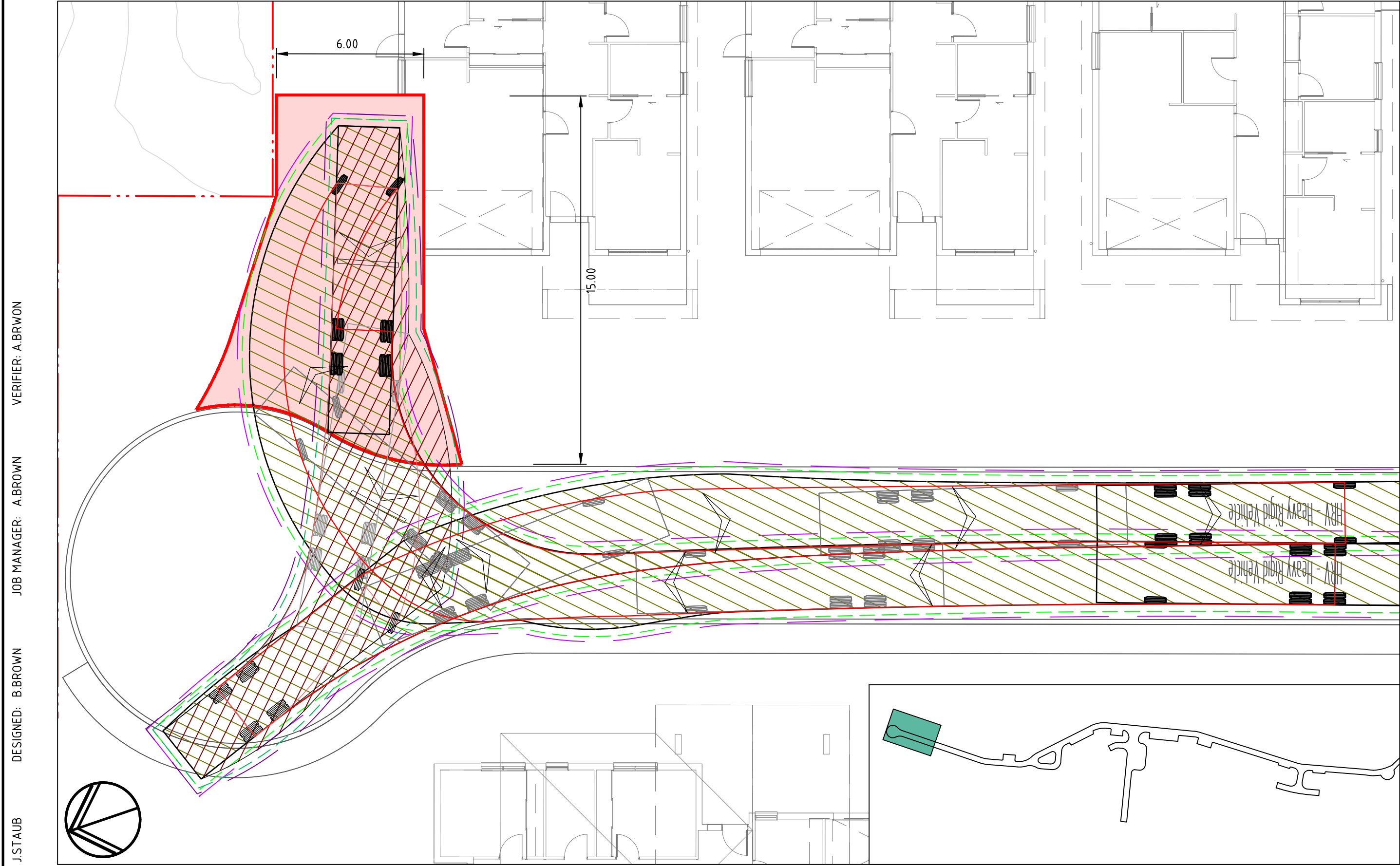
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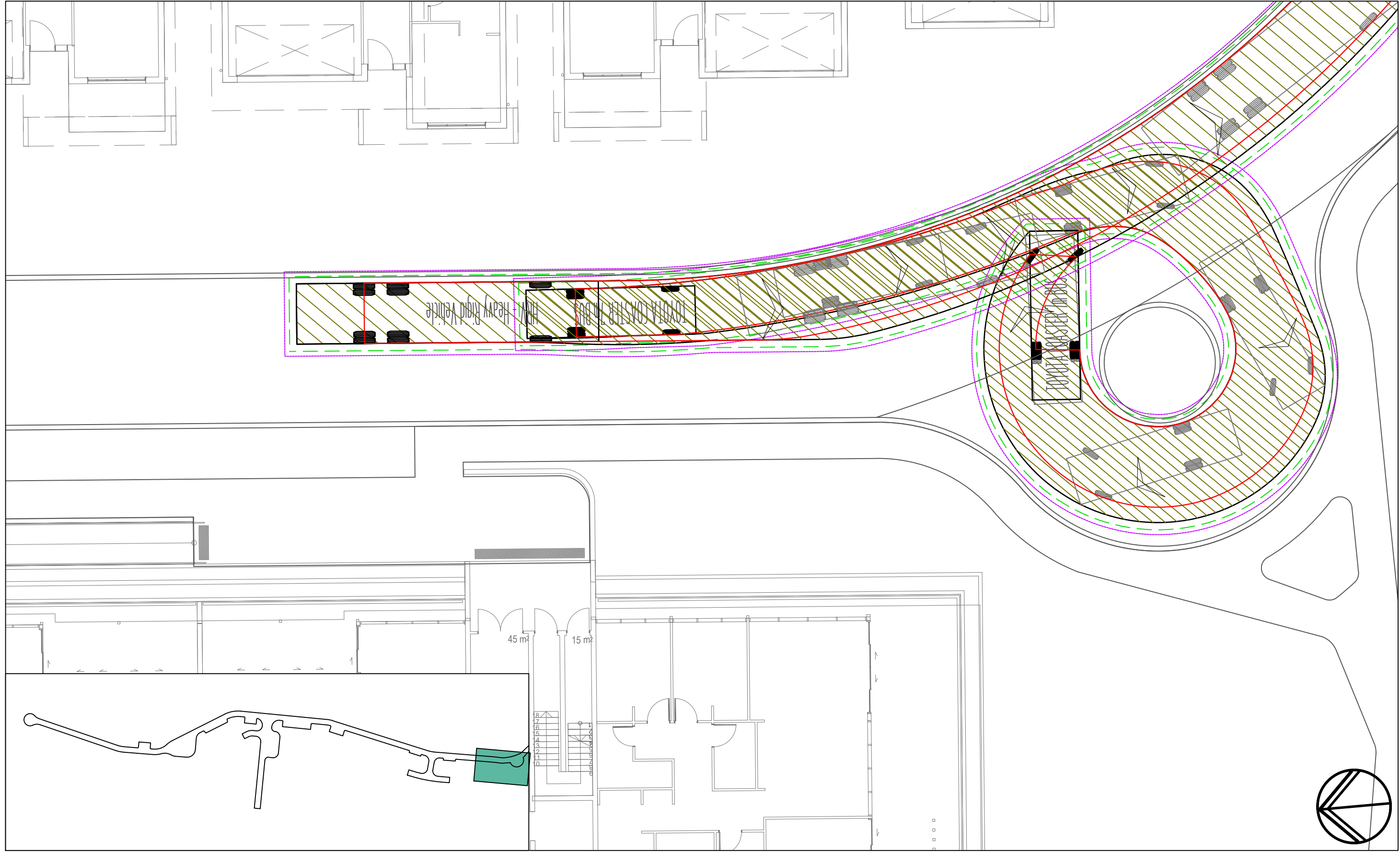


NELSON BAY ROAD

VARDON ROAD



HRV NORTHERN CUL-DE-SAC 3 POINT TURN SWEPT PATH - HRV MOVEMENT 1



SRV SOUTHERN CUL-DE-SAC 3 POINT TURN SWEPT PATH - SRV MOVEMENT 2

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
D	ISSUED FOR APPROVAL	JR	AB	JH	22.07.24
E	AMENDED FOR APPROVAL	RG	AB	JH	18.12.24

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SCALE 1:150 @ A1
SCALE 1:100 @ A1

0 1.5 3 4.5 6 7.5m
0 10 20 30 40 50m

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ABN 81 094 433 100

PROJECT

APPERLY VILLAGE

NELSON BAY ROAD, FERN BAY. NSW. 2259.

DRAWING TITLE

TURNING PATH PLAN - SHEET 1

JOB NUMBER

NL166557

DRAWING NUMBER

DA-C03.91

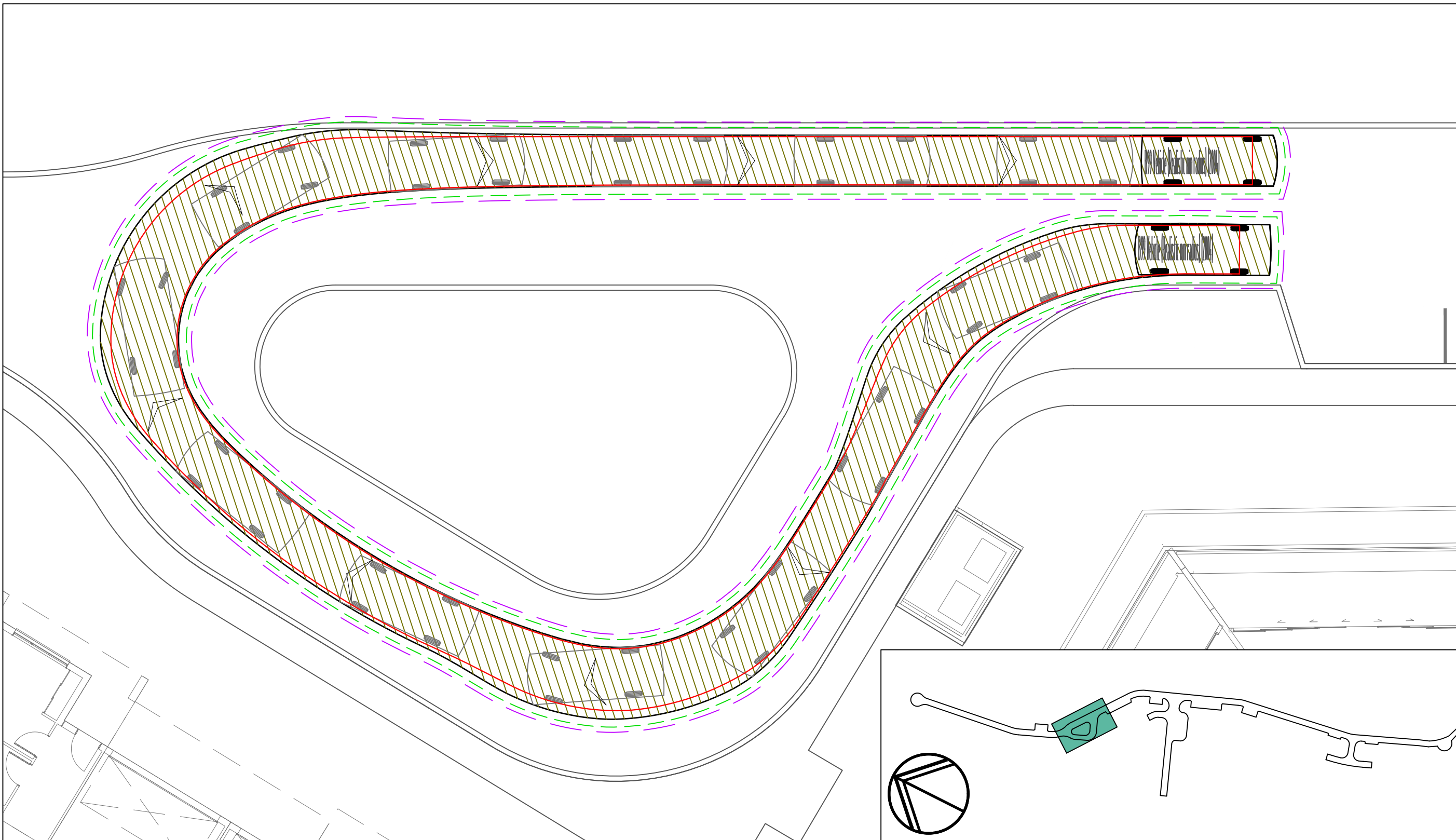
REVISION

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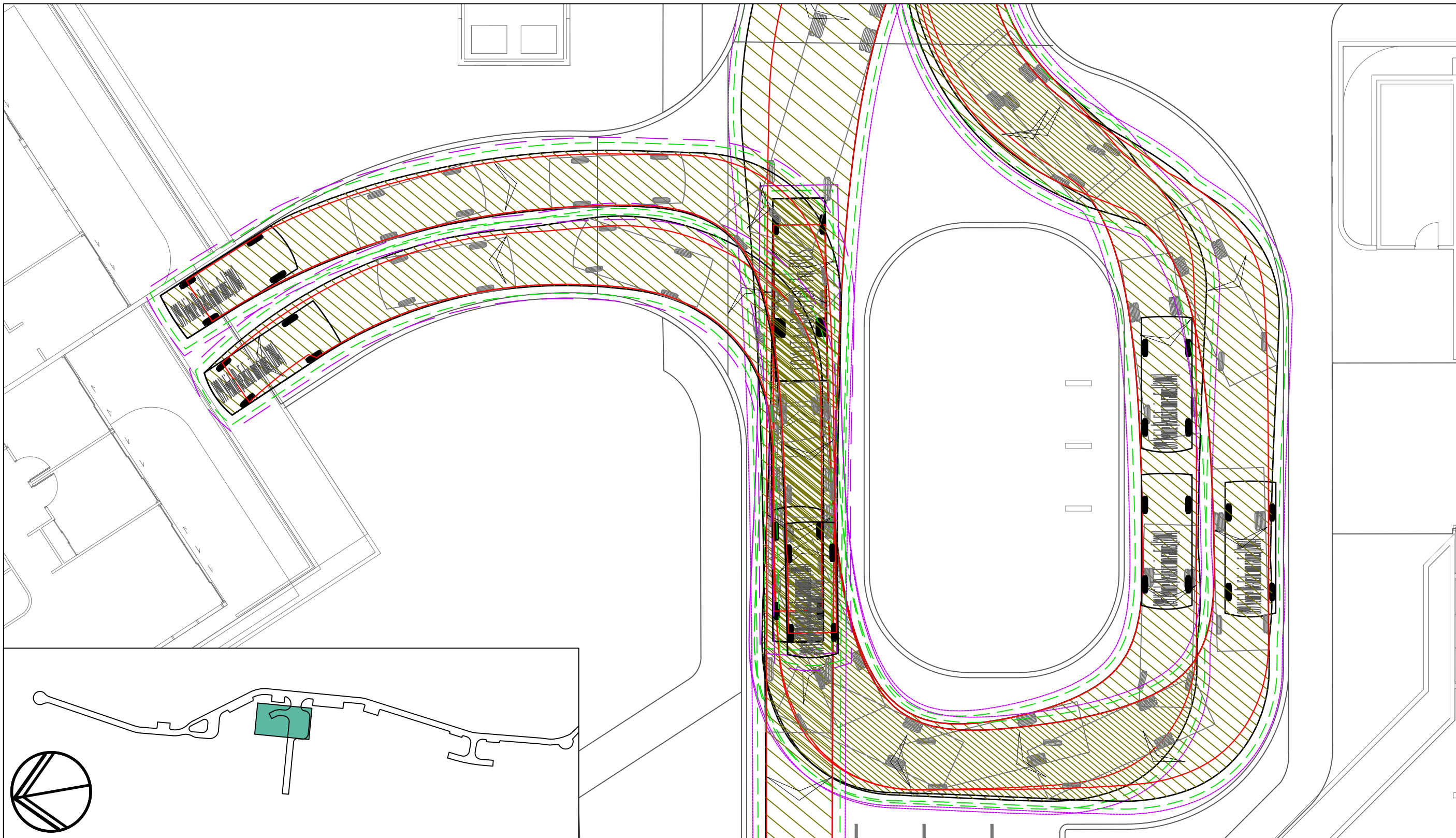
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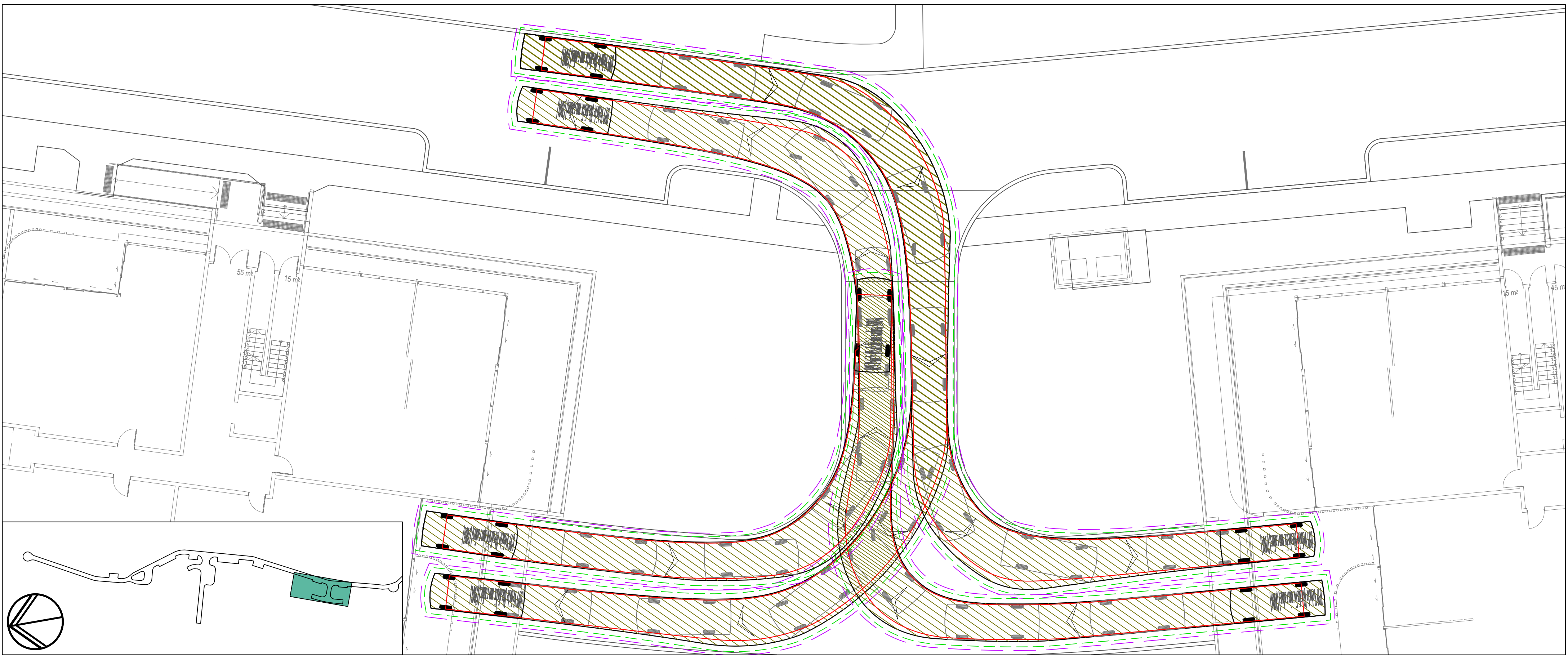
DRAWN: J. STAUB DESIGNED: B. BROWN JOB MANAGER: A. BROWN VERIFIER: A. BROWN



B99 MC02 SWEPT PATH - B99 MOVEMENT 1



B99 MC01 BASEMENT ENTRY AND EXIT SWEPT PATH - B99 MOVEMENT 2



B99 MC02 BASEMENT ENTRY AND EXIT SWEPT PATH - B99 MOVEMENT 3

DRAWN: J. STAUB
DESIGNED: B. BROWN
JOB MANAGER: A. BROWN
VERIFIER: A. BROWN

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
D	ISSUED FOR APPROVAL	JR	AB	JH	22.07.24
E	AMENDED FOR APPROVAL	RG	AB	JH	18.12.24

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SCALE 1:150 @ A1

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PROJECT

APPERLY VILLAGE
NELSON BAY ROAD, FERN
BAY. NSW. 2259.

DRAWING TITLE

TURNING PATH PLAN - SHEET 2

JOB NUMBER

NL166557

DRAWING NUMBER

DA-C03.92

REVISION

E

DRAWING SHEET SIZE = A1

- NOTES
1.

THE BULK EARTHWORKS CUT/FILL VOLUMES ARE A COMPARISON OF THE EXISTING NATURAL SURFACE (BASED ON A COMBINATION OF DETAILED SURVEY AND LIDAR) THAT HAS BEEN STRIPPED (200mm AVERAGE DEPTH), COMPARED TO THE PROPOSED BULK FINISHED SURFACE. NO ALLOWANCE HAS BEEN MADE FOR:

a. BULKING FACTORS

b. UNSUITABLE MATERIAL

c. DETAILED EXCAVATION

d. TEMPORARY EXCAVATIONS, BATTERS, ETC

2.

THE COMPARISON IS PARTLY BASED UPON LIDAR, HENCE THEY ARE APPROXIMATE ONLY AND ARE RELIANT UPON THE ACCURACY OF THE LIDAR. DETAILED SURVEY SHOULD BE REQUIRED TO CONFIRM EARTHWORKS ON ALL PARTS OF THE SITE AT THE DETAILED DESIGN STAGE.

3.

EXPECTED EARTHWORKS VOLUMES:

a. TOPSOIL STRIP

b. BULK CUT

c. BULK FILL

d. BALANCE CUT/FILL

13,319m³

40,988m³

38,601m³

2,387m³ (EXCESS)
- LEGEND

0.28

DENOTES FILL DEPTH

-0.76

DENOTES CUT DEPTH

XX.XX

CUT / FILL CONTOURS
(0.1m INTERVALS)
- Surface Analysis: Elevation Ranges

Number	Color	Minimum Elevation (m)	Maximum Elevation (m)
1		-5.000	-2.500
2		-2.500	-2.000
3		-2.000	-1.500
4		-1.500	-1.000
5		-1.000	-0.500
6		-0.500	-0.250
7		-0.250	-0.100
8		-0.100	0.000
9		0.000	0.100
10		0.100	0.250
11		0.250	0.500
12		0.500	1.000
13		1.000	1.500
14		1.500	3.000
-
- VERIFIER: A.BROWN

JOB MANAGER: A.BROWN

DESIGNED: B.BROWN

DRAWN: J.STAUB
- | REVISION | DESCRIPTION | ISSUED | VER'D | APP'D | DATE |
|----------|----------------------|--------|-------|-------|----------|
| G | ISSUED FOR APPROVAL | JR | AB | JH | 22.07.24 |
| H | AMENDED FOR APPROVAL | RG | AB | JH | 18.12.24 |
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| | | | | | |
- PRINCIPLE
LIVING

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SCALE 1:1250 @ A1

0

10

20

30

40

50m
- NORTHROP

Newcastle

Level 1, 215 Pacific Hwy, Charlestown NSW 2290

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ABN 81 094 433 100
- PROJECT

APPERLY VILLAGE

NELSON BAY ROAD, FERN
BAY. NSW. 2259.
- DRAWING TITLE

BULK EARTHWORKS PLAN
- APPROVAL

JOB NUMBER

NL166557

DRAWING NUMBER

DA-C04.01

REVISION

H

DRAWING SHEET SIZE = A1

Appendix D – Flood Certificate

FLOOD CERTIFICATE

File No: PSC2013-05401
Issue date: 14-Aug-18
Property ID: 27791

Angus Brien
215-217 Pacific Highway
CHARLESTOWN NSW 2290

Certificate number: 83-2018-251-1

Property details: 4A Vardon Road FERN BAY LOT: 4 DP: 823114

Thank you for your recent flood enquiry regarding the above property. This certificate confirms that this property is located in a **flood prone** area. This is a "flood control lot" for the purposes of the *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*.

Flood Planning Level 2.9 metres AHD

(This level defines the minimum floor level for habitable rooms and land that is subject to flood-related development controls (refer to Port Stephens LEP Section 7.3, Port Stephens DCP Section B5).)

Highest Hazard Category High Hazard Flood Storage area

Flood levels that may be useful are:

Probable maximum flood level 5.1 metres AHD

(The highest flood level that could conceivably occur at this location. If required, onsite flood refuges are built at or above this level, refer to the Port Stephens Development Control Plan B5.2)

Current day 1% AEP flood level 1.6 metres AHD

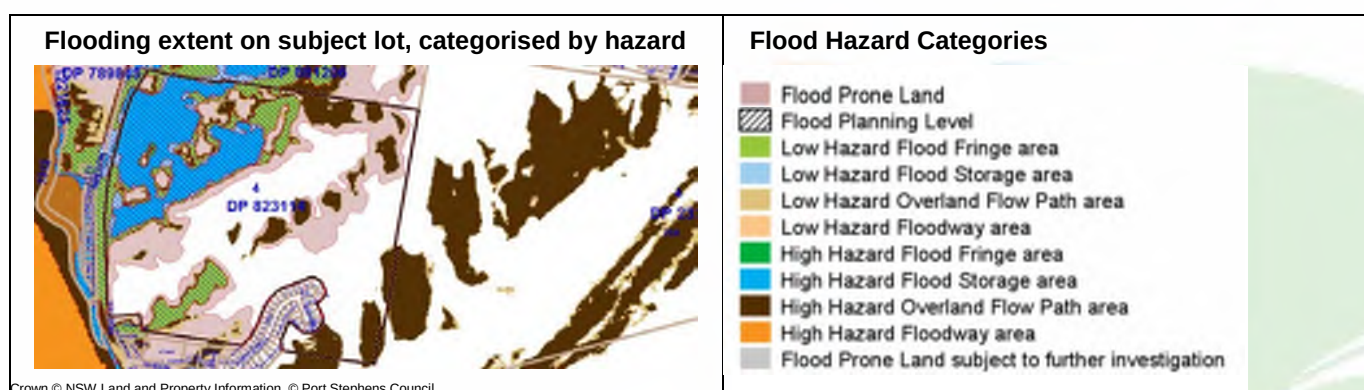
(This level is useful for insurance purposes, refer to your insurance policy and the Insurance Contracts Regulation 1985 (Cwealth).)

Adaptable minimum floor level 2.6 metres AHD

(The 1% AEP flood level plus 0.5m, 50 years from now, refer to the Port Stephens Development Control Plan B5.2.)

Minimum onsite wastewater level 1.8 metres AHD

(The 5% AEP level 50 years from now, refer to the Port Stephens On-site Sewage Management Development Assessment Framework and AS/NZS 1547:2012 5.5 land application system design.)



Information derived from Port Stephens Council 2017, *Williamstown / Salt Ash Floodplain Risk Management Study and Plan*, BMT WBM, Newcastle.

IMPORTANT INFORMATION

This Certificate is provided in good faith and in accordance with the provisions of section 733 of the Local Government Act 1993. This certificate provides an estimate of real flood characteristics. Any particular flood may be different to the conditions that were assumed to determine the information shown in this certificate.

The provided flood information has been compiled from information provided by external consultants and flood studies completed by Council in accordance with the NSW Floodplain Development Manual. The information has not been independently verified or checked beyond the agreed scope of work and Council does not accept liability in connection with unverified information.

Council acknowledges that its flood information may be incomplete and varying in accuracy, however it is the best information available to Council at the time of issue.

The information is provided to give the applicant an understanding as to the extent of flooding affecting the property as well as assist in the preparation of a Floodplain Risk Management Report. The information is subject to change if more accurate data becomes available to Council. Accordingly the information in this certificate is not warranted after the day of issue.

Council is not responsible for updating flood data when site conditions have change from the time of the original flood study and does not accept responsibility arising from any change in site conditions.

Where the relevant information is available, Council's Flood Planning Levels include the estimated impact of climate change.

Council recommends that the information contained in this Certificate be interpreted by a suitably qualified professional. It is the responsibility of the applicant to obtain survey level data (in metres AHD) for the site.

Council disclaims responsibilities to any other person other than the person nominated on the Flood Certificate arising from or in connection with the information provided.

The floor level survey for the property (if available) is based on the conditions on the date of the survey. Any changes to buildings since the survey may alter the appropriate floor level. Refer to the Port Stephens LEP 2013 Section 7.3 and Port Stephens Development Control Plan Section B5 for details on development controls on flood prone land.

For information, the insurance industry uses its own estimates of flood risk and its own definitions for flooding, which may differ when compared with Council's information and the NSW Floodplain Development Manual. You should contact your insurance company to find out if a flood certificate may influence your insurance premium.

The information provided may contain personal information as defined under the Privacy and Personal Information Protection Act 1998. The purpose of collecting this information is to enable Council to consider matters under related legislation, issue related documentation where required and other associated matters as provided by law and will be utilised by Council officers in assessing the proposal and other associated activities. The information may also be made available to other persons in accordance with the relevant Acts and regulations, such as the Government Information (Public Access) Act 2009 and will be stored in Council's record system.

DEFINITIONS

"Flood Planning Level" defines the area of land below the 1% AEP flood event in the year 2100 plus freeboard and is the area of land subject to flood-related development controls (refer to Port Stephens LEP Section 7.3, Port Stephens Development Control Plan Section B5). The Flood Planning Level defines the minimum floor level for habitable rooms.

"Freeboard" is a safety margin applied to the estimation of flood levels to compensate for uncertainties due to factors such as wave action, localised hydraulic behaviour (eg flow path blockages caused by natural and urban debris such as trees, 'wheelie' bins, cars, containers) and changes in rainfall patterns and ocean water levels as a result of the changing climate (refer Flood Manual Section 4).

"Habitable room" in a residential situation is a living or working area, such as a lounge room, dining room, rumpus room, kitchen, bedroom or workroom; in an industrial or commercial situation is an area used for offices or to store valuable possessions susceptible to flood damage (refer Flood Manual Section 4).

"Adaptable minimum floor level" is the reduced flood planning level allowed in Council's Development Control Plan where the proposed development facilitates ongoing flood adaptation (for example, where the design facilitates building raising in the future, such as a pier and beam housing design).

"Probable maximum flood level" is the flood level that arises from the largest flood that could conceivably occur at a particular location (the "PMF" or extreme design event). This level does not include any freeboard and provides an upper limit of flooding and associated consequences for the problem being investigated. It is used for emergency response planning purposes to address the safety of people and defines the floodplain and identifies "Flood Prone" land.

"AEP" (Annual Exceedance Probability) is the chance of a flood of a given or larger size occurring in any one year (for example, the 1% AEP event has a 1% chance of occurring every year; the 5% AEP event has a 5% chance of occurring every year).

"Surveyed floor level" is the surveyed level at the entrance to the residence, usually measured as part of the floodplain risk management plan undertaken for the area.

"AHD" (Australian Height Datum) a common national survey level datum, approximately corresponding to mean sea level set in the mid to late 1960s.

Hazard Categories

"High hazard" flood area is the area of flood which poses a possible danger to personal safety, where the evacuation of trucks would be difficult, where able-bodied adults would have difficulty wading to safety or where there is a potential for significant damage to buildings (refer Flood Manual Appendix L).

"Low hazard" flood area is the area of flood where, should it be necessary, a truck could evacuate people and their possessions or an able-bodied adult would have little difficulty in wading to safety (refer Flood Manual Appendix L).

Hydraulic Categories

"Floodways" are those areas where a significant volume of water flows during floods and are often aligned with obvious natural channels. They are areas that, even if only partially blocked, would cause a significant increase in flood levels and/or a significant redistribution of flood flow, which may in turn adversely affect other areas (refer Flood Manual Section 4).

"Overland flow path" is land inundated by local runoff on its way to a waterway, rather than overbank flow from a stream, river, estuary, lake or dam (refer Flood Manual Section 4).

"Flood Storage" areas are those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The loss of storage areas may increase the severity of flood impacts by reducing natural flood attenuation (refer Flood Manual Section 4).

"Flood Fringe" is the remaining land in the Flood Planning Area after the Floodway area and Flood Storage area have been defined (refer Flood Manual Section 4).

"Flood Prone Land subject to further investigation" refers to the area of land susceptible to flooding where a comprehensive technical investigation of flood behaviour (to define the variation over time of flood levels, extent, velocity, flood hazard and the Flood Planning Level up to and including the probable maximum flood) has not yet been carried out (refer Flood Manual Appendix F).

"Minimal Risk Flood Prone Land" is land on the floodplain that is above the Flood Planning Level. This means that there are no flood-related development controls that apply to residential development, but critical emergency response and recovery facilities, such as evacuation centres and vulnerable development types, such as aged care and child care facilities, may not be appropriate in this location.

Appendix E – Golf Course Improvement Drawings

PROPOSED SCORECARD (LADIES)

SCORECARD									
Hole			Par		Length				
1			5		439				
2			3		106				
3			4		294				
4			5		382				
5			4		331				
6			4		291				
7			3		133				
8			4		282				
9			5		419				
OUT			37		2677				
Lengths in metres									

Hole			Par		Length	
10			4		213	
11			5		425	
12			4		325	
13			4		306	
14			3		128	
15			4		230	
16			5		443	
17			4		271	
18			4		324	
IN			37		2665	
OUT			37		2677	
TOTAL			74		5342	

SCORECARD								
Hole	Par	Length	Hole	Par	Length			
1	5	480	10	4	233			
2	3	116	11	5	465			
3	4	322	12	4	355			
4	5	418	13	4	335			
5	4	362	14	3	140			
6	4	318	15	4	252			
7	3	145	16	5	484			
8	4	308	17	4	296			
9	5	458	18	4	354			
OUT		37	IN		37	2914		
			OUT		37	2928		
Lengths in yards						TOTAL		
						74		
						5842		

PROPOSED SCORECARD (MENS)

SCORECARD					
Hole	Par	Length	Hole	Par	Length
1	5	499	10	3	220
2	3	126	11	5	429
3	4	351	12	4	368
4	4	404	13	4	403
5	4	384	14	3	152
6	4	321	15	4	298
7	3	173	16	5	504
8	4	331	17	4	380
9	5	493	18	4	365
OUT	36	3082	IN	36	3119
			OUT	36	3082
Lengths in metres			TOTAL	72	6201

SCORECARD					
Hole			Par		
1	5	546	10	3	241
2	3	138	11	5	469
3	4	384	12	4	402
4	4	442	13	4	441
5	4	420	14	3	166
6	4	351	15	4	326
7	3	189	16	5	551
8	4	362	17	4	416
9	5	539	18	4	399
OUT			IN		
36			3411		
3371			OUT		
Lengths in yards			36		
			3371		
			TOTAL		
			72		
			6781		

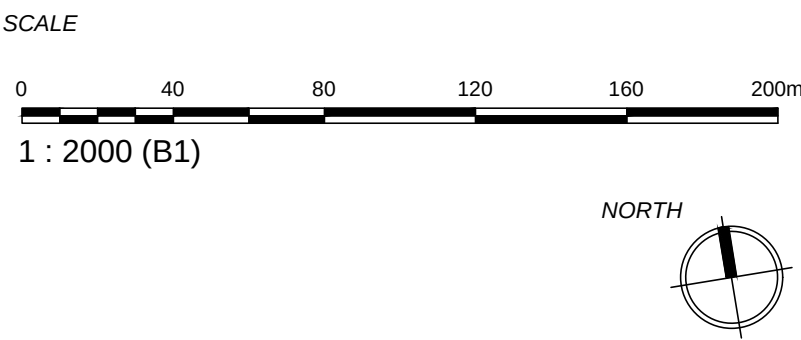
01 (1:1000 @ B1)



02 (1:1000 @ B1)



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LEGEND

No.	DATE	REVISION DESCRIPTION
B	25.05.21	ISSUE FOR REVIEW ONLY
C	14.06.21	PRELIMINARY ISSUE FOR APPROVAL
D	11.03.22	PRELIMINARY ISSUE FOR APPROVAL
E	31.03.22	PRELIMINARY ISSUE FOR APPROVAL
F	06.04.22	ISSUE FOR DEVELOPMENT APPLICATION



PROJECT
NEWCASTLE GOLF CLUB
COURSE IMPROVEMENT WORKS
DEVELOPMENT APPLICATION

DRAWING
GENERAL LAYOUT PLAN

DRAWING No.
1502.DA.01

SHEET No.
01 / 10

DATE
06.04.22

ISSUE FOR
APPROVAL

Appendix F – Music Link Report

MUSIC-link Report

Project Details		Company Details	
Project:	NL166557	Company:	Northrop Consulting Engineers
Report Export Date:	27/11/2024	Contact:	Andrew Brown
Catchment Name:	NL166557_MusicModel_26.11.24	Address:	Level 1, 215 Pacific Highway Charlestown, NSW, 2290
Catchment Area:	4.757ha	Phone:	(02) 49431777
Impervious Area*:	63.89%	Email:	abrown@northrop.com.au
Rainfall Station:	WILLIAMTOWN RAFF - Station 061078 - Zone B		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1998 - 31/12/2007 11:54:00 PM		
Mean Annual Rainfall:	1125mm		
Evapotranspiration:	1394mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.35		
Study Area:	Williamstown		
Scenario:	Default Catchment - Sandy soils		

* takes into account areas from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Post-Development Node	Reduction	Node Type	Number	Node Type	Number
Flow	25.41%	Rain Water Tank Node	15	Urban Source Node	27
TSS	93.11%	Swale Node	5		
TP	73.31%	Wetland Node	1		
TN	47.71%				
GP	100%				

Comments

Passing Parameters					
Node Type	Node Name	Parameter	Min	Max	Actual
Post	Post-Development Node	% Load Reduction	None	None	25.4
Post	Post-Development Node	GP % Load Reduction	90	None	100
Post	Post-Development Node	TN % Load Reduction	45	None	47.7
Post	Post-Development Node	TP % Load Reduction	60	None	73.3
Post	Post-Development Node	TSS % Load Reduction	90	None	93.1
Rain	Rainwater Tank (1 x 2kL)	% Reuse Demand Met	None	None	89.31
Rain	Rainwater Tank (20kL)	% Reuse Demand Met	None	None	36.12
Rain	Rainwater Tank (20kL)	% Reuse Demand Met	None	None	33.9063
Rain	Rainwater Tank (20kL)	% Reuse Demand Met	None	None	34.29
Rain	Rainwater Tank (20kL)	% Reuse Demand Met	None	None	36.92
Rain	Rainwater Tank (3 X 2kL)	% Reuse Demand Met	None	None	87.8664
Rain	Rainwater Tank (3 x2kL)	% Reuse Demand Met	None	None	87.45
Rain	Rainwater Tank (4 X 2kL)	% Reuse Demand Met	None	None	88.20
Rain	Rainwater Tank (4 X 2kL)	% Reuse Demand Met	None	None	88.20
Rain	Rainwater Tank (5 X 2kL)	% Reuse Demand Met	None	None	87.7484
Rain	Rainwater Tank (5 X 2kL)	% Reuse Demand Met	None	None	87.70
Rain	Rainwater Tank (5 X 2kL)	% Reuse Demand Met	None	None	87.96
Rain	Rainwater Tank (5 X 2kL)	% Reuse Demand Met	None	None	88.1611
Rain	Rainwater Tank (6 X 2kL)	% Reuse Demand Met	None	None	86.74
Rain	Rainwater Tank (6 x2kL)	% Reuse Demand Met	None	None	87.9595
Swale	Swale (118m)	Bed slope	0.01	0.05	0.01
Swale	Swale (118m)	Bed slope	0.01	0.05	0.01
Swale	Swale (27m)	Bed slope	0.01	0.05	0.01
Swale	Swale (59m)	Bed slope	0.01	0.05	0.01
Swale	Swale (59m)	Bed slope	0.01	0.05	0.01
Urban	BUILDING 1	Area Impervious (ha)	None	None	0.255
Urban	BUILDING 1	Area Penious (ha)	None	None	0
Urban	BUILDING 1	Total Area (ha)	None	None	0.255
Urban	BUILDING 2	Area Impervious (ha)	None	None	0.188
Urban	BUILDING 2	Area Penious (ha)	None	None	0
Urban	BUILDING 2	Total Area (ha)	None	None	0.188
Urban	BUILDING 3	Area Impervious (ha)	None	None	0.234
Urban	BUILDING 3	Area Penious (ha)	None	None	0
Urban	BUILDING 3	Total Area (ha)	None	None	0.234
Urban	Building 4	Area Impervious (ha)	None	None	0.195
Urban	Building 4	Area Penious (ha)	None	None	0
Urban	Building 4	Total Area (ha)	None	None	0.195
Urban	DISTURBED LANDSCAPE TO HW5	Area Impervious (ha)	None	None	0
Urban	DISTURBED LANDSCAPE TO HW5	Area Penious (ha)	None	None	0.103
Urban	DISTURBED LANDSCAPE TO HW5	Total Area (ha)	None	None	0.103

Only certain parameters are reported when they pass validation

Node Type	Node Name	Parameter	Min	Max	Actual
Urban	DISTURBED LANDSCAPED AREA TO HW1	Area Impervious (ha)	None	None	0
Urban	DISTURBED LANDSCAPED AREA TO HW1	Area Pervious (ha)	None	None	0.148
Urban	DISTURBED LANDSCAPED AREA TO HW1	Total Area (ha)	None	None	0.148
Urban	DISTURBED LANDSCAPED AREA TO HW2	Area Impervious (ha)	None	None	0
Urban	DISTURBED LANDSCAPED AREA TO HW2	Area Pervious (ha)	None	None	0.045
Urban	DISTURBED LANDSCAPED AREA TO HW2	Total Area (ha)	None	None	0.045
Urban	DISTURBED LANDSCAPING AREA TO HW3	Area Impervious (ha)	None	None	0
Urban	DISTURBED LANDSCAPING AREA TO HW3	Area Pervious (ha)	None	None	0.037
Urban	DISTURBED LANDSCAPING AREA TO HW3	Total Area (ha)	None	None	0.037
Urban	Hardstand / LANDSCAPED AREA TO HW1	Area Impervious (ha)	None	None	0.078
Urban	Hardstand / LANDSCAPED AREA TO HW1	Area Pervious (ha)	None	None	0.019
Urban	Hardstand / LANDSCAPED AREA TO HW1	Total Area (ha)	None	None	0.098
Urban	LANDSCAPING AREAS BYPASSING WETLAND	Area Impervious (ha)	None	None	0
Urban	LANDSCAPING AREAS BYPASSING WETLAND	Area Pervious (ha)	None	None	0.472
Urban	LANDSCAPING AREAS BYPASSING WETLAND	Total Area (ha)	None	None	0.472
Urban	OTHER AREAS BYPASSING WETLAND	Area Impervious (ha)	None	None	0.172
Urban	OTHER AREAS BYPASSING WETLAND	Area Pervious (ha)	None	None	0.072
Urban	OTHER AREAS BYPASSING WETLAND	Total Area (ha)	None	None	0.245
Urban	ROAD AREA	Area Impervious (ha)	None	None	0.035
Urban	ROAD AREA	Area Impervious (ha)	None	None	0.073
Urban	ROAD AREA	Area Pervious (ha)	None	None	0.014
Urban	ROAD AREA	Area Pervious (ha)	None	None	0.032
Urban	ROAD AREA	Total Area (ha)	None	None	0.05
Urban	ROAD AREA	Total Area (ha)	None	None	0.106
Urban	ROAD AREA TO HW1	Area Impervious (ha)	None	None	0.123
Urban	ROAD AREA TO HW1	Area Pervious (ha)	None	None	0.052
Urban	ROAD AREA TO HW1	Total Area (ha)	None	None	0.176
Urban	ROAD AREA TO HW2	Area Impervious (ha)	None	None	0.130
Urban	ROAD AREA TO HW2	Area Pervious (ha)	None	None	0.055
Urban	ROAD AREA TO HW2	Total Area (ha)	None	None	0.186
Urban	ROAD AREA TO HW3	Area Impervious (ha)	None	None	0.143
Urban	ROAD AREA TO HW3	Area Pervious (ha)	None	None	0.062
Urban	ROAD AREA TO HW3	Total Area (ha)	None	None	0.206
Urban	UNIT 1-6	Area Impervious (ha)	None	None	0.187
Urban	UNIT 1-6	Area Pervious (ha)	None	None	0.079
Urban	UNIT 1-6	Total Area (ha)	None	None	0.267
Urban	UNIT 33-35	Area Impervious (ha)	None	None	0.088
Urban	UNIT 33-35	Area Pervious (ha)	None	None	0.037
Urban	UNIT 33-35	Total Area (ha)	None	None	0.126
Urban	UNIT 36	Area Impervious (ha)	None	None	0.035

Only certain parameters are reported when they pass validation

Node Type	Node Name	Parameter	Min	Max	Actual
Urban	UNIT 36	Area Penicous (ha)	None	None	0.014
Urban	UNIT 36	Total Area (ha)	None	None	0.05
Urban	UNITS 11-13	Area Impenious (ha)	None	None	0.092
Urban	UNITS 11-13	Area Penicous (ha)	None	None	0.039
Urban	UNITS 11-13	Total Area (ha)	None	None	0.132
Urban	UNITS 14-18	Area Impenious (ha)	None	None	0.151
Urban	UNITS 14-18	Area Penicous (ha)	None	None	0.064
Urban	UNITS 14-18	Total Area (ha)	None	None	0.216
Urban	UNITS 19-23	Area Impenious (ha)	None	None	0.154
Urban	UNITS 19-23	Area Penicous (ha)	None	None	0.066
Urban	UNITS 19-23	Total Area (ha)	None	None	0.221
Urban	UNITS 24-27	Area Impenious (ha)	None	None	0.121
Urban	UNITS 24-27	Area Penicous (ha)	None	None	0.051
Urban	UNITS 24-27	Total Area (ha)	None	None	0.173
Urban	UNITS 28-32	Area Impenious (ha)	None	None	0.147
Urban	UNITS 28-32	Area Penicous (ha)	None	None	0.063
Urban	UNITS 28-32	Total Area (ha)	None	None	0.211
Urban	UNITS 37-39	Area Impenious (ha)	None	None	0.146
Urban	UNITS 37-39	Area Penicous (ha)	None	None	0.063
Urban	UNITS 37-39	Total Area (ha)	None	None	0.21
Urban	UNITS 40-42	Area Impenious (ha)	None	None	0.163
Urban	UNITS 40-42	Area Penicous (ha)	None	None	0.070
Urban	UNITS 40-42	Total Area (ha)	None	None	0.234
Urban	UNITS 7-10	Area Impenious (ha)	None	None	0.121
Urban	UNITS 7-10	Area Penicous (ha)	None	None	0.051
Urban	UNITS 7-10	Total Area (ha)	None	None	0.173
Wetland	Wetland (11_760 sq.m)	% Reuse Demand Met	None	None	0

Only certain parameters are reported when they pass validation

Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Wetland	Wetland (11_760 sq.m)	Extended detention depth (m)	0.25	0.75	0.2
Wetland	Wetland (11_760 sq.m)	National Detention Time (hrs)	48	72	0.618

Only certain parameters are reported when they pass validation