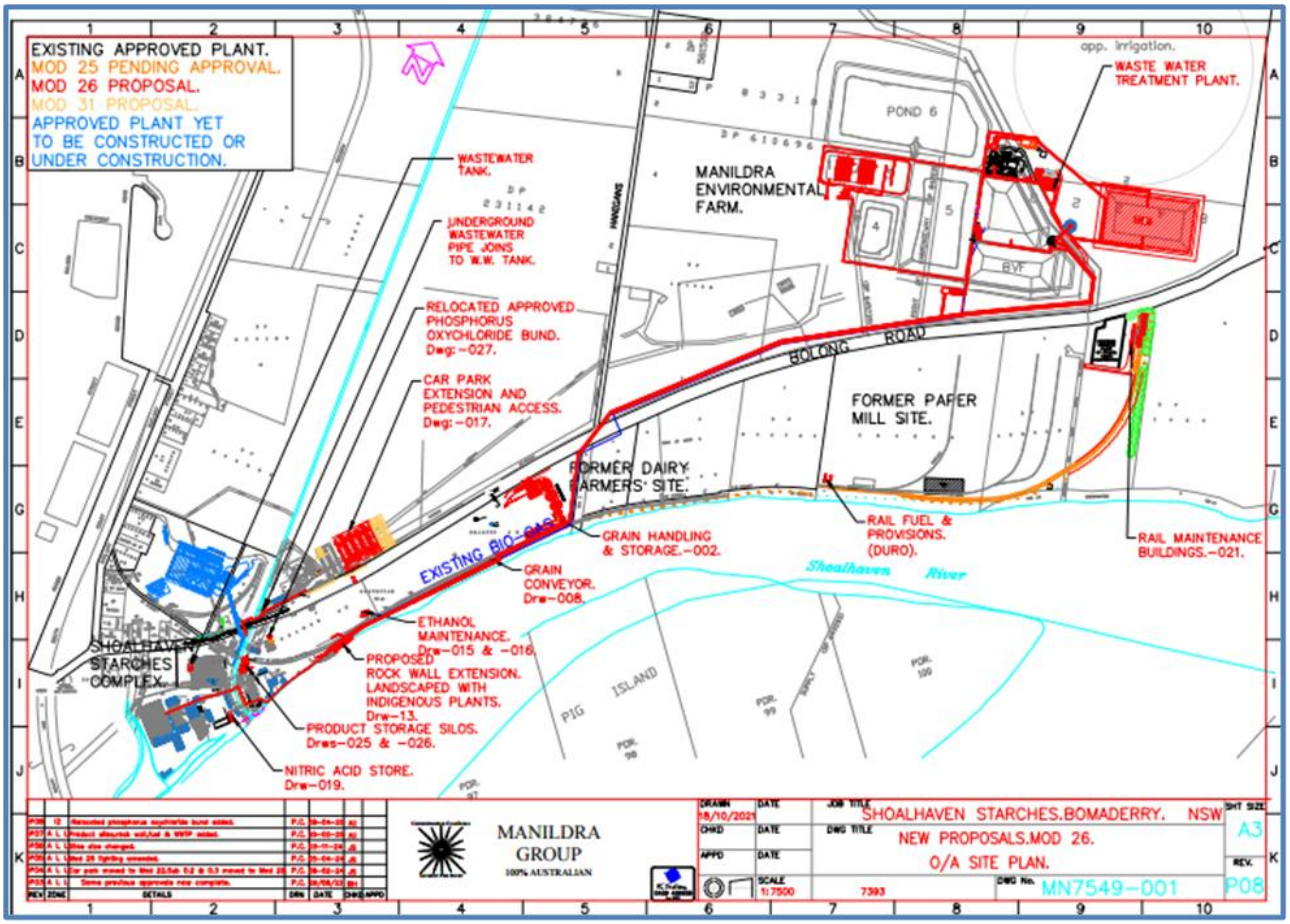


Additional Grain Storage and Handling Facilities, Alterations and Additions to Wastewater Treatment Plant; and other Works: Project Mod26

220 Bolong Road, Bomaderry

Flood Compliance Report



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220 BOLONG ROAD, BOMADERRY
FLOOD COMPLIANCE REPORT

NOVEMBER 2025

Project **Additional Grain Storage and Handling Facilities, Alterations and Additions to Wastewater Treatment Plant; and other Works: Project Mod26** **220 Bolong Road, Bomaderry** **Flood Compliance Report**	**Project Number** **114044-41**
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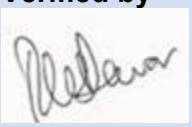
Date 26 November 2025	**Verified by** 

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EXECUTIVE SUMMARY

Background: The Shoalhaven Starches plant is located on the northern bank of the Shoalhaven River at Bomaderry (Figure 1).

Shoalhaven Starches seek approval to modify their Project Approval for the Shoalhaven Starches Expansion Project to undertake the works as listed in Table 1, referred to as Modification Application No. 26 (Mod26). Plans of the proposed works are shown on Figure 2 and included in Appendix B. The proposed works can be separated into the following three components. The additional grain storage and handling facilities will provide a raw material storage buffer which will reduce the risk from disruptions to supply as well as improving a range of plant efficiencies. Alterations and additions to the Water Treatment Plant are required to accommodate increased wastewater flows and the Other Works are required to improve operation of the plant.

Flooding: The proposed works are on land inundated in the 1% Annual Exceedance Probability (AEP) flood event by floodwaters from the Shoalhaven River (as determined in the November 2022 Shoalhaven River Flood Study – Reference 1). The construction of any works on the floodplain will cause a loss of temporary floodplain storage and a loss of hydraulic conveyance. The resulting increase in flood levels will depend upon the magnitude of these losses.

Prior to construction of the Shoalhaven Starches plant at Bomaderry there would have been significant flow through the site and adjoining land during a flood, as there is across any riverbank. Since approximately 1970 the ongoing construction of the plant has reduced the flow path through a large part of Shoalhaven Starches lands on the northern bank. Floodwaters are therefore diverted to other parts of the floodplain and this may increase flood levels on these lands.

It should be noted that other works on the Shoalhaven River floodplain (e.g. completed new bridge at Nowra and upgrading of the Terara levee) will also have contributed to changes in flood level over time in parts of the floodplain. The impacts of these other works have not been determined as part of this report.

Past Studies: Several previous flood studies have been undertaken for Shoalhaven City Council and Shoalhaven Starches. The key ones are listed below.

1. Lower Shoalhaven River Flood Study, November 2022 (for Council by Stantec, Reference 1).
2. Shoalhaven River Flood Study, March 2013 (for Shoalhaven Starches by WMAwater, Reference 2).
3. Lower Shoalhaven River Flood Study, April 1990 (for Council by Webb McKeown & Associates now known as WMAwater, Reference 3).

WMAwater has also undertaken many (> 10) flood impact assessment / compliance reports for Shoalhaven Starches in the last 15+ years. These past flood impact assessments by WMAwater

were undertaken using hydraulic models prepared initially in Reference 3 and subsequently in Reference 2. With completion of the November 2022 Lower Shoalhaven River Flood Study (Reference 1), the hydrologic and hydraulic models established in that study have been adopted for use in this report by WMAwater for Shoalhaven Starches.

These flood impact assessment reports determined the incremental changes in peak flood levels due to ongoing proposed works by Shoalhaven Starches. It is only since 2023/2024, with the adoption of the computer models provided in Reference 1, that the cumulative effects of all works by Shoalhaven Starches have been quantified.

A comparison between the peak 1% AEP flood levels from the March 2013 (Reference 2) flood study and the November 2022 (Reference 1) flood study indicates a significance reduction in flood levels, as shown Figure 3. This has occurred due to many factors including the adoption of the 2019 Australian Rainfall and Runoff (ARR, Reference 4) guidelines in Reference 1, whilst Reference 2 and Reference 3 adopted the prior 1987 edition of ARR (Reference 5).

Development on the Floodplain: Each development on the floodplain has the potential to cause an impact upon flood levels. The impacts of works within the floodplain on hydraulic characteristics are twofold, firstly, a loss of temporary floodplain storage volume and secondly a loss / restriction of flow area or conveyance. It is the loss of flow area which produces the greatest impact, as the area of floodplain storage lost due to all works by Shoalhaven Starches since 1990, represents less than 1% of the total available floodplain storage area of the northern floodplain of the Shoalhaven River.

Scope of Work: The scope of work was to use up to date hydraulic modelling taken from Reference 1 to assess the impacts on flooding of the proposed works by Shoalhaven Starches. This report provides an assessment of the implications of the proposed works (termed Mod26) on surrounding flood levels and considers both the incremental effect (i.e. the change compared to that previously approved up to November 2025 that includes built and not yet built), as well as the cumulative effects of all past approved works (built and not yet built) by or for Shoalhaven Starches since 1990.

It should be noted that the design events (5% AEP, 1% AEP and the PMF) adopted to assess the impacts on flooding of the proposed works do not include anthropomorphic climate change (i.e. rainfall increase and sea level rise). However, climate change has been considered in Appendix C.

The hydraulic modelling assumes the same topography (taken from Reference 1) for 1990 and November 2025 conditions outside the lands owned by Shoalhaven Starches. However, within the Shoalhaven Starches lands, including the Supagas facility, the Reference 1 TUFLOW model has been revised to create the following three model scenarios.

1. The works as present in 1990 (termed the 1990 Existing model).
2. Those approved (built and not yet built) as of November 2025 (termed the November 2025

Existing model).

3. Those approved (built and not yet built) as of November 2025 plus including the Mod26 proposed works as shown on Figure 2 (termed the Mod26Design or Proposed model).

Thus, for example, the constructed new bridge over the Shoalhaven River at Nowra is included in all three scenarios as are all works on the Riverview Road / Terara levee. This approach therefore only determines the cumulative effects of the works by or for Shoalhaven Starches since 1990 and has not assessed the impacts of other works on the floodplain in that time.

Assessment of Impacts of Proposed Development: The impacts of the proposed development on flooding have been evaluated for the following two scenarios.

- Comparison of the Proposed with the November 2025 Existing model. This determines the incremental impact of the proposed Mod26 development application.
- Comparison of the Proposed with the 1990 Existing model. This provides the cumulative effects of the proposed Mod26 development plus all approved (built and not yet built) works by or for Shoalhaven Starches since 1990.

Results of Assessment: The proposed Mod26 works have increased flood levels as shown on Figure 4 to Figure 15. Figure 16 and Figure 17 show the land use zones in the local area with the maximum flood level increases on each property shown on Figure 18 to Figure 23.

In summary the maximum cumulative increases in flood level since 1990 are shown below. However, in all three events most areas only experience a maximum increase of up to 0.1m on land outside of that owned by Shoalhaven Starches.

- 5% AEP – up to 0.05m (Figure 4),
- 1% AEP – up to 0.1m (Figure 8),
- PMF – up to 0.2m (Figure 12).

The maximum incremental increases in flood level since November 2025 are shown below. However, the increases are predominantly within land owned by Shoalhaven Starches.

- 5% AEP – up to 0.01m (Figure 6),
- 1% AEP – up to 0.01m (Figure 10),
- PMF – up to 0.05m (Figure 14).

Possible Mitigation Measures: There are no viable means of reducing the increase in peak flood levels resulting from these works. One of the most beneficial and practical means of reducing flood damages to existing buildings and risk to life is to improve the awareness and preparedness of the occupants or employees. There are several ways of undertaking such a scheme and these are outlined in Table 4 and most require involvement by Council and / or the SES. Funding a scheme would assist in improving the community's flood awareness and consequently reducing flood damages and risk to life for all floodplain occupiers.

Climate Change: The August 2024 ARR Version 4.2 has provided a methodology for determining the effects of anthropomorphic rainfall increase and sea level rise and this has been discussed in Appendix C. Figure 3 to Figure 23 do not consider anthropomorphic climate change but figures in Appendix C do include the impacts of climate change. The results in Appendix C should be used to determine design flood levels for all works that are required to satisfy a given flood planning level.

1. INTRODUCTION

1.1. Background

The Shoalhaven Starches plant is located on the northern bank of the Shoalhaven River at Bomaderry (Figure 1). Shoalhaven Starches seek approval to modify their Project Approval for the Shoalhaven Starches Expansion Project to undertake the following works as listed in Table 1, referred to as Modification Application No. 26 (Mod26). Plans of the proposed works are shown on Figure 2 and included in Appendix B.

Table 1: Proposed Works Associated with Mod26

Factory Component	Proposed Works Associated with Modification Application No. 26 (Mod26)
Additional grain storage and handling facilities	• The installation of three (3) wheat silos to the west of the former Dairy Farmers factory building. • Construction of a train unloading facility to the south of the former Dairy Farmers factory building. • The installation of a container inverter to be sited to the west of the propped silos. • The installation of a grain conveyor and services gantry that will connect the proposed grain storage and handling facilities along the Shoalhaven River frontage of the site to the Shoalhaven Starches factory site. • The construction of the conveyor will in part require the extension of the rock revetment wall along the Shoalhaven River embankment. • The installation of a weighbridge to the north of the former Dairy Farmers factory building. • The construction of an electricity substation control room, workshop and office building to the north of the former Dairy Farmers factory building. • The above works will necessitate the demolition of the eastern part of the former Dairy Farmers factory building (as required). • The relocation of the existing car park located between the Bolong Road frontage and the former Dairy Farmers factory building.
Wastewater Treatment Plant (WTP) Upgrade	• Construction of one in-ground treated effluent storage pond with a capacity of 150 ML. • Convert the existing Wet Weather Storage Ponds No. 1, 2 and 3 into another Anaerobic Digestor with a volume of 80 ML. • It is proposed to install an above ground enclosed steel 400 KL Equalisation Tank to the east of the existing SO Basin. • Construction of a building for biogas collection fans from the new Pond 3 digester immediately to the south of the converted Anaerobic Digestor. • Installation of Biogas scrubber units. • Interconnecting pipework, pumps and blowers. • A new wastewater collection tank (70 Kl) at the factory and new pipe to the WWTP. • Substation and maintenance shed.

Factory Component	Proposed Works Associated with Modification Application No. 26 (Mod26)
	• Additional MBR and RO plant and associated building.
Relocation of approved finished product silos	• Relocate and construct up to 15 finished product silos (starch & gluten) on the main factory site instead of in conjunction with the Northern Packing Plant site.
Other Works	
Rail maintenance building	• Construct a rail maintenance building, with associated internal vehicle access, at the eastern terminus of the recently approved Mod 25 rail line extension to the east of the former Paper Mill factory site. • It is also proposed to install provision for rail fuel storage adjacent to the existing rail line within the former Paper Mill site.
Ethanol Maintenance Building	• Construct an Ethanol Maintenance building within the south-eastern part of the main factory site.
Nitric Acid Storage	• Construction of a Nitric Acid storage adjacent to existing cooling towers to the west of Abernethys Creek.

The additional grain storage and handling facilities will provide a raw material storage buffer which will reduce the risk from disruptions to supply as well as improving a range of plant efficiencies. Alterations and additions to the WTP are required to accommodate increased wastewater flows. The Other Works are required to improve operation of the plant. The proposed works are on land (Image 1) inundated in the 1% Annual Exceedance Probability (AEP) flood event by floodwaters from the Shoalhaven River (taken from the November 2022 Shoalhaven River Flood Study – Reference 1).

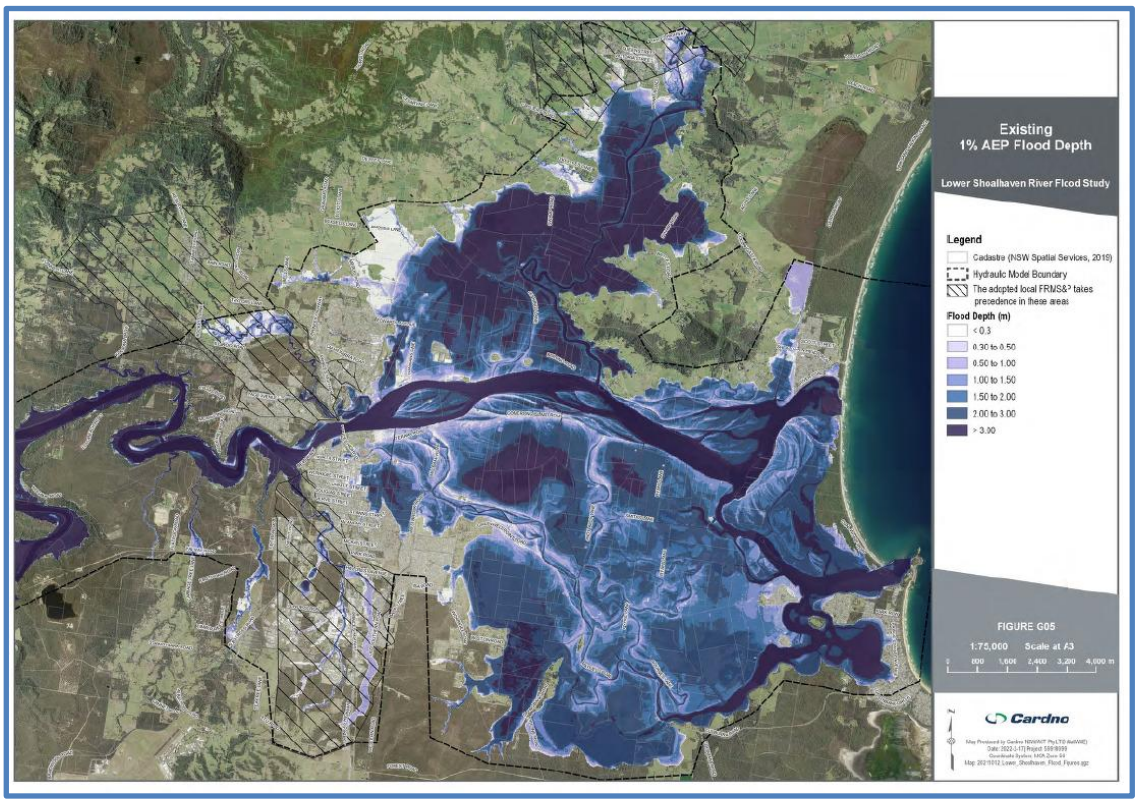


Image 1 - 1% AEP flood extent (Reference 1)

The construction of any works on the floodplain (i.e. the works are inundated in the PMF) will cause a loss of temporary floodplain storage and a loss of hydraulic conveyance. The resulting increases in flood levels will depend upon the magnitude of these losses. Prior to construction of the Shoalhaven Starches plant at Bomaderry there would have been significant flow through the site and adjoining land during a flood, as there is across any riverbank. Since approximately 1970, the ongoing construction of the plant has reduced the flow path through a large part of Shoalhaven Starches lands, immediately adjoining the riverbank. Floodwaters are therefore diverted to other parts of the floodplain and this may increase flood levels on these lands.

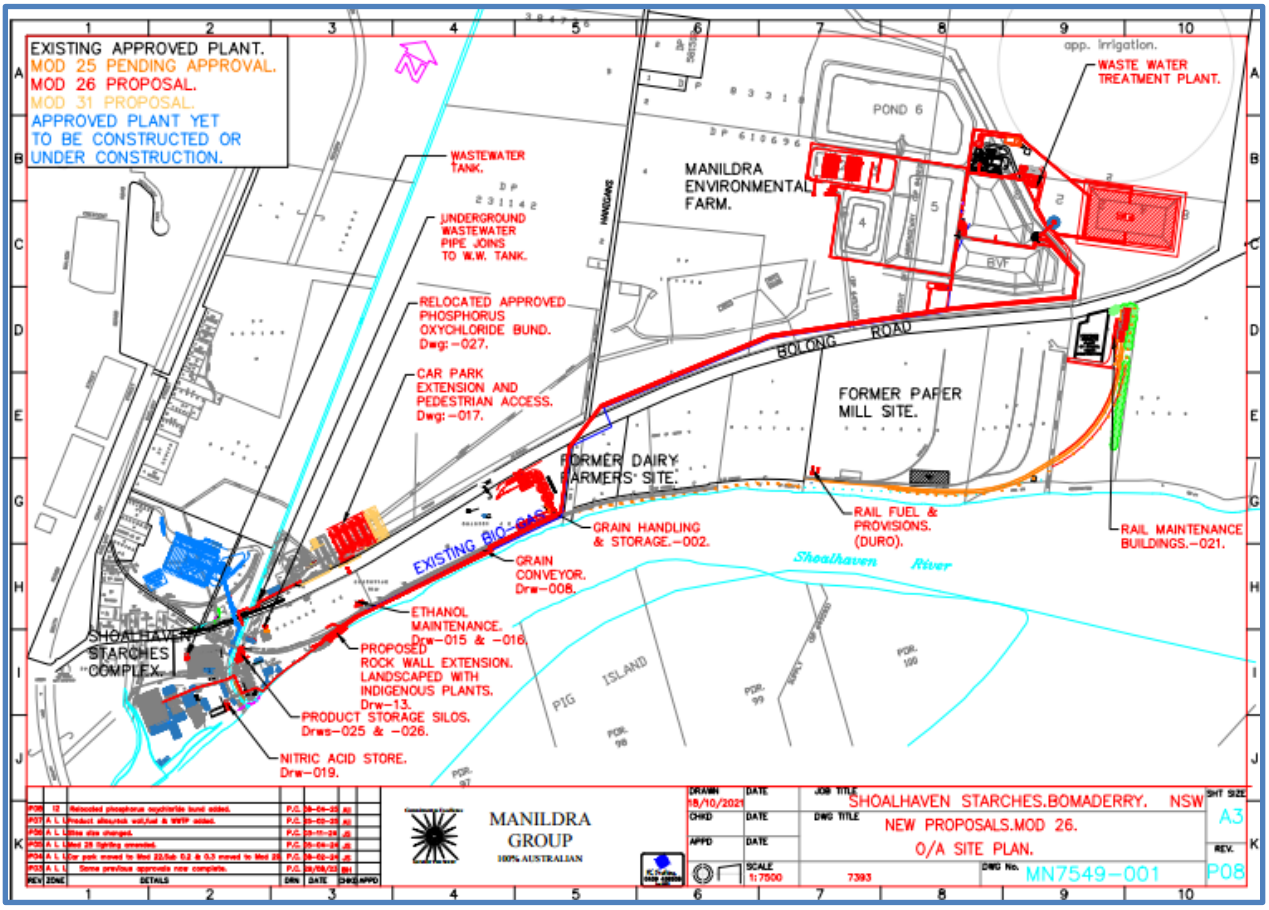


Image 2 - Mod26 Proposed Works

WMAwater Pty Ltd (formerly Webb McKeown & Associates) was commissioned by Shoalhaven Starches to provide this flood compliance report for the proposed Mod26 works (Image 2). A glossary of flood related terms is provided in Appendix A.

1.2. Scope of Work

The flood assessment undertaken included the following.

- Assessment of existing flood conditions at the site.
- Assessment of hydraulic impacts (increases in the 5% AEP, 1% AEP and PMF flood levels) of the proposed Mod26 works. This was considered in comparison to the "November 2025 Existing" floodplain conditions as well as the cumulative impact assessment of the Mod26 proposed development (plus all built and approved but not yet built works by Shoalhaven Starches) since 1990 (1990 Existing).
- Mapping to show where the increases in flood levels have occurred across the floodplain and within individual properties.
- Discussion of results.
- Discussion on possible flood mitigation measures.
- Assess compliance with Shoalhaven City Council's DCP Chapter G9.
- Provide comment on Section 5.21 from Council's LEP.

- Possible approaches for increased management of the flood risk.
- Evaluation of the possible climate change issues (refer Appendix C), including the August 2024 ARR Version 4.2 climate change update (Reference 4).

1.3. Study Area

Shoalhaven Starches plant is located on the northern bank of the Shoalhaven River approximately 1.5 kilometres downstream of Nowra Bridge. The plant has been on this site since approximately 1970 and has expanded considerably since that time. The proposed developments are located within the Shoalhaven River catchment (Figure 1) which is part of the Shoalhaven City Council LGA.

There is a well-documented history of flooding on the Shoalhaven River since European settlement commenced around 1800. Most notable are the floods of 1860 and 1870 which devastated the then urban and commercial centre at Terara on the southern bank. The flood of April 1870 was probably greater than a 1% AEP event. It inundated the Terara township by over a metre and swept away approximately one third of the village land. Five lives were lost in rural areas along the Shoalhaven River. According to some accounts, the earlier 1860 flood was even more devastating and carried away over 50 buildings. Several lives were lost as well as some 79 acres (32 hectares) of land. Following these floods most of the population moved to high ground in the west and formed the town of Nowra with Terara declining to a small village.

Since 1970 major flooding has occurred in 1974, 1975 and 1978 with smaller events in 1976 and 1988. More recently the lower Shoalhaven River catchment was flooded in June 2013, August 2015, June 2016, February 2020, August 2020, March 2021 and May 2021. The March 1978 flood is the largest flood in the last 50 years reaching 5.3m AHD at Nowra Bridge, the next largest was August 2020 which reached 4.2m AHD at Nowra Bridge with the other post 1988 floods not exceeding 4m AHD at Nowra Bridge.

1.4. History of Floodplain Modelling - Lower Shoalhaven River

Best practice flood modelling typically involves the setting up and calibration of two computer models. A hydrologic model that converts the rainfall to runoff and a hydraulic model that includes inflows from the hydrologic model, as well as ocean boundaries, and determines peak flood levels and velocities based on hydraulic formulae. Both models are calibrated to historical data (where possible), including historical flood levels and river flow gaugings, to ensure that they can replicate the historical events and are then used to determine design flood events. Design events are those that have a known probability of occurrence, such as the 1% AEP event (i.e. the flood has a 1% chance of being equalled or exceeded in any year).

The 1990 Lower Shoalhaven River Flood Study (Reference 3) was commissioned by the then NSW Government Public Works and Shoalhaven Council. It established the CELLS hydraulic computer model and determined design flood levels along the river and adjoining floodplain. From

approximately the year 2000 to 2013 the same CELLS hydraulic computer model was used by WMAwater, on behalf of Shoalhaven Starches, to evaluate the potential incremental increases in flood level due to further works by Shoalhaven Starches on the northern floodplain.

In 2013 Shoalhaven Starches commissioned WMAwater to update the Shoalhaven River Flood Study hydraulic modelling to current best practice (Reference 2) and adopted a TUFLOW hydraulic computer model with the hydrologic inputs taken from the 1990 Shoalhaven Council and NSW Government Public Works funded Flood Study (Reference 3). This hydraulic model has been used by WMAwater in every subsequent flood impact assessment undertaken for Shoalhaven Starches up until publication of the November 2022 Lower Shoalhaven River Flood Study (Reference 1).

It should be noted that the design flood levels from the 1990 Shoalhaven Council Flood Study (Reference 3) are very similar to the results from the Shoalhaven Starches funded 2013 Flood Study (Reference 2), as they both adopt the same hydrologic modelling inputs and were each calibrated to the same historical flood levels.

In February 2023 Shoalhaven Council approved the November 2022 Lower Shoalhaven River Flood Study undertaken by Stantec / Cardno (Reference 1). This study reviewed all available flood information and determined updated best practice design flood levels across the study area. The study compared the November 2022 Lower Shoalhaven River Flood Study (Reference 1) design peak water levels to the previous Shoalhaven City Council 1990 Shoalhaven River Flood Study (Reference 3) results and indicated as follows.

- *Water levels are 0.3m to 0.5m lower at Nowra Bridge for the 20% AEP and 5% AEP events.*
- *Water levels are generally significantly lower by 0.9m at Nowra Bridge in the 1% AEP event.*
- *The PMF event produces design peak water levels that are very close (0.05m lower) to the Extreme event peak water levels at Nowra Bridge from the 1990 Flood Study (Reference 3).*

The changes in design flood levels at Nowra and immediately downstream are largely because of (there are other reasons) the following.

- Adoption of updated hydrologic methodologies detailed in the 2019 version of ARR (not including the 2024 climate change advice) (Reference 4) compared to the 1987 version of ARR (Reference 5) that was used in the two prior Flood Studies.
- Changed design ocean water levels.

It is not possible to create a rigorous digital flood map of the results from the 1990 Flood Study (Reference 3) but the comparison of 1% AEP flood levels from the March 2013 Shoalhaven River Flood Study (Reference 2) and the November 2022 Lower Shoalhaven River Flood Study (Reference 1) are shown on Figure 3. This shows the significant lowering of the 1% AEP flood levels at Nowra Bridge, as noted above (note the 1990 and 2013 Flood Studies produce similar

peak levels).

The hydrologic and hydraulic models established in the November 2022 Lower Shoalhaven River Flood Study (Reference 1) have been adopted for use in this flood impact assessment. A Flood Certificate dated 10 August 2023 from Shoalhaven City Council is provided in Appendix D.

1.5. Inclusion of August 2024 ARR Version 4.2 Climate Change

In August 2024 Engineers Australia released ARR Version 4.2. The most significant change was inclusion of an updated anthropomorphic climate change approach. This provided a methodology to include increases in design rainfall intensities from those adopted in the original Version 4.1of ARR 2019. Shoalhaven City Council advised that this updated climate change approach should be included in this flood compliance report and this is documented in Appendix C.

The outcome of the above is that design flood contours and depths figures for the 5% AEP, 1% AEP and PMF events, including rainfall increase and sea level increase, are provided in Appendix C. These figures should be used to determine design flood levels for all works that are required to satisfy a given flood planning level.

1.6. The Proposed Works

The proposed Mod26 works are shown in Image 2 and documented on plans in Appendix B and listed on Table 1. The works indicate several structures which will have minimal impact on flooding, including a pipe gantry, underground and above ground electric cables, construction of car parking and relocation and demolition of existing structures.

The hydraulic modelling has assumed that the structures are “solid” preventing the inflow of floodwaters (apart from gantries or other elevated structures) and will restrict the flow of floodwaters from the Shoalhaven River to the northern floodplain. However, the impact of the proposed works will be mitigated, to some extent, as the proposed structures are in places in the “shadow” of existing structures which already restrict the passage of floodwaters.

2. APPROACH

2.1. Background

Each development on the floodplain has the potential to cause an impact upon flood levels. The impacts of works within the floodplain on hydraulic characteristics are twofold - firstly a loss of temporary floodplain storage volume and secondly a loss / restriction of flow area or conveyance. It is the loss of flow area which produces the greatest impact, as the area of floodplain storage lost due to all works by Shoalhaven Starches since 1990, represents less than 1% of the total available temporary floodplain storage area of the northern floodplain of the Shoalhaven River.

Whilst the individual impacts (construction of a building) may be small the cumulative increases from several developments over time may be significant. Therefore, the proposed Mod26 works (Appendix B) need to be assessed in the context of the total cumulative impacts of all development by Shoalhaven Starches in the northern floodplain as well as the incremental impacts.

For the purposes of this report the nominal starting date for the assessment of cumulative impacts is 1990. This date corresponds to the floodplain development status at the time when the previous design flood level information adopted by Shoalhaven City Council was established in the1990 Lower Shoalhaven River Flood Study (Reference 3).

2.2. Works on the Floodplain Since 1990

It is not possible to itemise all developments on the Shoalhaven River floodplain that have occurred since 1990. Many of them are small (building a house) and have minimal effect on flood levels and there is no accurate record of each development. The most well-known large-scale developments since 1990 in the local area of the Shoalhaven Starches complex are:

- those by or for Shoalhaven Starches,
- those by the prior Dairy Farmers on their site to the east of Shoalhaven Starches,
- the upgrading of the southern riverbank levee from the Princes Highway to Terara and
- construction of the new bridge over the Shoalhaven River at Nowra.

All these large developments that have occurred since 1990 have had some form of flood impact assessment undertaken for them. For example, it is noted that the 2022 Shoalhaven Flood Study (Reference 1) states "*Transport for NSW (TfNSW) (formerly RMS) prepared an REF for of a new bridge on the A1 Princes Highway over the Shoalhaven River at Nowra. A flooding and hydrologic assessment was prepared by Arup Pty Ltd. The assessment concluded that the proposed bridge design and intersection upgrade at Bridge Road and Illaroo Road achieves flood immunity for the up to 1% AEP flood event. However, the proposed design increases peak flood levels at a limited number of properties near Moorhouse Park by about 0.2 m for the 2% and 1% AEP event*".

The adopted 2022 Lower Shoalhaven River Flood Study (Reference 1) is based on the land and building topographies as they existed at the time these were surveyed and collected as part of the

study (circa 2019 / 2020). For example, the Shoalhaven Starches large storage ponds on the northern floodplain are included and Reference 1 notes that the approved design for the new bridge over the Shoalhaven River at Nowra has been included in the modelling. Thus, the design flood levels adopted by Shoalhaven City Council in February 2023, and to be used for future flood related development control purposes (i.e. setting house floor levels), include all the increases in flood levels that have occurred by all developments on floodplain up to approximately 2019 / 2020. Though the topography does not include the approved and yet to be built developments on the floodplain (the modelling can only include what is on the ground at the time, plus the Nowra bridge design) by or for Shoalhaven Starches or the current Mod26 proposed works.

All modelling undertaken in this report assumes the same topography for 1990 and November 2025 conditions outside the lands owned by Shoalhaven Starches. Thus, for example the new bridge over the river at Nowra is included in both the 1990 and November 2025 conditions. This approach therefore only determines the cumulative effects of the works by or for Shoalhaven Starches since 1990 and has not assessed the impacts of works by others on the floodplain.

2.3. Hydraulic Modelling Approach Adopted in this Study

The loss of hydraulic conveyance depends on the extent of the restriction to a flow path caused by the works. Prior to construction of the Shoalhaven Starches plant at Bomaderry there would have been significant flow through the site during a flood, as there is across any riverbank. However, since approximately 1970 the ongoing construction of the plant has already significantly reduced the flow path through the site. This issue has been investigated in WMAwater's October 2000 report titled "*Further Development within the Manildra Starches Plant off Bolong Road, Bomaderry - Hydraulic Assessment*". In summary an agreement was reached that any future development within the intensively built-up area of the plant, as indicated on Image 3 below (taken from that report) would not further decrease the flow path and therefore hydraulic modelling to quantify their hydraulic impacts would not be required.

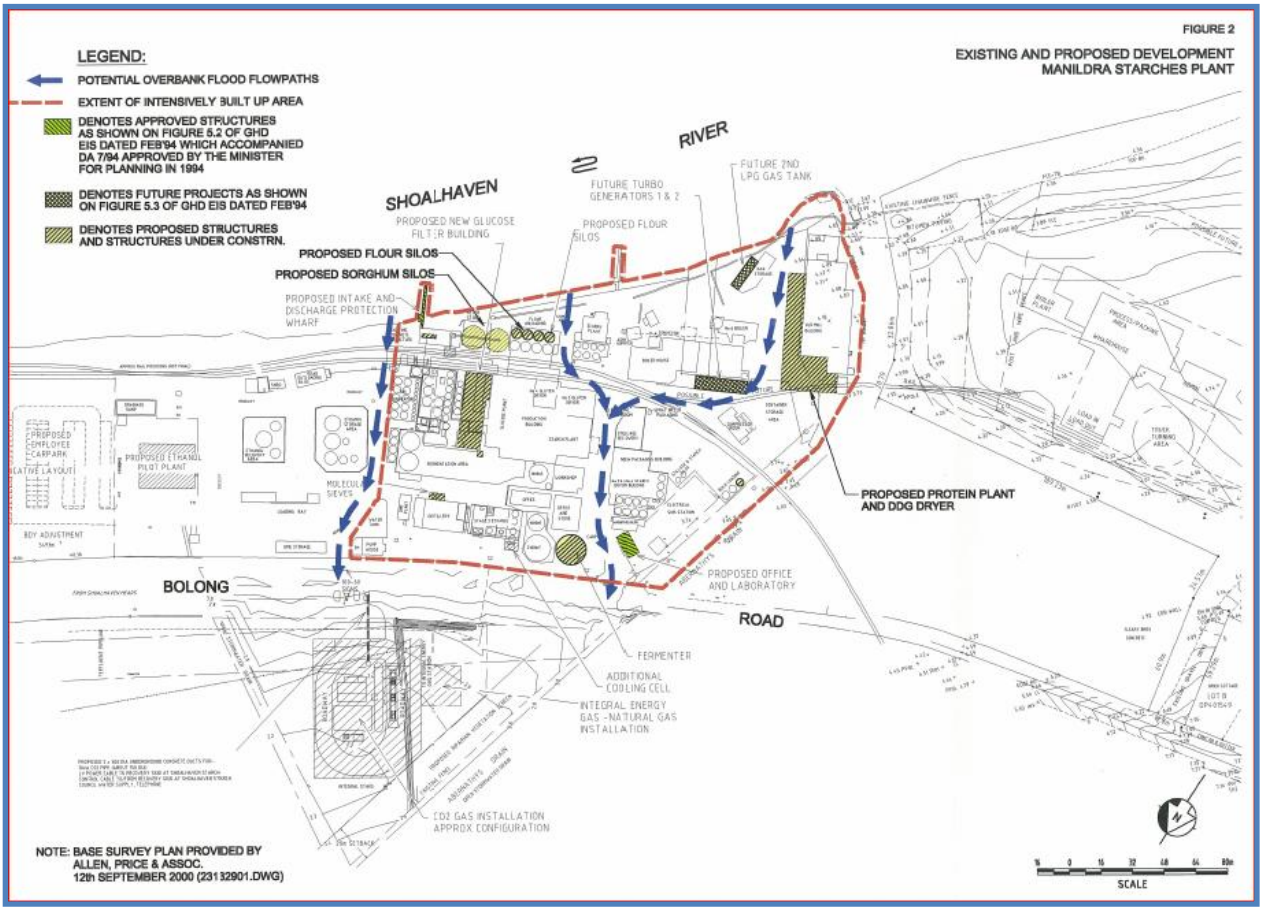


Image 3 - Agreed Extent of Intensively Built-up Area

Thus, in simple terms further works within this intensively built-up area do not require hydraulic modelling area but if located outside the intensively built-up area they do require hydraulic modelling.

The currently proposed Mod26 works are simulated by adjustments to the TUFLOW computer hydraulic model. It should be noted that the modelling of structures on the floodplain can be undertaken using two broad approaches. In simple terms these are:

- by assuming the ground levels of the grid cells covering the footprint of the structure are raised and thus floodwaters are prevented from entering those grid cells and the entire temporary floodplain storage contained within the subject grid cells is lost.
- by restricting the flow path across the grid cells by raising the friction factor (termed the Manning's "n" value). Using this approach the temporary floodplain storage contained within the subject grid cells is maintained.

There are advantages and disadvantages of each of the above approaches and the adopted 2022 Lower Shoalhaven River Flood Study (Reference 1) used both approaches but modelled the Shoalhaven Starches plant by raising the friction factor. The approach adopted in this assessment also uses both approaches but with greater emphasis on identifying each structure and "blocking" the subject cells from the grid. In this way individual structures can be more accurately added or subtracted from the grid than using the friction factor approach and the temporary loss of floodplain

storage and flow conveyance are more accurately accounted for in the modelling.

Hydraulic computer modelling, whilst best practice, has many limitations and it must always be noted that a model is only a representation of reality and cannot accurately simulate every nuance of a complex development such as a large industrial plant. The use of TUFLOW with a 15m by 15m grid as adopted in the 2022 Lower Shoalhaven River Flood Study (Reference 1) enables some structures to be modelled very accurately by "filling" their exact dimensions (e.g. a large building or a storage pond). However, with smaller structures or those with considerable openings or similar (pipe work) this is not always possible, and approximations are required.

A further issue is that if limited vegetation removal / establishment or works on the bank of the Shoalhaven River (revegetation, rock revetment works, landscaping) is proposed, it is generally not possible to accurately reflect the hydraulic impacts in the current TUFLOW model as a much smaller grid than the current 15m by 15m is required.

2.4. Modelling Scenarios

The hydraulic modelling assumes the same topography for 1990 and November 2025 conditions (taken from Reference 1) outside the lands owned by Shoalhaven Starches. However, within the Shoalhaven Starches lands the Reference 1 model has been revised to create the following three model scenarios.

- The works as present in 1990 (termed the 1990 Existing model).
- Those approved (built and not yet built) as of November 2025 (termed the November 2025 Existing model).
- Those approved (built and not yet built) as of November 2025 and including the Mod26 proposed development application (termed the Mod26 Design or Proposed model).

Thus, for example, the new bridge over the Shoalhaven River at Nowra is included in all three scenarios. This approach therefore only determines the cumulative effects of the works by or for Shoalhaven Starches since 1990 and has not assessed the impacts of other works on the floodplain.

3. FLOOD IMPACT ASSESSMENT

3.1. Description of Scenarios

The impacts of the proposed development on flooding have been evaluated for the following two scenarios.

- Comparison of the Proposed with the 1990 Existing model. This provides the cumulative effects of the Mod26 proposed development plus all approved (built and not yet built) works by or for Shoalhaven Starches since 1990.
- Comparison of the Proposed with the November 2025 Existing model. This determines the incremental impact of the proposed Mod26 works.

Three design flood events have been modelled, the 5% AEP, 1% AEP and PMF events. More frequent events, smaller than the 5% AEP, have not been modelled as the northern riverbank of the Shoalhaven River is not overtopped to any significant extent until an event larger than the 5% AEP. Thus, in these small more frequent events (where there is no topping of the northern overbank) there would be nil impact on peak flood levels of the proposed works. According to available records, the last event to overtop the northern overbank was the March 1978 flood. It should be noted that flooding of the northern floodplain has occurred several times since 1978 but this has been due to the rain falling directly on the floodplain, as well as from runoff from the upstream catchments ponding in low lying areas.

Larger events than the 1% AEP will occur, but these events are obviously extremely rare and are not used for flood related planning determinations by Councils, except when their failure has potential catastrophic consequences (such as dam failure).

The comparison between the scenarios is termed a flood impact map with the different colours reflecting the change in peak water levels. In summary, in this report, the green / blue tones reflect a decrease in flood level whilst the yellow / orange / brown / red tones reflect an increase in peak level. Areas in black are no longer flooded and in purple are newly flooded areas.

3.2. Results

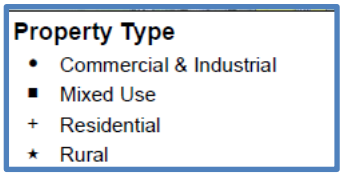
3.2.1. Description of Figures

The changes in peak water levels for the three design events are shown on Figure 4 to Figure 15. For each of the three design events four figures are provided. These are an Entire Floodplain and a Local Area figure for the above two comparisons (Proposed v 1990 Existing and Proposed v November 2025 Existing). These figures show areas where peak flood levels have increased and decreased because of the proposed Mod26 works.

Figure 16 (Entire Floodplain) and Figure 17 (Local Area) indicate the land use zones and land owned by Shoalhaven Starches (Manildra). To identify individual properties that have been

affected by an increase in flood level, Figure 18 to Figure 23 have been provided. These show Entire Floodplain and Local Area figures for each of the three design events for the comparison of the Proposed with the 1990 Existing. A description of the information provided on these figures is as follow.

- Only properties where there is an increase in flood level on any part of the property of greater than 0.01m are identified.
- The land use of each property is identified by the following symbols.



- The colour of each property identifies the maximum increase in flood level within any part of the property. As this is the maximum increase it may be that other parts of the property are not affected by an increase in level or may not be inundated at all in the design event. The actual extent of inundation or increase in level on a property can be determined from Figure 4 to Figure 15.

3.2.2. Interpretation of Results

In summary the maximum cumulative increases in flood level since 1990 are shown below. However, in all three events most areas only experience a maximum increase of up to 0.1m.

- 5% AEP – up to 0.05m (Figure 4),
- 1% AEP – up to 0.1m (Figure 8),
- PMF – up to 0.2m (Figure 12).

The maximum incremental increases in flood level since November 2025 are shown below. However, the increases are predominantly within land owned by Shoalhaven Starches.

- 5% AEP – up to 0.01m (Figure 6),
- 1% AEP – up to 0.01m (Figure 10),
- PMF – up to 0.05m (Figure 14).

Any increase in flood level may result in the following.

- Increase in lateral extent of inundation.
- Increase in duration of inundation.
- Increase in risk to life during a flood.
- Increase in magnitude of flood damages.

Increase in lateral extent of inundation. The extent of the lateral increase in inundation will depend on the slope of the land at the floodplain extent and the magnitude of the increase in flood level. As the maximum cumulative increase in flood level since 1990 for all three design events on a property (Figure 19, Figure 21, and Figure 23) is largely below 0.1m, the lateral increase in

flood extent is unlikely to be of significance.

Increase in duration of inundation. In the 1% AEP event the duration of overbank inundation on the northern floodplain may be two days or more and any increase in duration caused by the works will be minimal unless the works significantly affect the drainage paths by which the floodwaters exit to the Shoalhaven River. If this occurs, works should be undertaken to clear and redesign these drainage paths.

Increase in risk to life during a flood. The relatively small magnitude of the increase in flood levels and consequent increase in depths of inundation is unlikely to contribute to any significant increase in risk to life or significantly affect any flood evacuation routes.

Increase in magnitude of flood damages. The damages caused by flooding can be separated into three broad categories: economic, social and environmental. Economic impacts are quantified based on inundation of property and buildings to both private and public authorities (clean-up / renewal of flood affected assets, assistance to residents in clean-up, disaster relief payments, etc). Social impacts are considered through intangible damages associated with property inundation as well as inundation of roads causing traffic disruption. Environmental impacts of flooding are important to consider given the potential for chemicals or like to enter flood waters.

The cost of damages and the degree of disruption to the community caused by flooding depends upon many factors including the following.

- The magnitude (depth, velocity, and duration) of the flood.
- Land use and susceptibility to damages.
- Awareness of the community to flooding.
- Effective warning time.
- The availability of an evacuation plan or damage minimisation program.
- Physical factors such as failure of services (sewerage), flood borne debris, sedimentation.
- The types of assets and infrastructure affected.

The estimation of flood damages tends to focus on the physical impact of damages on the human environment but there is also a need to consider the ecological costs and benefits associated with flooding. Flood damages can be defined as being tangible or intangible. Tangible damages are those for which a monetary value can be easily assigned, while intangible damages are those to which a monetary value cannot easily be attributed. The categories of flood damages are shown in Table 2.

Tangible flood damages to houses are comprised of two basic categories; direct and indirect damages (refer Table 2). Direct damages are caused by floodwaters wetting goods, structures and possessions, thereby damaging them and resulting in either costs to replace or repair or in a reduction to their value. Direct damages are further classified as either internal (damage to the

contents of a building including equipment and furniture), structural (referring to the structural fabric of a building such as foundations, walls, floors, windows) or external (damage to all items outside the building such as cars and equipment). Indirect damages are the additional financial losses caused by the flood, for example the cost of temporary accommodation, loss of wages by employees, etc.

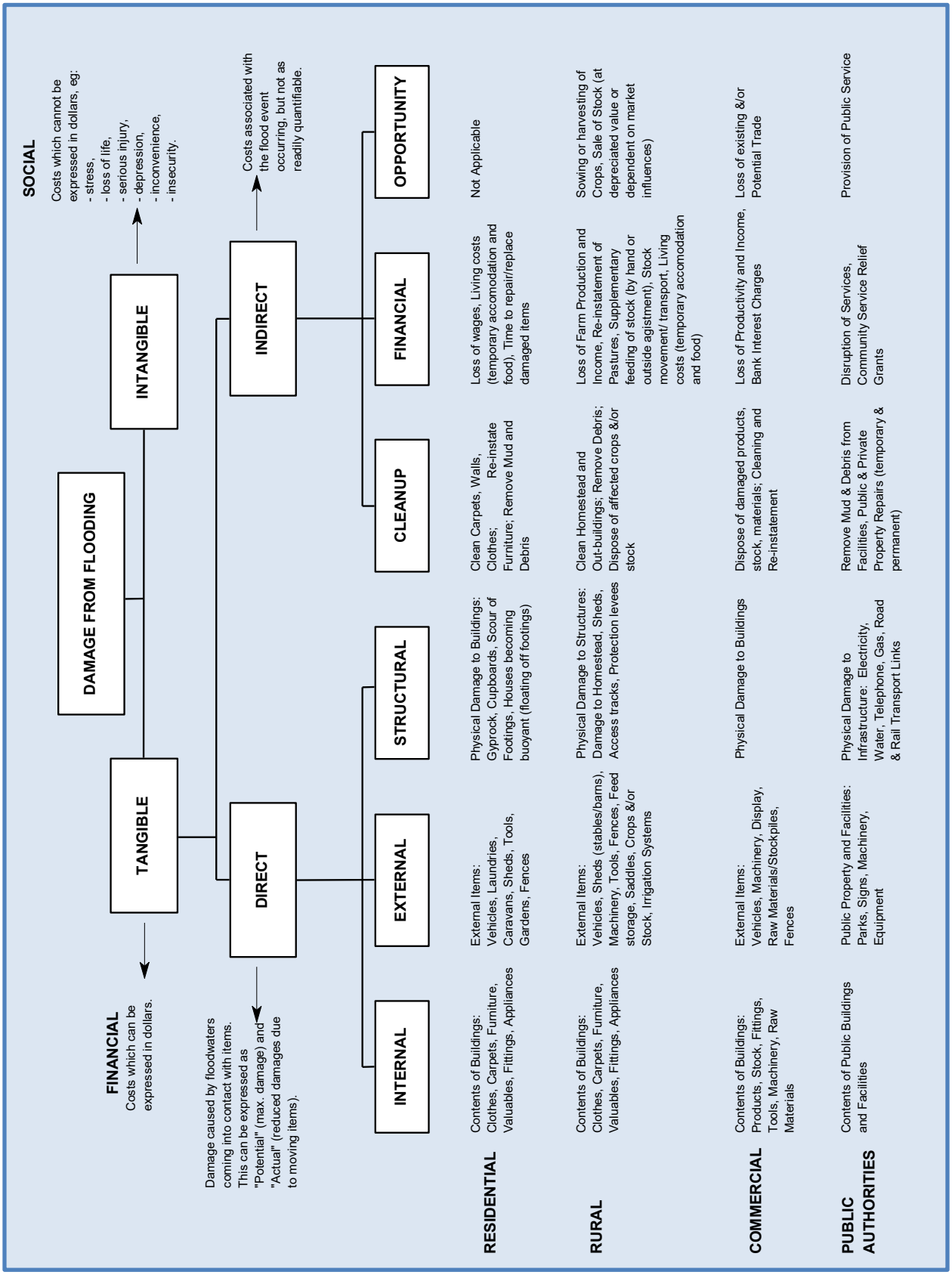
Public sector (non-building) damages include recreational/tourist facilities; water and sewerage supply; gas supply; telephone supply; electricity supply including transmission poles/lines, sub-stations, and underground cables; rail; roads and bridges including traffic lights/signs; and costs to employ emergency services and assist in cleaning up. Public sector damages can contribute a significant proportion to total flood costs but are difficult to accurately calculate or predict.

Costs to Councils from flooding typically comprise.

- Clean-up costs.
- Erosion and siltation.
- Drain cleanout and maintenance.
- Removing fallen trees.
- Inundation of Council buildings.
- Direct damage to roads, bridges, and culverts.
- Removing vehicles washed away.
- Assistance to ratepayers.
- Increases in insurance premiums.
- Closures of streets.
- Loss of working life of road pavements.
- Operational costs following and during flood events.

Given the variability of flooding and property and content values a rigorous assessment of the $value of the increase in tangible damages, due to the relatively small increase in peak flood level, cannot be accurately quantified.

Table 2: Categories of Flood Damages



The intangible damages associated with flooding, by their nature, are inherently more difficult to estimate in monetary terms. Additional costs/damages are incurred by residents affected by flooding, such as stress, risk/loss to life, injury, loss of sentimental items, etc. It is not possible to put a monetary value on the intangible damages, as they are likely to vary dramatically between each flood (from a negligible amount to several hundred times greater than the tangible damages), and depend on a range of factors such as the size of flood, the individuals affected, and community preparedness. However, it is still important that the consideration of intangible damages is included when assessing the impacts of flooding on a community.

The key points regarding the environmental impacts of flooding are:

- Floodwaters will carry large quantities of suspended sediment and other pollutants, primarily derived from the catchment.
- Floodwaters may also convey hazardous chemicals (oils, paints, etc) that might be stored on flood-affected properties.

In conclusion, all types of damages will generally increase with an increase in flood depth, however the magnitude of the increased flood damages will depend on what structure / land use is affected and the magnitude of the increase in peak level. As the cumulative increase in the peak level resulting from continued development by or for Shoalhaven Starches since 1990 is generally small (generally less than 0.1m) the consequent increase in flood damages at each property is unlikely to be significant. However, in total the damages will be large as many properties are affected. As the incremental increase in flood level is much smaller than the cumulative increase since 1990, the consequent increase in flood damages will be very much smaller.

4. POSSIBLE MITIGATION MEASURES

4.1. Overview

As indicated in Section 3 and accompanying figures, the construction of buildings and associated plant on Shoalhaven Starches land since 1990, has increased flood levels upstream of the site, through constriction of the flow paths and loss of temporary floodplain storage. Increases in flood level will occur with all new development on the floodplain. As noted in Section 2.2 increases will result from construction of the new bridge at Nowra as will have occurred from previous levee construction at Riverview Road and along to Terara.

The Shoalhaven Starches plant was located on its present site to be on a train line and with ready access to water. Over the years it has purchased land within the northern floodplain to enable continued development of the plant in a sustainable and environmentally sensitive manner.

Shoalhaven Starches take all viable steps to minimise increases in flood level through ongoing development but it is impossible to negate the adverse flood effects of construction on the floodplain. For example, some parts of the plant can be constructed on piers to allow the free flow of floodwaters beneath, but this is not possible for all structures. Plant can also be located in areas to minimise impacts such as in the “shadow” of existing plant. It is impossible to construct sedimentation ponds that are required for the plant to operate, without reducing the temporary floodplain storage capacity. However, their impacts are minimised by constructing them in the middle of the very large northern floodplain. Some existing plant will be removed as part of the proposed Mod26 works.

In summary no mitigation works are possible to negate the impacts of development on the floodplain by or for Shoalhaven Starches. However, management measures to address the impact of flooding on the safety of workers and damage to the plant are addressed in the Shoalhaven Starches Flood Plan. Also, at the investigation stage for any proposed works, consideration is given to their potential flood impacts. An example is that the proposed works have been designed (as far as possible) to reduce the risk of damage during a flood as the Mod26 works includes provisions for protecting electrical installations (by elevating some and burying others) and locating works in the “shadow” of existing plant.

4.2. Discussion of Possible Flood Risk Management Measures

There are three broad categories of flood risk management measures as shown in Table 3. Flood modification changes the nature of flooding, property modification are changes to the property and response modification change the response of people in a flood.

Table 3: Categories of Flood Risk Management Measures

Flood Modification	Property Modification	Response Modification
Levees	Land zoning	Flood warning
Temporary defences	Voluntary purchase	Evacuation planning
Channel construction	Building & development controls	Evacuation access
Channel modification	Flood proofing	Flood plan / recovery plan
Major structure modification	House raising	Community awareness
Drainage network modification	Flood access	
Drainage maintenance		
Retarding basins		

There are no viable flood risk modification measures which can negate or even reduce the increase in flood levels to surrounding properties caused by or for Shoalhaven Starches. Of the property modification measures, the only possible viable measures are flood proofing or house raising. For many buildings these measures cannot be undertaken due to the construction type of the building (realistically it is not possible to raise a brick building). However, it is unlikely that landowners would consider that the relatively small increase in flood level would justify the disruption and inconvenience required to implement these measures.

The only viable management measures to reduce the impact of the works by or for Shoalhaven Starches are response modification measures. These might include the following.

- Improve / update the existing BoM or other local flood warning system.
- Improve / update the evacuation planning strategy.
- It is unlikely that improving the actual evacuation access routes are possible but installation of flood depth markers or similar would assist in informing evacuees of the risk in driving through floodwaters.
- Provision of advice to landowners (by a flier or similar provided by the SES or Council) of the need to prepare a flood evacuation plan would potentially mean reduced risk and / or damages in an event. This measure would have to be repeated at regular intervals.
- One of the most beneficial and practical means of reducing flood damages to existing buildings (residential, commercial and industrial) is to improve the awareness and preparedness of the occupants. There are several ways of undertaking such a scheme and these are outlined in Table 4 and most require involvement by Council and / or the SES. Funding a scheme would assist in improving the community's flood awareness and consequently reducing flood damages. Some Councils in NSW have undertaken flood awareness flood awareness workshops with landowners.

Table 4: Flood Awareness Methods

Method	Comment
Letter/pamphlet from Council	These may be sent (annually or biannually) with the rate notice or separately. A Council database of flood liable properties/addresses makes this a relatively inexpensive measure which can be effective if residents take the time to absorb and apply the suggestions. The pamphlet can inform residents of ongoing implementation of the flood studies or similar on Council's web site, changes to flood levels, climate change or any other relevant information.
Council website	Council should continue to update and expand their website to provide both technical information on flood levels as well as qualitative information on how residents can make themselves flood aware. This would provide an excellent source of knowledge on flooding within the study area (and elsewhere in the LGA) as well as on issues such as climate change.
Community Working Group	Council could initiate a Community Flood Working Group framework (undertaken in other catchments elsewhere) and this would provide a valuable two-way conduit between local residents and Council.
School project or local historical society	This provides an excellent means of informing the younger generation about flooding, waterway management and climate change. It may involve talks from various authorities and can be combined with other related topics such as water quality.
Displays at key locations or similar	This is an inexpensive way of informing the community and may be combined with related displays.
Historical flood markers and flood depth markers	Signs or marks can be prominently displayed on telegraph poles or such like to indicate the level reached in previous floods. Depth indicators advise of potential hazards. These are inexpensive and effective but in some flood communities are not well accepted as it is considered that they may affect property values.
Articles in local newspapers	Ongoing articles in the newspapers will ensure that the flood and climate change issues are not forgotten. Historical features and remembrance of the anniversary of past events are interesting for residents.
Collection of peak water level data from future floods	Collection of data (photographs) assists in reinforcing to the residents that Council is aware of the problem and ensures that the design flood levels are as accurate as possible. This might also include establishment of peak water level marker poles and which house floors are inundated.
Types of information available	A recurring problem in many flood liable areas is that new owners consider they were not adequately advised that their property was flood affected on the 10.7 Certificate during the purchase process. Council may wish to advise interested parties, when they inquire during the property purchase process, regarding flood information currently available, how it can be obtained and the cost. This information also needs to be provided to all tenants and visitors who may rent for a period. Some Councils have conducted "briefing" sessions with real estate agents and conveyancers.
Establishment of a flood affectation effects database	A database would provide information on (say) which houses require evacuation, which public structures will be affected (e.g., telephone or power cuts). This database should be updated following each flood with input from the community.
Flood preparedness program	Providing information to the community regarding flooding helps to inform it of the problems and associated implications. However, it does not necessarily adequately prepare people to react effectively to the problem. A Flood Preparedness Program would ensure that the community is adequately prepared. The SES would take a lead role in this.
Develop approaches to foster community ownership of the problem	Flood damages in future events can be minimised if the community is aware of the problem and takes steps to find solutions. The development of approaches that promote community ownership should therefore be encouraged. For example, residents should be advised that they have a responsibility to advise Council if they see a problem such as debris blockage or such like. This process can be linked to water quality or other water related issues including estuary management. The specific approach can only be developed in consultation with the community.

5. COMPLIANCE WITH SHOALHAVEN CITY COUNCIL'S CHAPTER G9: DEVELOPMENT ON FLOOD PRONE LAND (DCP2014) FOR THE PROPOSED WORKS

5.1. Objectives of the DCP

The objectives of the DCP are to:

I. To provide criteria for the assessment of development applications.
II. Build upon the SLEP 2014 by providing detailed objectives, and controls for development.
III. Foster ecologically sustainable development.
IV. Ensure development responds to the qualities of the subject site and to the character of the surrounding neighbourhood.
V. Encourage innovative housing, commercial and industrial design.
VI. Maintain and enhance the natural, built and cultural significance of heritage items.
VII. Manage the risks to new development from natural hazards including coastal, flood and bushfire risks.

5.2. Compliance

The following sections describe compliance with Chapter G9: Development on Flood Prone Land (DCP2014 Amended 14th December 2018) for the proposed works as described in Appendix B. As the works will not involve subdivision of lands, performance criteria for subdivision of lands have not been addressed.

5.3. Performance Criteria - General (Section 5.1 of DCP)

PERFORMANCE CRITERIA	RESPONSE
P1 Development or work on flood prone land will meet the following:	
The development will not increase the risk to life or safety of persons during a flood event on the development site and adjoining land.	The works are such that the construction will require approximately 40 additional temporary contractors but no additional full-time workers. Thus, there will not be a significant increase in the permanent workforce on the site or provide an additional threat to the safety of any worker during a flood.
The development or work will not unduly restrict the flow behavior of floodwaters.	Refer Section 3.
The development or work will not unduly increase the level or flow of floodwaters or stormwater runoff on land in the vicinity.	Refer Section 3. As the majority of local catchment runoff is entirely contained within land owned by Shoalhaven Starches, so also are any affectations.

PERFORMANCE CRITERIA	RESPONSE
The development or work will not exacerbate the adverse consequences of floodwaters flowing on the land with regard to erosion, siltation and destruction of vegetation.	The works are largely within existing built-up industrial land clear of vegetation. All runoff under existing and future conditions will reach the ground in nearly identical locations, thus the works will have no significant impact on erosion or siltation.
The structural characteristics of any building or work that are the subject of the application are capable of withstanding flooding in accordance with the requirements of the Council.	**A separate structural report will be provided.**
The development will not become unsafe during floods or result in moving debris that potentially threatens the safety of people or the integrity of structures.	**A separate structural report will be provided.**
Potential damage due to inundation of proposed buildings and structures is minimised.	Structural failure of the works during a flood will potentially increase the rate of inflow of floodwaters from the Shoalhaven River to the northern floodplain. However, the increased rate of inflow is unlikely to cause damage to surrounding buildings or structures outside Shoalhaven Starches lands.
The development will not obstruct escape routes for both people and stock in the event of a flood.	The works will not occupy escape routes or cause workers to become trapped.
The development will not unduly increase dependency on emergency services.	The works are such that their construction will not significantly increase the number of workers on the site or provide an additional threat to the safety of any worker during a flood.
Interaction of flooding from all possible sources has been taken into account in assessing the proposed development against risks to life and property resulting from any adverse hydraulic impacts.	Refer Section 3.

PERFORMANCE CRITERIA	RESPONSE
The development will not adversely affect the integrity of floodplains and floodways, including riparian vegetation, fluvial geomorphologic environmental processes and water quality.	The works will be constructed on land designated as part high hazard floodway in the 1% AEP event. The site is mainly industrial land with nil existing vegetation (apart from grass) and is beyond the influence of normal fluvial geomorphic processes. The works will have no impact on water quality or the integrity of the floodplain and floodways.

5.4. Performance Criteria - General (Section 5.2 of DCP)

PERFORMANCE CRITERIA	RESPONSE
P2 Filling or excavation on flood prone land will meet the following:	
High hazard floodway areas are kept free of fill and/or obstructions.	Part of the works may be in a high hazard floodway as that is the only possible location for the works within the existing plant layout.
The proposed fill or excavation will not unduly restrict the flow behaviour of floodwaters.	Refer Section 3.
The proposed fill or excavation will not unduly increase the level or flow of floodwaters or stormwater runoff on land in the vicinity, including adjoining land.	Refer Section 3.
The proposed fill or excavation will not exacerbate erosion, siltation and destruction of vegetation caused by floodwaters flowing on the land.	The works are largely within existing built-up industrial land clear of vegetation. The works will not exacerbate erosion, siltation and destruction of vegetation caused by floodwaters flowing on the land.
The proposed fill or excavation will not be carried out on flood prone land if sufficient flood free area is available for development within the subject property.	The proposed locations of the works are the only possible locations within the existing plant layout.
The proposed excavation does not create new habitable rooms, non-habitable storage areas or carparks with floor levels below the existing ground level.	No excavation will be undertaken apart from creation of foundations or similar. There are no proposed habitable rooms. All non-habitable and the storage of hazardous or similar material which will be flood proofed to the 1% AEP flood level (including climate change -refer Appendix C) or above. Any

PERFORMANCE CRITERIA	RESPONSE
	floor levels will be set as high as practical for safe access in an industrial plant.

5.5. Site Specific Flood Related Development Controls – Lower Shoalhaven River (Section 5.4.4 of DCP)

Specific Controls	RESPONSE
INDUSTRIAL DEVELOPMENT AT BOMADERRY	
The potential hydraulic effects of any future construction works shall be minimised through locating them in the "shadow" of other buildings or away from the main flow paths where possible.	Refer responses in Section 5.3 and 5.4.
Any proposed works must be designed and located to minimise any increase in flood damages to other users/occupiers of the floodplain.	Refer responses in Section 5.3 and 5.4.
A full hydraulic assessment will be required prior to any future development or redevelopment to assess the potential impacts upon flooding.	As undertaken in this Report and refer to responses in Section 5.3 and 5.4.

6. ADDITIONAL ISSUES

6.1. Response to Clause 5.21 of Council's LEP

(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, Every reasonable endeavour has been made by Shoalhaven Starches to achieve these goals. However, the Shoalhaven Starches plant has been at this site for over 50 years and it is not viable to relocate it to a flood free site. Expansion must occur to be economic and meet the demands of consumers. The works are such that the construction will require approximately 40 additional temporary contractors but no additional full-time workers. Thus, there will not be a significant increase in the permanent workforce on the site or provide an additional threat to the safety of any worker during a flood. Possible flood risk management measures are addressed in Section 4.2 of this Report.

(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, As noted above the incremental hydraulic impacts associated with this Mod26 works are within Council's tolerable range of +/- 50mm. The proposal involves a modification to an existing industrial complex established on the subject land prior to flood planning provisions and understanding of flood function and behaviour. This proposal involves modifications and installation of additional plant within this existing established industrial complex. Climate change has been considered in Section 3 a) below and in Section 6.2 and Appendix C.

(c) to avoid adverse or cumulative impacts on flood behaviour and the environment, Refer Section 3 of this Report. As most of the surrounding floodplain is land owned by Shoalhaven Starches, so also are the affectations. Possible flood risk management measures are addressed in Section 4.2 of this Report.

(d) to enable the safe occupation and efficient evacuation of people in the event of a flood. Every reasonable endeavour has been made by Shoalhaven Starches to achieve these goals and already has a comprehensive Flood Evacuation Plan. This will be updated to include the proposed works but the proposed works do not reduce the ability of workers to safely leave the site. The works are such that the construction will require approximately 40 additional temporary contractors but no additional full-time workers. Thus, there will not be a significant increase in the permanent workforce on the site or provide an additional threat to the safety of any worker during a flood. The works will not occupy escape routes or cause workers to become trapped.

(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, Refer response in Point 1. b) above.

(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, This has been demonstrated by the modelling results. Refer to Section 3 of this Report.

(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, As noted above in Point 1 a) and d) above.

(d) incorporates appropriate measures to manage risk to life in the event of a flood, As noted above in Point 1 d).

(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. The works are largely within existing built-up industrial land clear of vegetation and clear of riverbanks and watercourses. The works will thus not exacerbate erosion, siltation and destruction of vegetation caused by floodwaters flowing on the land.

(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, Climate change will potentially affect the Shoalhaven Starches plant in two ways. Firstly, a rise in the ocean will potentially raise flood levels at the site. This can largely be ignored as the site is some 15 kms from the ocean, thus the flood levels at the site are dominated by the flow in the Shoalhaven River rather than the ocean level. Secondly, a rise in rainfall intensity or duration in a design event due to climate change will impact the site by raising design flood levels.

Anthropomorphic rainfall increase climate change has been included in the hydrologic and hydraulic modelling for the design flood contours and depth figures in Appendix C.

In summary, climate change rainfall increases will change the absolute design flood levels for a design scenario but generally not the relative flood level increases (i.e existing v design scenario).

Climate change was considered in the November 2022 Lower Shoalhaven River Flood Study (Reference 1) providing the following summary.

The study also assessed the potential impacts of both Climate Change induced rainfall increases and sea level rise using current recommended ARR2019 values based on global climate modelling. Increased rainfall due to climate change has the biggest impact in the Shoalhaven River upstream of Nowra Bridge due to the increased flows and the incised valley. The increased flow dominates changes in expected flood levels to approximately Terara, with sea level rise having impacts in the Shoalhaven River downstream of Terara and in the Crookhaven River/Crookhaven Creek floodplain. Only minor increases in flood level are observed in the Broughton Creek floodplain.

For the 1% AEP, with rainfall increases of 16.3% due to Climate Change, associated increased flows may result in increases in flood levels in the Shoalhaven River upstream of Nowra by up to almost 1.4m at Grassy Gully and 1.1m at Gradys Caravan Park reducing to 200mm at Nowra Bridge. Increases in the lower floodplain areas are generally less than 150mm for all scenarios up to 7.6% rainfall increase with increases typically 150 – 250 mm for the 16.3% (2090 RCP 8.5) rainfall increase.

In combination with Sea Level Rise a further increase in water levels may be expected around low-lying foreshore areas and up to 400mm total water level increases near the Shoalhaven and Crookhaven River entrances.

(b) the intended design and scale of buildings resulting from the development, The proposed works are as far as possible located to minimise the affectation on flood levels but as noted above, the existing plant cannot be moved.

(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, As noted above in Point 1 a) and d).

(d) the potential to modify, relocate or remove buildings resulting from development if the surrounding area is impacted by flooding or coastal erosion. Coastal erosion is not relevant for this site being 15 kms upstream. The proposal involves a modification to an existing industrial complex established on the subject land prior to flood planning provisions and understanding of flood function and behaviour. Consideration was given to modifying the design and relocation of the proposed buildings and plant / works during preparation of the proposed works to minimise potential hydraulic impacts, as noted in 3 b) above. Where practical this was undertaken. Possible flood risk management measures are addressed in Section 4.2.

6.2. Response to Climate Change Issues

Climate change has the potential to impact flooding through two main actions, sea level rise and rainfall increase. Sea level rise will have no significant impact on flooding at the Shoalhaven Starches site (assuming the current typical Year 2100 sea level rise scenario), as the site is some 15 kms upstream of the Pacific Ocean at Shoalhaven Heads.

Potential rainfall increase is less well understood. If it is assumed that the rainfall increase climate change will result in increased runoff in a flood event, this will most likely result in a greater frequency of flooding and an increase in the design flood levels. For example, the current 1% AEP flood level might increase, and the subsequent climate change 1% AEP level may reach the level of the current 0.5% AEP or 0.2% AEP flood level. The increase in frequency of flooding will potentially affect production at the plant as it will be closed more frequently. Increased flood levels will also increase flood damages at the site in each flood event which overtops the northern riverbank.

Climate change cannot be resolved on a local scale, it is a worldwide phenomenon and as such must be addressed by each country through development controls. The results in Appendix C should be used to determine design flood levels for all works that are required to satisfy a given flood planning level.

7. REFERENCES

1. Shoalhaven City Council
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Cardno, November 2022

2. Shoalhaven Starches
Shoalhaven River Flood Study
WMAwater, March 2013

3. Public Works Department
Lower Shoalhaven River Flood Study
Report No. PWD 87049, ISBN 724028692, April 1990

4. Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I **Australian Rainfall and Runoff: A Guide to Flood Estimation**
Geoscience Australia, Australia, 2016

5. Pilgrim DH (Editor in Chief)
Australian Rainfall and Runoff – A Guide to Flood Estimation
Institution of Engineers, Australia, 1987



Figures

FIGURE 1
SHOALHAVEN RIVER STUDY AREA

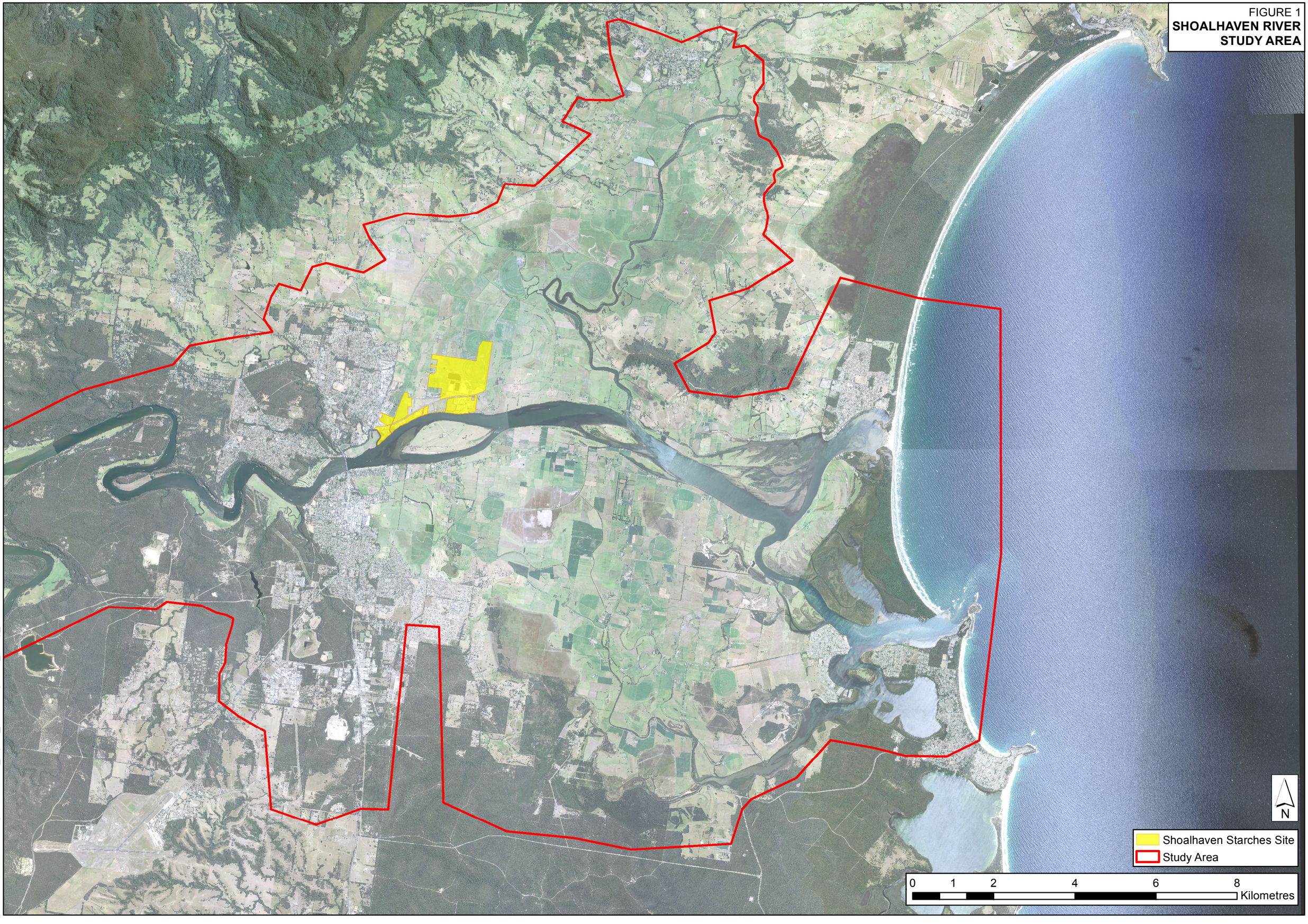

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FIGURE 2
LAYOUT OF PROPOSED WORKS

EXISTING APPROVED PLANT.
MOD 25 PENDING APPROVAL.
MOD 26 PROPOSAL.
MOD 31 PROPOSAL.
APPROVED PLANT YET TO BE CONSTRUCTED OR UNDER CONSTRUCTION.

WASTEWATER TANK.

UNDERGROUND WASTEWATER PIPE JOINS TO W.W. TANK.

RELOCATED APPROVED PHOSPHORUS OXYCHLORIDE BUND. Dwg: –027.

CAR PARK EXTENSION AND PEDESTRIAN ACCESS. Dwg: –017.

MANILDRA ENVIRONMENTAL FARM.

POND 6

BVF

PROPOSED CONCRETE PLANT BY OTHERS. UNDER CONSTRUCTION

BOLONG ROAD

FORMER PAPER MILL SITE.

FORMER DAIRY FARMERS SITE.

EXISTING BIO-GAS

GRAIN HANDLING & STORAGE.–002.

GRAIN CONVEYOR. Drw–008.

RAIL FUEL & PROVISIONS. (DURO).

RAIL MAINTENANCE BUILDINGS.–021.

Shoalhaven River

ETHANOL MAINTENANCE. Drw–015 & –016.

PROPOSED ROCK WALL EXTENSION. LANDSCAPED WITH INDIGENOUS PLANTS. Drw–13.

PRODUCT STORAGE SILOS. Drws–025 & –026.

NITRIC ACID STORE. Drw–019.

SHOALHAVEN STARCHES COMPLEX.

PIG ISLAND

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P08	I2	Relocated phosphorus oxychloride bund added.	P.C.	08–04–25	All	
P07	A L L	Product silos,rock wall,fuel & WWTP added.	P.C.	25–02–25	All	
P06	A L L	Silos size changed.	P.C.	03–11–24	JS	
P05	A L L	Mod 25 lighting amended.	P.C.	05–04–24	JS	
P04	A L L	Car park moved to Mod 22.Sub 0.2 & 0.3 moved to Mod 29.	P.C.	08–02–24	JS	
P03	A L L	Some previous approvals now complete.	P.C.	29/08/23	BH	

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MANILDRA GROUP
100% AUSTRALIAN

PC Drafting 0439 436508

DRAWN 18/10/2021	DATE	JOB TITLE SHOALHAVEN STARCHES.BOMADERRY. NSW	SHT SIZE A3
CHKD	DATE	DWG TITLE NEW PROPOSALS.MOD 26. O/A SITE PLAN.	REV. P08
APPD	DATE		
	SCALE 1: 7500	7393	DWG No. MN7549–001

FIGURE 3
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
REVISED EXISTING CASE
NOVEMBER 2022 FLOOD STUDY V MARCH 2013 FLOOD STUDY
1% AEP EVENT

J:\Jobs\114044\ARC\Impacts\251028_impact_Mod26\Figure03_Revised_Existing_Case_November_2022_Flood_Study_v_March_2013_Flood_Study_1pc_AEP_event.mxd

N

Study Area

Change in peak flood level (m)

- < -1
- -1.0 - -0.8
- -0.8 - -0.6
- -0.6 - -0.4
- -0.4 - -0.2
- -0.2 - -0.1
- -0.1 - 0.1
- 0.1 - 0.2
- > 0.2
- No Longer Flooded
- Newly Flooded

0 0.5 1 2 3 4 Kilometres

FIGURE 4

SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
IMPACT PROPOSED DEVELOPMENT
1990 EXISTING V MOD26 DESIGN
5% AEP EVENT

N

Study Area

Impact (m)

- < -0.4
- -0.4 to -0.3
- -0.3 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- No Longer Flooded
- Newly Flooded

0 0.5 1 2 3 4 Kilometres

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FIGURE 5

SHOALHAVEN RIVER (LOCAL AREA)
IMPACT PROPOSED DEVELOPMENT
1990 EXISTING V MOD26 DESIGN
5% AEP EVENT

N

Impact (m)

- < -0.4
- -0.4 to -0.3
- -0.3 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- No Longer Flooded
- Newly Flooded

0 0.125 0.25 0.5 0.75 1 Kilometres

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FIGURE 6
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
IMPACT PROPOSED DEVELOPMENT
NOV2025 EXISTING V MOD26 DESIGN
5% AEP EVENT

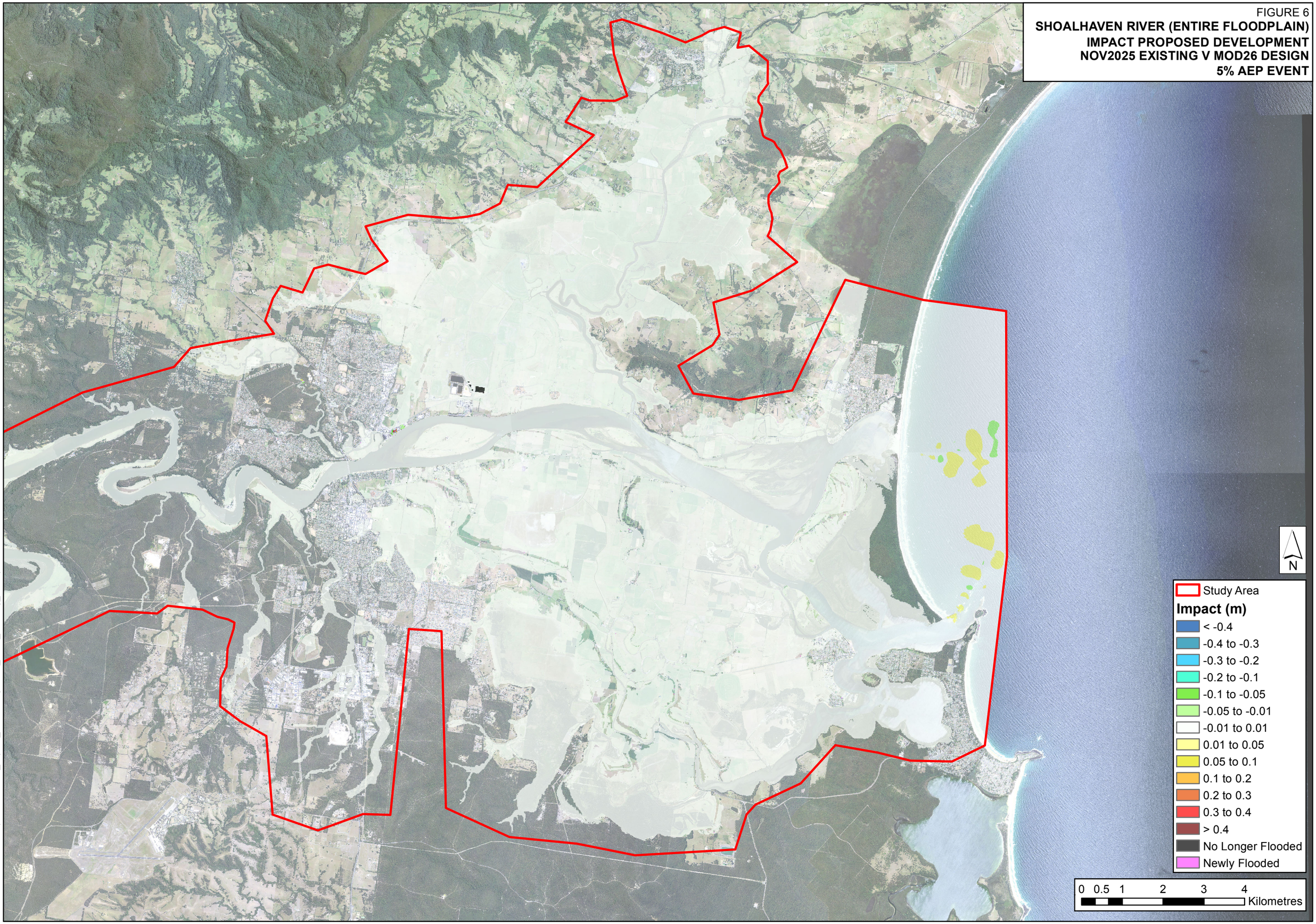

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FIGURE 7

SHOALHAVEN RIVER (LOCAL AREA)
IMPACT PROPOSED DEVELOPMENT
NOV2025 EXISTING V MOD26 DESIGN
5% AEP EVENT

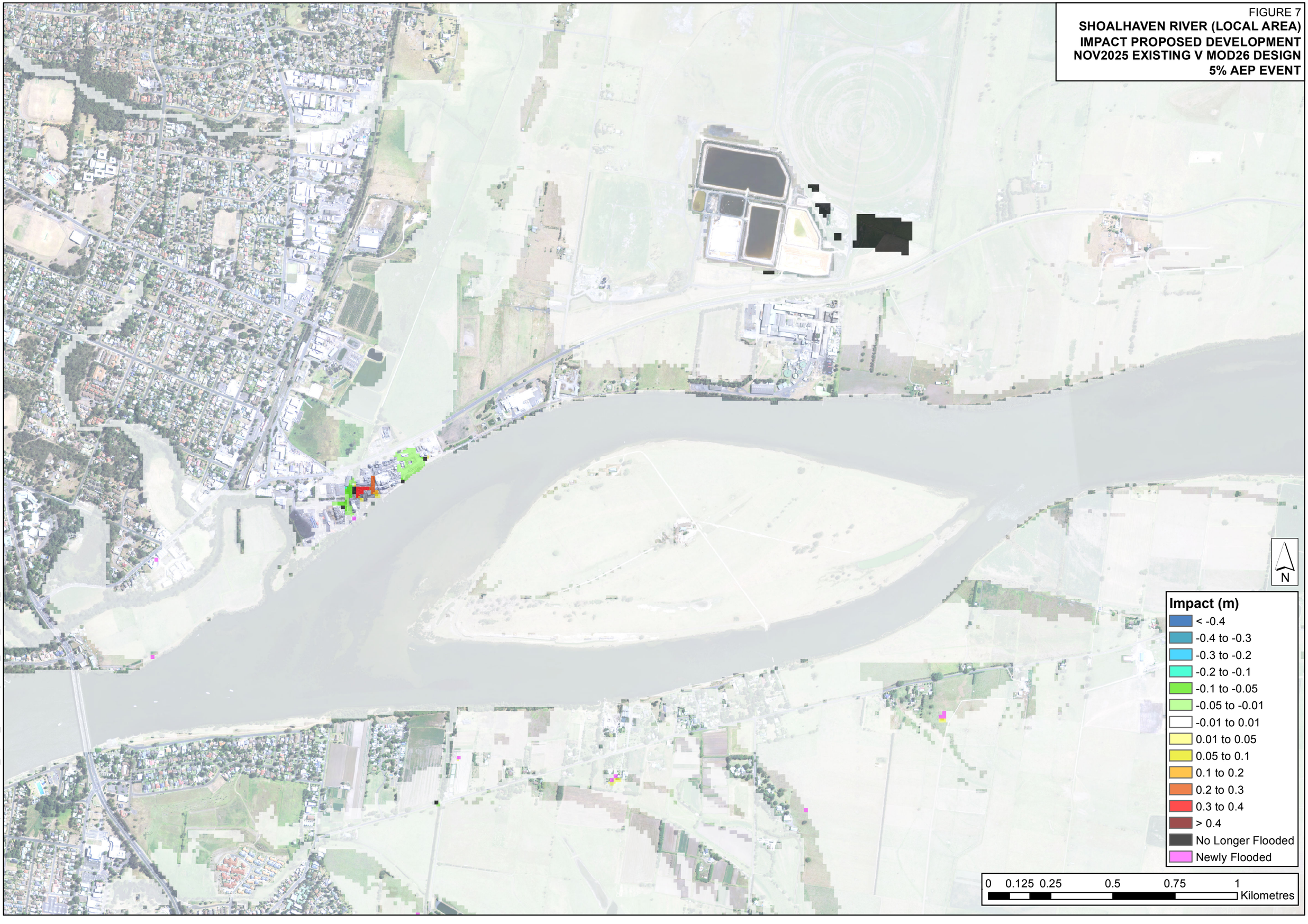

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FIGURE 8
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
IMPACT PROPOSED DEVELOPMENT
1990 EXISTING V MOD26 DESIGN
1% AEP EVENT

N

Study Area

Impact (m)

- < -0.4
- -0.4 to -0.3
- -0.3 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- No Longer Flooded
- Newly Flooded

0 0.5 1 2 3 4 Kilometres

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FIGURE 9
SHOALHAVEN RIVER (LOCAL AREA)
IMPACT PROPOSED DEVELOPMENT
1990 EXISTING V MOD26 DESIGN
1% AEP EVENT

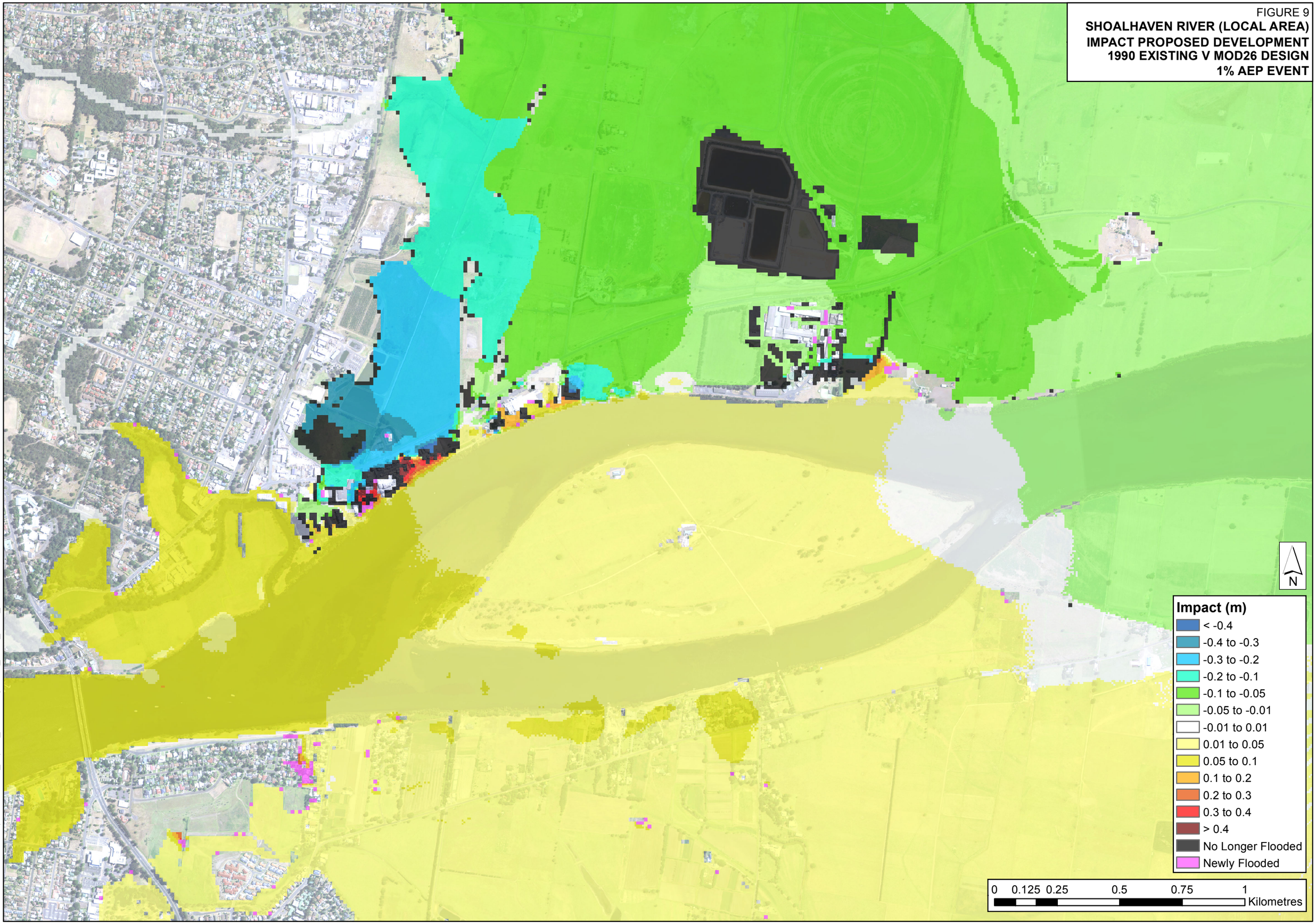

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FIGURE 10
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
IMPACT PROPOSED DEVELOPMENT
NOV2025 EXISTING V MOD26 DESIGN
1% AEP EVENT

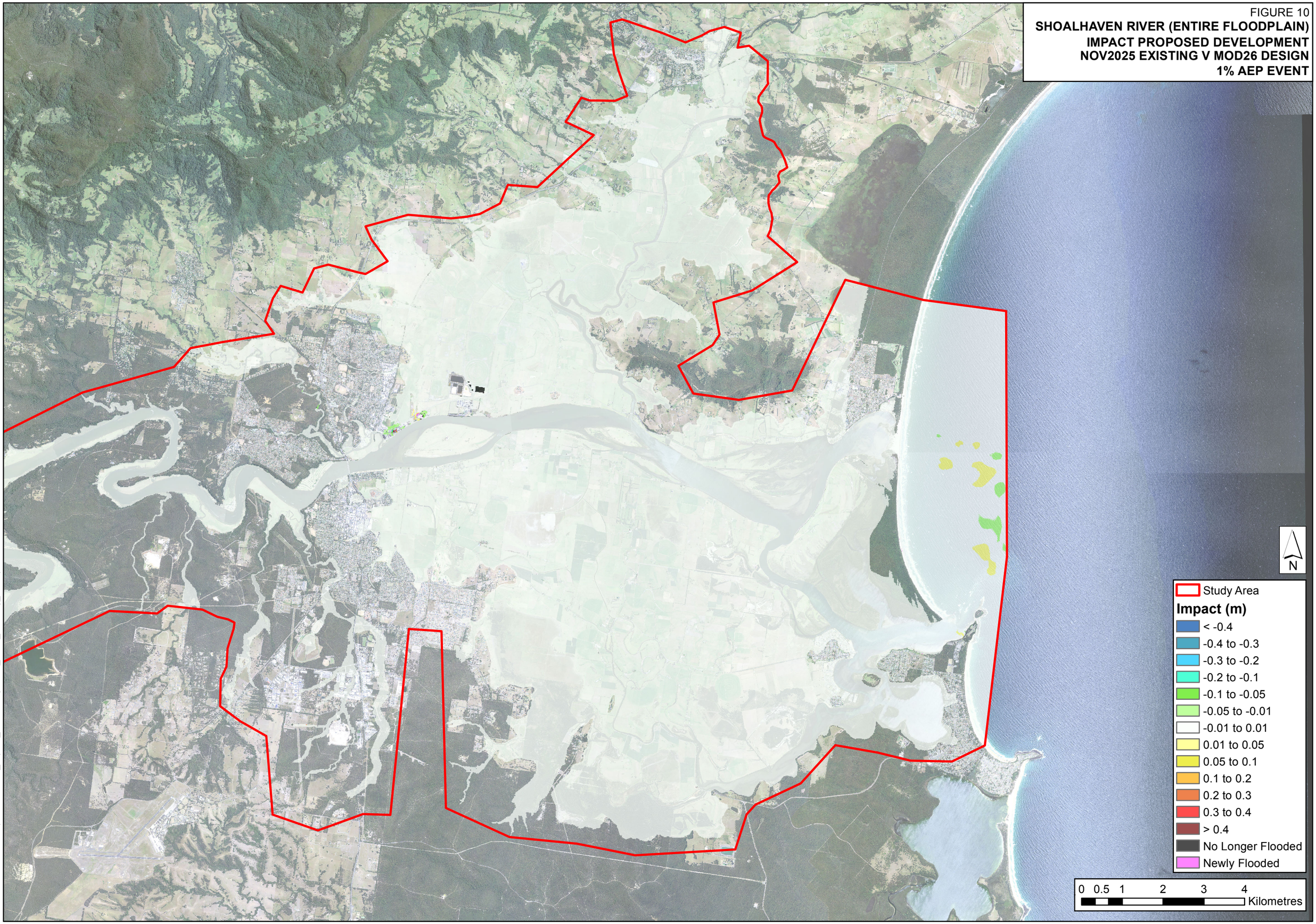

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FIGURE 11

SHOALHAVEN RIVER (LOCAL AREA)
IMPACT PROPOSED DEVELOPMENT
NOV2025 EXISTING V MOD26 DESIGN
1% AEP EVENT

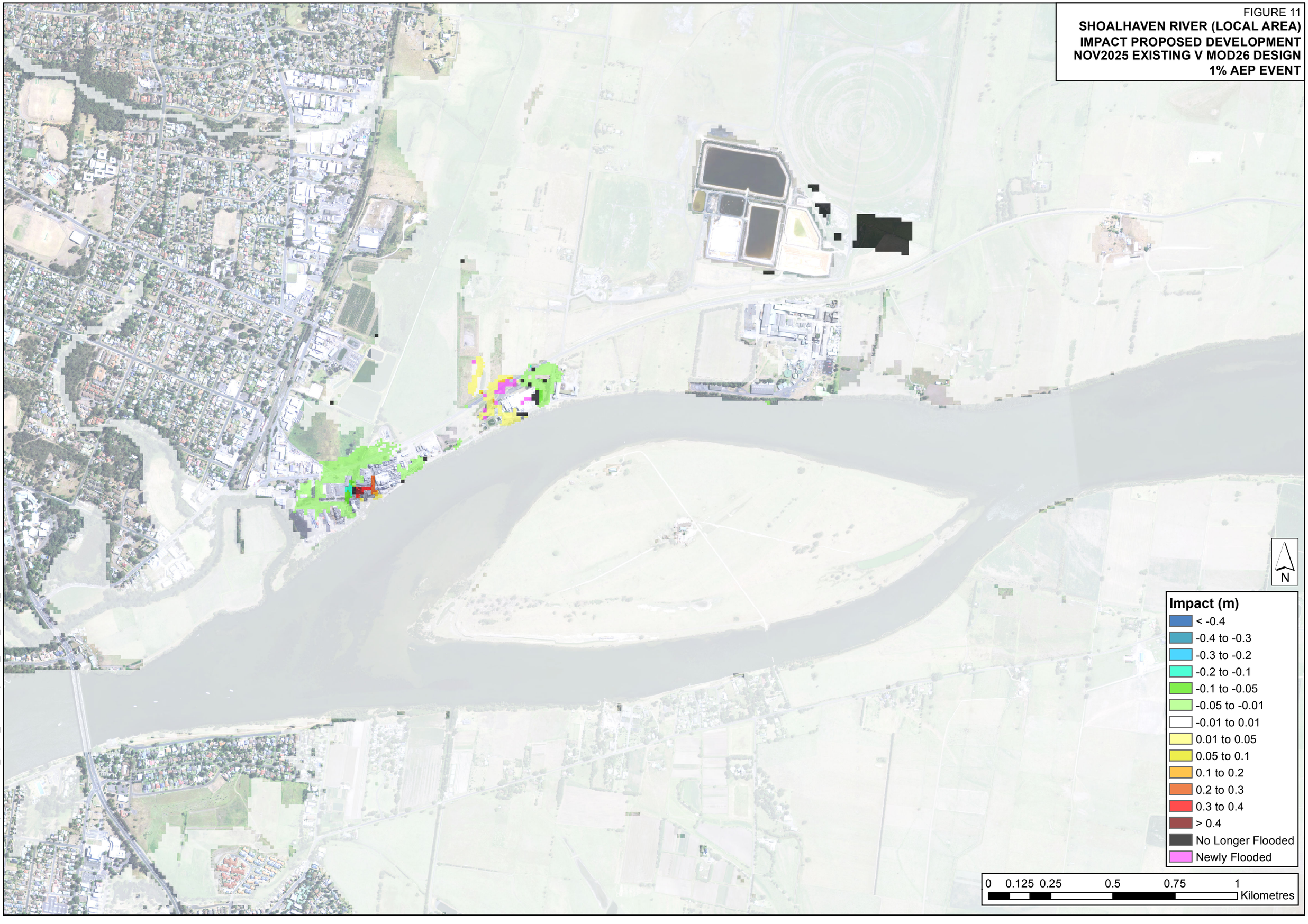

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FIGURE 12
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
IMPACT PROPOSED DEVELOPMENT
1990 EXISTING V MOD26 DESIGN
PMF EVENT

N

Study Area

Impact (m)

- < -0.4
- -0.4 to -0.3
- -0.3 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- No Longer Flooded
- Newly Flooded

0 0.5 1 2 3 4 Kilometres

J:\Jobs\114044\ARC\Impacts\251028_impact_Mod26\Figure12_PMF_1990_Floodplain.mxd

FIGURE 13
SHOALHAVEN RIVER (LOCAL AREA)
IMPACT PROPOSED DEVELOPMENT
1990 EXISTING V MOD26 DESIGN
PMF EVENT

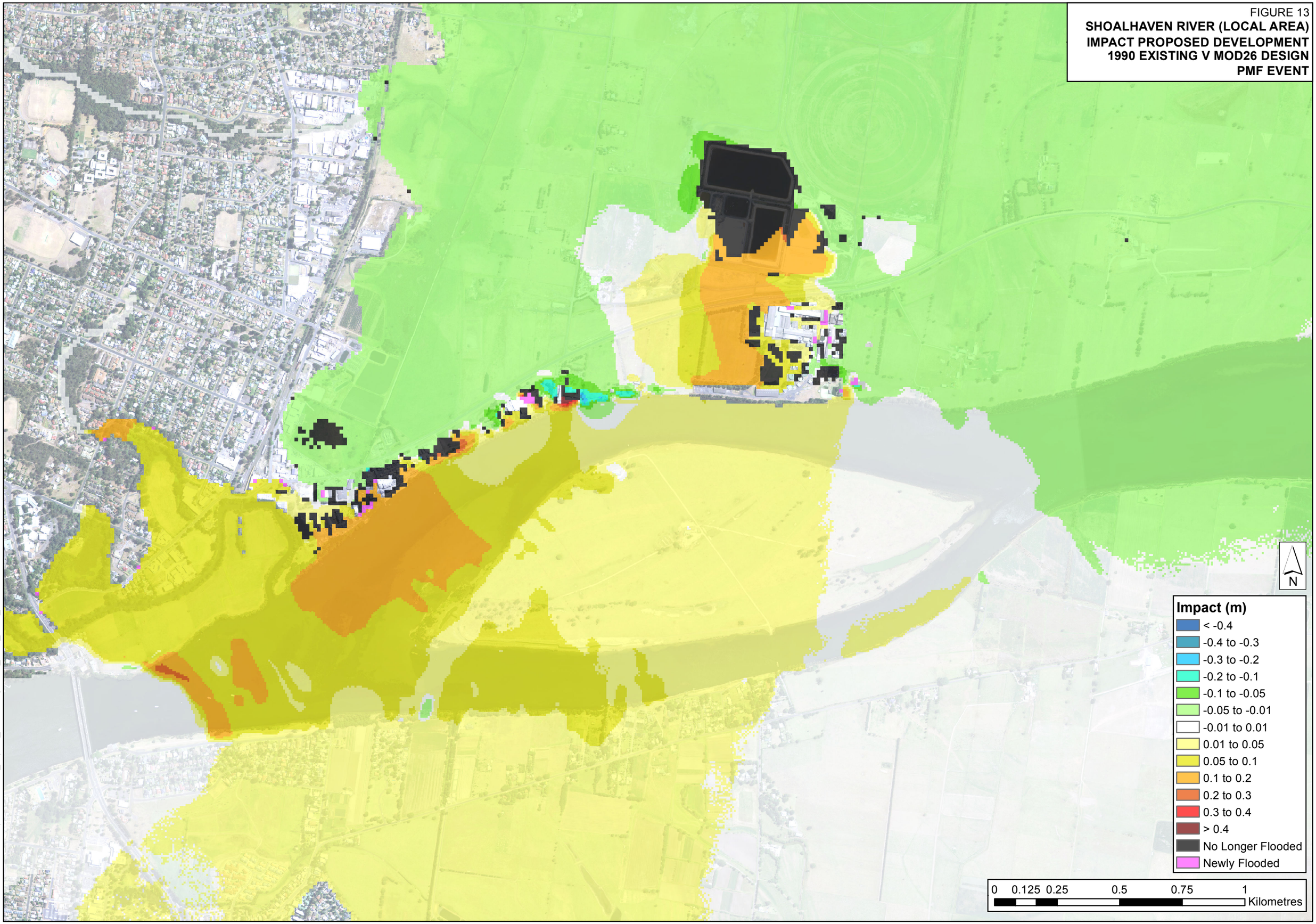

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FIGURE 14
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
IMPACT PROPOSED DEVELOPMENT
NOV2025 EXISTING V MOD26 DESIGN
PMF EVENT

N

Study Area

Impact (m)

- < -0.4
- -0.4 to -0.3
- -0.3 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- No Longer Flooded
- Newly Flooded

0 0.5 1 2 3 4 Kilometres

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FIGURE 15

SHOALHAVEN RIVER (LOCAL AREA)
IMPACT PROPOSED DEVELOPMENT
NOV2025 EXISTING V MOD26 DESIGN
PMF EVENT

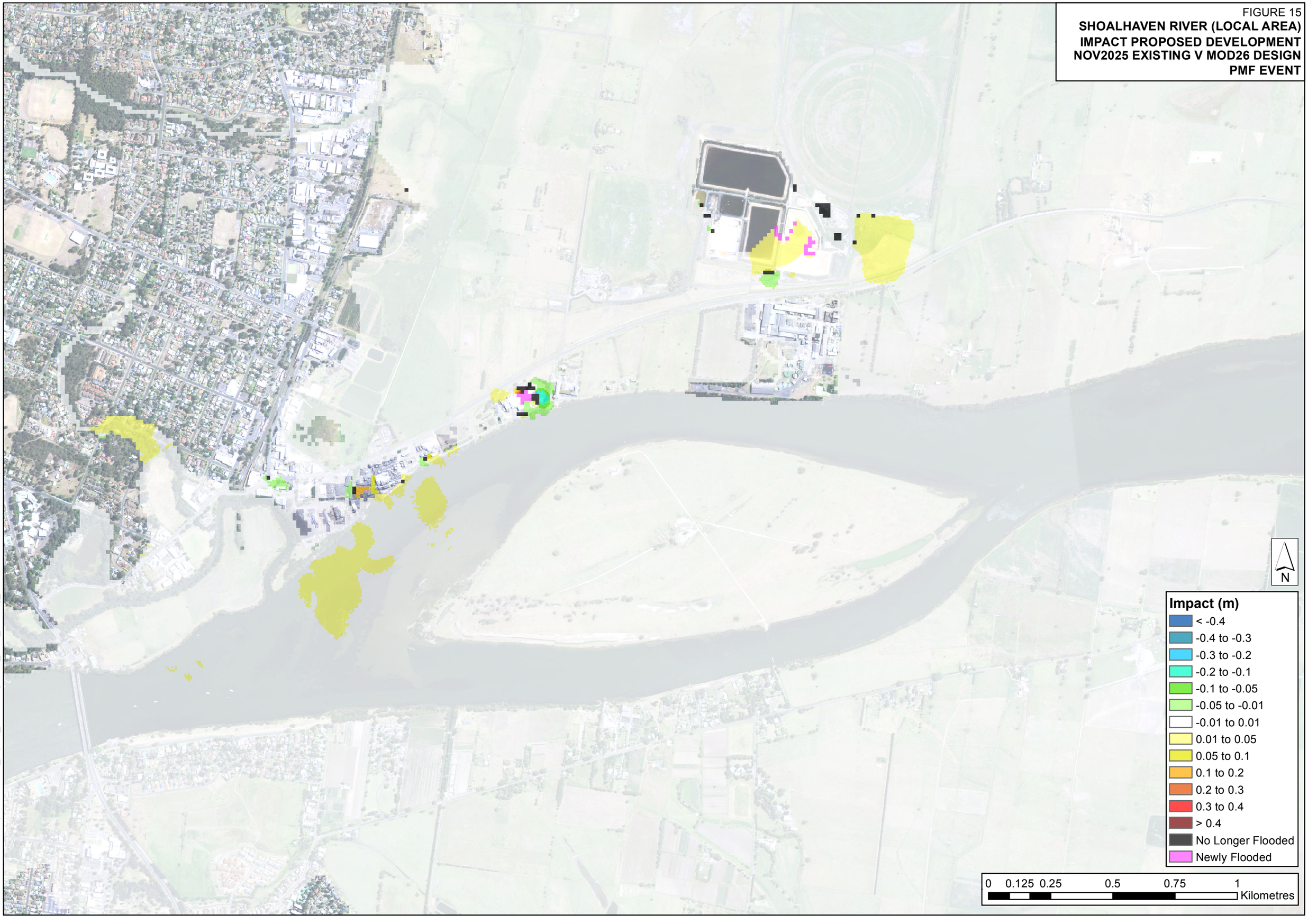

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FIGURE 16
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
LAND USE ZONES

N

Study Area
Cadastre
Properties owned by Manildra Group

Land Use Zones
Commercial & Industrial
Environmental
Mixed use
Residential
Recreation
Rural
Special

0 1 2 4 6 8
Kilometres

J:\Jobs\114044\ARC\Impacts\251028_impact_Mod26\Figure16_Land_Use_Zones_floodplain.mxd

FIGURE 17
SHOALHAVEN RIVER (LOCAL AREA)
LAND USE ZONES

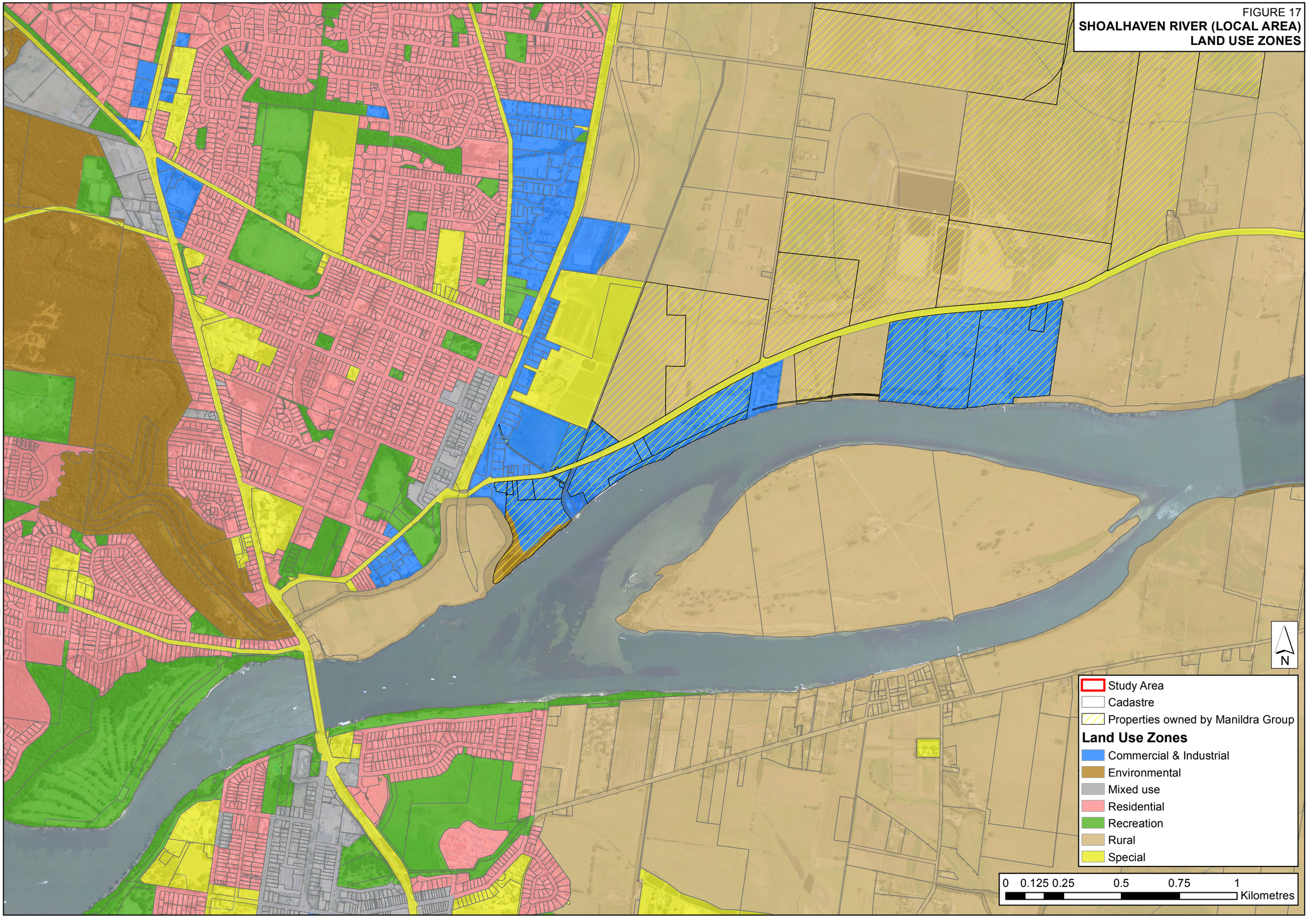

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FIGURE 18
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
PROPERTIES IMPACTED
1990 EXISTING V MOD26 DESIGN
5% AEP EVENT

N

Study Area

Property Type

- Rural
- Residential
- Commercial Industrial
- Mixed Use

Maximum change in flood level (m)

- < 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- > 0.3

0 0.5 1 2 3 4 Kilometres

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FIGURE 19

SHOALHAVEN RIVER (LOCAL AREA)
PROPERTIES IMPACTED
1990 EXISTING V MOD26 DESIGN
5% AEP EVENT

Property Type
- Rural
- Residential
- Commercial Industrial
- Mixed Use

Maximum change in flood level (m)
- < 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- > 0.3

N

0 0.125 0.25 0.5 0.75 1 Kilometres

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FIGURE 20

SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
PROPERTIES IMPACTED
1990 EXISTING V MOD26 DESIGN
1% AEP EVENT

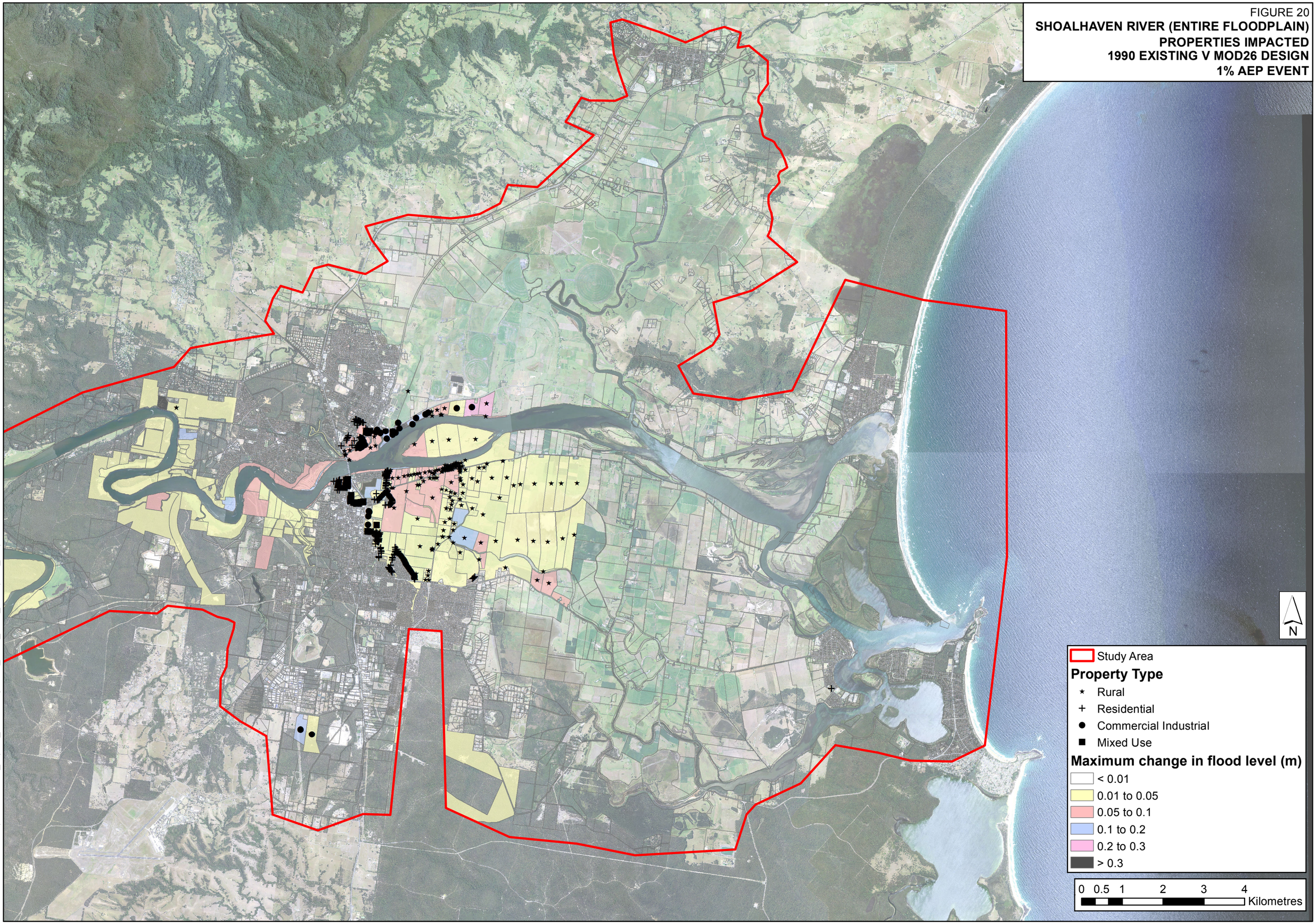

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FIGURE 21

SHOALHAVEN RIVER (LOCAL AREA)
PROPERTIES IMPACTED
1990 EXISTING V MOD26 DESIGN
1% AEP EVENT

Property Type
- Rural
- Residential
- Commercial Industrial
- Mixed Use

Maximum change in flood level (m)
- < 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- > 0.3

0 0.125 0.25 0.5 0.75 1 Kilometres

N

J:\Jobs\114044\ARC\Impacts\251028_impact_Mod26\Figure21_100Y_1990_Local_Prop.mxd

FIGURE 22
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
PROPERTIES IMPACTED
1990 EXISTING V MOD26 DESIGN
PMF EVENT

N

Study Area

Property Type

- Rural
- Residential
- Commercial Industrial
- Mixed Use

Maximum change in flood level (m)

- < 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- > 0.3

0 0.5 1 2 3 4 Kilometres

J:\Jobs\114044\ARC\Impacts\251028_impact_Mod26\Figure22_PMF_1990_Floodplain_Prop.mxd

FIGURE 23

SHOALHAVEN RIVER (LOCAL AREA)
PROPERTIES IMPACTED
1990 EXISTING V MOD26 DESIGN
PMF EVENT

Property Type
- Rural
- Residential
- Commercial Industrial
- Mixed Use

Maximum change in flood level (m)
- < 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- > 0.3

N

0 0.125 0.25 0.5 0.75 1 Kilometres

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Glossary of Terms

Appendix A

APPENDIX A: GLOSSARY of TERMS

Taken from the Flood Risk Management Manual (June 2023 edition)

Term	Definition	Context for use / additional information
Annual exceedance probability (AEP)	The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage	AEP is generally the preferred terminology. ARI is the historical way of describing a flood event, for example, a 1% AEP flood has a 1% or 1 in 100 chance of being reached or exceeded in any given year
Australian height datum (AHD)	A common national surface level datum often used as a referenced level for ground, flood and flood levels	0.0 m AHD corresponds approximately to mean sea level
Average recurrence interval (ARI)	The long-term average number of years between the occurrence of a flood equal to or larger in size than the selected event	ARI is the historical way of describing a flood event. AEP is generally the preferred terminology, for example, a 100-year ARI flood that has 1 in 100 chance of being reached or exceeded in any given year. It is equivalent to a 1% AEP flood
Catchment	The area of land draining to a specific location	It includes the catchment of the primary waterway as well as any tributary streams and flowpaths
Catchment flooding	Flooding due to prolonged or intense rainfall (e.g. severe thunderstorms, monsoonal rains in the tropics, tropical cyclones)	Types of catchment flooding include riverine, local overland and groundwater flooding
Chance	The likelihood of something happening that will have adverse or beneficial consequences	In FRM this generally relates to the adverse consequences of floods with chance being related to AEP, for example, 1% chance or 1 in 100 chance per year is equivalent to 1% AEP
Coastal inundation	Inundation due to tidal or storm-driven coastal events, including storm surges in lower coastal waterways. This can be exacerbated by wind-wave generation from storm events	
Consent authority	The authority or agency with the legislative power to determine the outcome of development and building applications	This may be the relevant local council or Minister
Consequence	The outcomes of an event or situation affecting objectives, expressed qualitatively or quantitatively	Consequences can be adverse (e.g. death or injury to people, damage to property and disruption of the community) or beneficial
Continuing flood risk	Risk to existing and future development that may be reduced by EM measures	Flood risk to the existing development and future development may be reduced by EM measures depending on flood constraints, however, these measures cannot remove all risk and a residual risk will remain
Defined flood event (DFE)	The flood event selected as a general standard for the management of flooding to development	Aims to reduce the frequency of flooding but does not remove all flood risk, for example, in selecting a 1% AEP flood as a DFE you are accepting that there is a 1 in 100 chance that a larger event will occur in any year. This risk is being built into the decision
Design flood	The flood selected as part of the FRM process that forms the basis for physical works to modify the impacts of flooding	The design flood may be considered the flood mitigation standard, for example, a levee may be designed to exclude a 2% AEP flood, which means that floods rarer than this may breech the structure and impact upon the protected area. In this case, the 2% AEP flood would not equate to the crest level of the levee, because this generally has a freeboard allowance, but it may be the level of the spillway to allow for controlled levee overtopping
Development	May be treated differently depending on the following categorisation:	New developments involve rezoning and typically require major extensions of existing

Term	Definition	Context for use / additional information
	• **infill development**: the development of vacant blocks of land that are generally surrounded by developed properties and is permissible under current land zoning • **new development**: development of a completely different nature to that associated with the former land-use (e.g. the urban subdivision of a previously rural area) • **redevelopment**: rebuilding in an area (e.g. as urban areas age, it may become necessary to demolish and reconstruct buildings on a relatively large scale)	urban services, such as roads, water supply, sewerage and electric power Redevelopment generally does not require either rezoning or major extensions to urban services
Development control plan (DCP)	See Environmental Planning and Assessment Act 1979	
Emergency management (EM)	A comprehensive approach to dealing with risks to the community arising from hazards. It is a systematic method for identifying, analysing, evaluating and managing these risks	May include measures to reduce flood frequency or consequences through prevention and mitigation measures, and preparation, as well as response and recovery should a flood occur (see PPRR)
Ecologically sustainable development (ESD)	As outlined in the *Local Government Act 1993*	Principles of ESD are outlined in the *Local Government Act 1993*
Existing flood risk	The risk an existing community is exposed to as a result of its location on the floodplain	Existing flood risk may be reduced by existing or proposed FRM measures leaving a residual flood risk to the existing community. Residual flood risk may be further reduced by addressing continuing risk
Flood	A natural phenomenon that occurs when water covers land that is normally dry. It may result from coastal inundation (excluding tsunamis) or catchment flooding, or a combination of both	Flooding results from relatively high stream flow that overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flowpaths associated with major drainage, and/or oceanic inundation resulting from super-elevated ocean levels
Flood (hydrologic and hydraulic) modelling	Hydrologic and hydraulic computer models to simulate catchment processes of rainfall, run-off, stream flow and distribution of flows across the floodplain or similar	They typically involve consideration of the local flood history, available collected data, and the development of models that are calibrated and validated, where possible, against historic flood events and extended to determine the full range of flood behaviour
Flood affected land	Equivalent to flood prone land	See the definition of flood prone land
Flood awareness	An appreciation of the likely effects of flooding, and a knowledge of the relevant flood warning, response and evacuation procedures facilitating prompt and effective community response to a flood threat	In communities with a low degree of flood awareness, flood warnings may be ignored or misunderstood, and residents confused about what they should do, when to evacuate, what to take with them and where to go
Flood constraints	Key constraints that flooding place on land	These include flood function, flood hazard, flood range, and flood emergency response classification. These can be used to inform FRM including consideration of options such as mitigation works, EM and land-use planning
Flood damage	The tangible (direct and indirect) and intangible costs (financial, opportunity costs, clean-up) of flooding	Tangible costs are quantified in monetary terms (e.g. damage to goods) Intangible damages are difficult to quantify in monetary terms and include the increased levels of physical, emotional and psychological health problems suffered by flood affected people that are attributed to a flood
Flood education	Seeks to provide information to raise community awareness of flooding so as to enable individuals to understand how to	

Term	Definition	Context for use / additional information
	manage themselves and their property in response to flood warnings	
Flood evacuation	The movement of people from a place of danger to a place of relative safety, and their eventual return	People are usually evacuated to areas outside of flood prone land with access to adequate community support Livestock may be relocated to areas outside of the influence of flooding
Flood fringe areas	That part of the flood extents for the event remaining after the flood function areas of floodway and flood storage areas have been defined	
Flood function	The flood related functions of floodways, flood storage and flood fringe within the floodplain	Flood function is equivalent to hydraulic categorisation
Flood hazard	A flood that has the potential to cause harm or conditions with the potential to result in loss of life, injury and economic loss	The degree of hazard varies with the severity of flooding and is affected by flood behaviour (extent, depth, velocity, isolation, etc.)
Flood impact and risk assessment (FIRA)	A study to assess flood behaviour, constraints and risk, understand offsite flood impacts on property and the community resulting from the development, and flood risk to the development and its users	These studies are generally undertaken for development and are to be prepared by a suitably qualified engineer experienced in hydrological and hydraulic analysis for FRM
Flood liable land	Equivalent to flood prone land	See the definition of flood prone land
Flood plan (local or state) (LFP)	A sub-plan of an EM plan that deals specifically with flooding; they can exist at state, zone and local levels	The NSW Government develops flood plans as a legislative responsibility to determine how best to respond to floods. These community-based plans describe the risk to the community, outline agency roles and responsibilities, the agreed community emergency response strategy and how floods will be managed
Flood planning area (FPA)	The area of land below the FPL	The FPA is generally developed based on the FPL for typical residential development. Different types of development may have different FPLs applied within the FPA. In addition development controls will vary across the FPA due to varying flood constraints
Flood planning level (FPL)	The combination of the flood level from the DFE and freeboard selected for FRM purposes	Different FPLs may apply to different types of development Determining the FPL for typical residential development should generally start with a DFE of the 1% AEP flood plus an appropriate freeboard (typically 0.5 m). This assists in determining the FPA
Flood prone land	Land susceptible to flooding by the PMF event	Flood prone land is also known as the floodplain, flood liable land and flood affected land
Flood risk	Risk is based on the consideration of the consequences of the full range of flood behaviour on communities and their social settings, and the natural and built environment	See also risk. The degree of risk varies with circumstances across the full range of floods. It is affected by factors including flood behaviour and hazard, topography and EM difficulties
Flood risk management (FRM)	The management of flood risk to communities	Flood risk management manual: the policy and manual for the management of flood liable land
Flood storage areas	Areas of the floodplain that are outside floodways which generally provide for temporary storage of floodwaters during the passage of a flood and where flood behaviour is sensitive to changes that impact on temporary storage of water during a flood	See also flood function, floodways and flood fringe areas

Term	Definition	Context for use / additional information
Flood study	A comprehensive technical investigation of flood behaviour undertaken in accordance with the principles in this manual and consistent with associated guidelines A flood study defines the nature of flood behaviour and hazard across the floodplain by providing information on the extent, level and velocity of floodwaters, and on the distribution of flood flows considering the full range of flood events up to and including extreme events, such as the PMF	A flood study is undertaken in accordance with the FRM process outlined in this manual to support the understanding and management of flood risk. It is different from a flood impact and risk assessment (FIRA)
Flood warnings	Warnings issued when there is more certainty that flooding is expected, are more targeted and are issued for specific catchments	Flood warnings include more specific predictions of the severity of expected flooding and may give quantitative figures such as expected river water heights at gauge stations
Floodplain	Equivalent to flood prone land	See the definition of flood prone land
Floodways	Areas of the floodplain which generally convey a significant discharge of water during floods and are sensitive to changes that impact flow conveyance. They often align with naturally defined channels or form elsewhere in the floodplain	See also flood function, floodways and flood fringe areas Floodways are sometimes known as flow conveyance areas
Flow	The rate of flow of water measured in volume per unit time, for example, cubic metres per second (m^3/s)	Flow is different from the speed or velocity of flow, which is a measure of how fast the water is moving
Freeboard	A factor of safety typically used in relation to the setting of minimum floor levels or levee crest levels	Freeboard aims to provide reasonable certainty that the risk exposure selected in deciding on a specific event for development controls or mitigation works is achieved. Freeboards for development controls and mitigation works will differ. In addition freeboards for development control may vary with the type of flooding and with the type of development
Frequency	The measure of likelihood expressed as the number of occurrences of a specified event in a given time	For example, the frequency of occurrence of a 20% AEP or 5-year ARI flood is once every 5 years on average
FRM measures	Measures that can reduce flood risk	FRM measures may include FRM, flood mitigation, EM and land-use planning measures
FRM options	The FRM measures that might be feasible for the management of a particular area of the floodplain	Preparation of an FRM plan requires a detailed evaluation of FRM options
FRM plan	A management plan developed in accordance with the principles in this manual and its supporting guidelines	Previously known as a floodplain risk management plan or floodplain management plan. It may describe how particular areas of flood prone land are to be used and managed to achieve defined objectives
FRM study	A management study developed in accordance with the principles in this manual and its supporting guidelines	Previously known as a floodplain risk management study or floodplain management study
Future flood risk	The risk future development and its users are exposed to as a result of its location on the floodplain	Future flood risk may be reduced by existing or proposed FRM measures and land-use planning controls that consider the flood constraints on the land. This leaves a residual flood risk to the new development and its users. This residual flood risk may be further reduced by addressing continuing flood risk
Gauge height	The height of a flood level at a particular water level gauge site related to a specified datum	The datum may or may not be the AHD

Term	Definition	Context for use / additional information
Hazard	A source of potential harm or conditions that may result in loss of life, injury and economic loss due to flooding	
Hydraulics	The study of water flow in waterways and flowpaths; in particular, the evaluation of flow parameters such as water level and velocity	
Hydrology	The study of the rainfall and run-off process; in particular, the evaluation of peak flows, flow volumes and the derivation of hydrographs for a range of floods	
Integrated planning and reporting framework (IP&R)	The IP&R framework includes a suite of integrated plans that set out a vision and goals and strategic actions to achieve them. It involves a reporting structure to communicate progress to council and the community as well as a structured timeline for review to ensure the goals and actions are still relevant	Preparation of FRMS and plans and implementation and maintenance of works requires linkages to the IP&R framework
Likelihood	A qualitative description of probability and frequency	See also frequency and probability
Likelihood of occurrence	The likelihood that a specified event will occur	With respect to flooding, see also AEP and ARI
Local environmental plan (LEP)	See *Environmental Planning and Assessment Act 1979*	
Local government area (LGA)		The area serviced by the local government council
Local overland flooding (LOF)	Inundation by local run-off on its way to a waterway, rather than overbank flow from a waterway	
Local strategic planning statement (LSPS)		Local strategic planning statements assist councils to implement the priorities set out in their community strategic plan and actions in regional and district plans
Loss	Any negative consequence or adverse effect, financial or otherwise	
Merit-based approach	Weighs social, economic, ecological and cultural impacts of land-use options for different flood prone areas together with flood damage, hazard and behaviour implications, and environmental protection and wellbeing of the state's rivers and floodplains	The merit approach operates at 2 levels. At the strategic level it allows for the consideration of social, economic, ecological, cultural and flooding issues to determine strategies for the management of future flood risk, which are formulated into council plans, policy and environmental planning instruments At a site-specific level, it involves consideration of the merits of a development consistent with council LEPs, DCPs and local FRM policies, and consistent with FRM plans
NSW Floodplain Management Program	The NSW Government's program of technical support and financial assistance to local councils to enable them to understand and manage their flood risk	The program, manual and FRM guides support the delivery of the policy through a partnership across governments
NSW Flood prone land policy	The *NSW Flood prone land policy* included in this document	
Prevention, preparedness, response and recovery (PPRR)	Involves: • **prevention:** to eliminate or reduce the level of the risk or severity of emergencies • **preparedness:** enhances the capacity of agencies and communities to cope with the consequences of emergencies	In the flood context prevention involves FRM (including flood mitigation), EM and land-use planning measures

Term	Definition	Context for use / additional information
	• **response:** to ensure the immediate consequences of emergencies to communities are minimised • **recovery:** measures that support individuals and communities affected by emergencies in the reconstruction of physical infrastructure and restoration of physical, emotional, environmental and economic wellbeing	
Probability	A statistical measure of the expected chance of a flood	For example, AEP
Probable maximum flood (PMF)	The largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation (PMP), and where applicable, snow melt, coupled with the worst flood-producing catchment conditions	This is equivalent to the probable maximum precipitation flood in Australian Rainfall and Runoff (ARR) The PMF in ARR is used for estimating dam design floods
Probable maximum precipitation (PMP)	The greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year, with no allowance made for long-term climatic trends (World Meteorological Organization 1986)	PMP is the primary input to PMF estimation
Rainfall intensity	The rate at which rain falls, typically measured in millimetres per hour (mm/h)	Rainfall intensity varies throughout a storm in accordance with the temporal pattern of the storm
Residual flood risk	The risk to the existing and future community that remains with FRM, EM and land-use planning measures in place to address flood risk	FRM measures cannot remove all flood risk, but rather they reduce residual flood risk
Risk	The effect of uncertainty on objectives' (ISO 2018)	See also flood risk. Note 4 of the definition in ISO31000:2018 also states that 'risk is usually expressed in terms of risk sources, potential events, their consequences and their likelihood
Risk analysis	The systematic use of available information to determine how often specified (flood) events occur and the magnitude of their likely consequences	
Run-off	The amount of rainfall that ends up as streamflow, also known as rainfall excess	
State environmental planning policy (SEPP)	See Environmental Planning and Assessment Act 1979	
Scenario	A scenario may relate to current, historical or assumed future floodplain, catchment and climate conditions	Flood behaviour varies over time with changes in key catchment and floodplain (such as the scale of development) and climatic conditions (including climate change), and due to the implementation of FRM measures. A range of scenarios are generally needed to understand and assess flood behaviour
Stage	Equivalent to water level; measured with reference to a specified datum	Measurement may relate to AHD, a local datum or a local water level gauge
Storm surge	The increases in coastal water levels above predicted astronomical tide level (i.e. tidal anomaly) resulting from a range of location-dependent factors	These factors may include the inverted barometer effect, wind and wave setup and astronomical tidal waves, together with any other factors that increase tidal water level
Technical working group (TWG)		

Term	Definition	Context for use / additional information
Velocity	The speed of floodwaters, measured in metres per second (m/s)	
Vulnerability	The degree of susceptibility and resilience of a community, its social setting, and the built environment to flooding	Vulnerability is assessed in terms of ability of the community and environment to anticipate, cope and recover from flood events

Plans of the Works Provided by the Client

Appendix B

GRAIN HANDLING & STORAGE.
MOD 26.

PROJECT No.7549
13/05/25

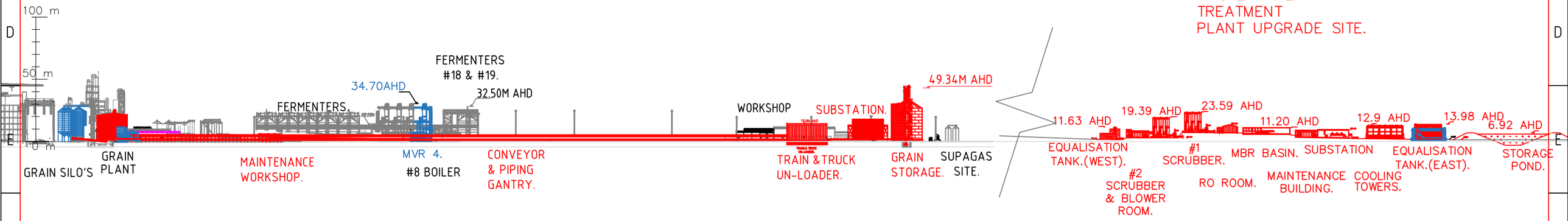
Drawing No.	REV.	
MN7549-000	P08	SITE ELEVATION.
MN7549-001	P08	O/A SITE PLAN.
MN7549-002	P20	O/A WESTERN SITE PLAN.
MN7549-003	P14	GRAIN HANDLING SITE PLAN.
MN7549-004	P12	GRAIN HANDLING NORTHERN ELEVATION.
MN7549-005	P12	GRAIN HANDLING SOUTHERN ELEVATION.
MN7549-006	P12	GRAIN HANDLING EASTERN ELEVATION.
MN7549-007	P12	GRAIN HANDLING WESTERN ELEVATION.
MN7549-008	P10	CONVEYOR TO PLANT GA.
MN7549-009	P06	WEST CONVEYOR & SERVICES GANTRY.
MN7549-010	P08	EAST CONVEYOR & SERVICES GANTRY.
MN7549-011	P05	SUBSTATION.
MN7549-012	P04	CONTROL ROOM/WORKSHOP/OFFICE G.A.
MN7549-013	P02	RIVER BANK STABILISATION.
MN7549-014	P01	TRUCK AND TRAIN UNLOADER.
MN7549-015	P02	ETHANOL MAINTENANCE BUILDING SITE.
MN7549-016	P01	ETHANOL MAINTENANCE BUILDING DETAIL.
MN7549-017	P07	CAR PARK EXTENSION AND PEDESTRIAN ACCESS.
MN7549-018	P04	TRAFFIC MOVEMENTS.
MN7549-019	P06	NITRIC ACID STORAGE & BUND.
MN7549-020	P19	RAIL MAINT. BUILDING.O/A SITE PLAN.
MN7549-021	P07	RAIL MAINT. BUILDING.SITE PLAN.
MN7549-022	P01	SILO GRAIN SCREENING BUILDING.
MN7549-023	P01	SILO GRAIN SIEVE BUILDING.
MN7549-024	P02	SECONDARY GRAIN SCREENING BUILDING.
MN7549-025	P03	PRODUCT SILOS SITE PLAN.
MN7549-026	P06	PRODUCT SILOS GA.
MN7549-027	P01	RELOCATED PHOSPHORUS OXYCHLORIDE BUND.
7980	P05	RAIL MAINT. BUILDING.LAYOUT PLAN.
8102	P1	SILO GRAIN DETAIL.
8113	P1	RAIL FUEL TANK.
8117	P01	Phosphorus oxychloride bund detail.

EXISTING APPROVED PLAN.

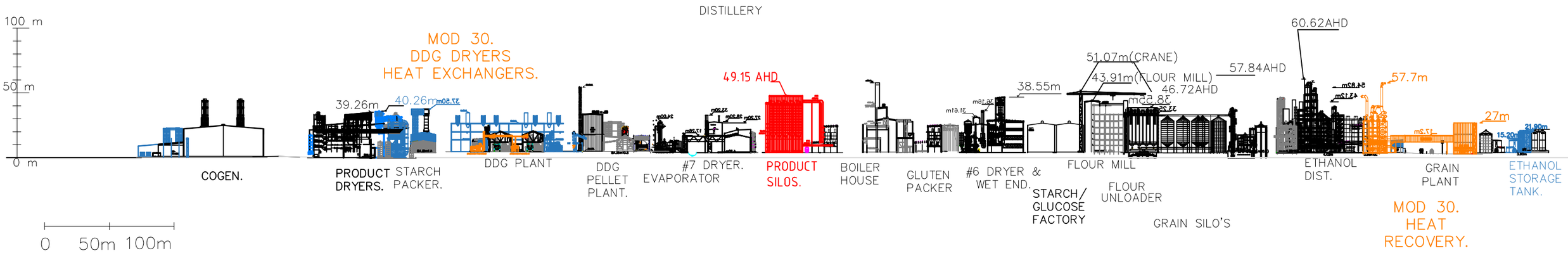
APPROVED PLANT YET TO BE CONSTRUCTED OR UNDER CONSTRUCTION.

MOD 26.

MOD 30.APPROVAL PENDING.



TYPICAL ELEVATIONS OF STRUCTURES
ON SHOALHAVEN STARCHES SITE.
ALL HEIGHTS ARE A.H.D.



0 50m 100m

SCALE 1: 3000

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P08	All	Now Mod 26.WWTP added.	P.C.	17-03-25	All	JS
P04	All	Changed to match engineers design.	P.C.	25-11-24	All	JS
P03	All	Starch dryers ect removed.	P.C.	15-11-24	All	JS
P01	All	Latest revision.	P.C.	05-09-24	All	B.H.

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DRAWN P.C.	DATE 05/09/24	JOB TITLE	SHOALHAVEN STARCHES.BOMADERRY. NSW
CHKD JS	DATE	DWG TITLE	PROPOSED GRAIN UN-LOADER.MOD 26. SITE ELEVATIONS GA.
APPD	DATE		
	SCALE 1:3000	PROJECT No. 7549-000	DWG No. MN7549-000

SHT SIZE A3

REV. P08

EXISTING APPROVED PLANT.
MOD 25 PENDING APPROVAL.
MOD 26 PROPOSAL.
MOD 31 PROPOSAL.
APPROVED PLANT YET TO BE CONSTRUCTED OR UNDER CONSTRUCTION.

WASTEWATER TANK.

UNDERGROUND WASTEWATER PIPE JOINS TO W.W. TANK.

RELOCATED APPROVED PHOSPHORUS OXYCHLORIDE BUND. Dwg: –027.

CAR PARK EXTENSION AND PEDESTRIAN ACCESS. Dwg: –017.

MANILDRA ENVIRONMENTAL FARM.

POND 6

app. irrigation.

WASTE WATER TREATMENT PLANT.

BOLONG ROAD

FORMER PAPER MILL SITE.

FORMER DAIRY FARMERS SITE.

EXISTING BIO-GAS

GRAIN HANDLING & STORAGE.–002.

GRAIN CONVEYOR. Drw–008.

RAIL FUEL & PROVISIONS. (DURO).

RAIL MAINTENANCE BUILDINGS.–021.

Shoalhaven River

ETHANOL MAINTENANCE. Drw–015 & –016.

PROPOSED ROCK WALL EXTENSION. LANDSCAPED WITH INDIGENOUS PLANTS. Drw–13.

PRODUCT STORAGE SILOS. Drws–025 & –026.

NITRIC ACID STORE. Drw–019.

SHOALHAVEN STARCHES COMPLEX.

PROPOSED CONCRETE PLANT BY OTHERS. UNDER CONSTRUCTION

PIG ISLAND

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P08	I2	Relocated phosphorus oxychloride bund added.	P.C.	08–04–25	All	
P07	A L L	Product silos,rock wall,fuel & WWTP added.	P.C.	25–02–25	All	
P06	A L L	Silos size changed.	P.C.	03–11–24	JS	
P05	A L L	Mod 25 lighting amended.	P.C.	05–04–24	JS	
P04	A L L	Car park moved to Mod 22.Sub 0.2 & 0.3 moved to Mod 29.	P.C.	08–02–24	JS	
P03	A L L	Some previous approvals now complete.	P.C.	29/08/23	BH	

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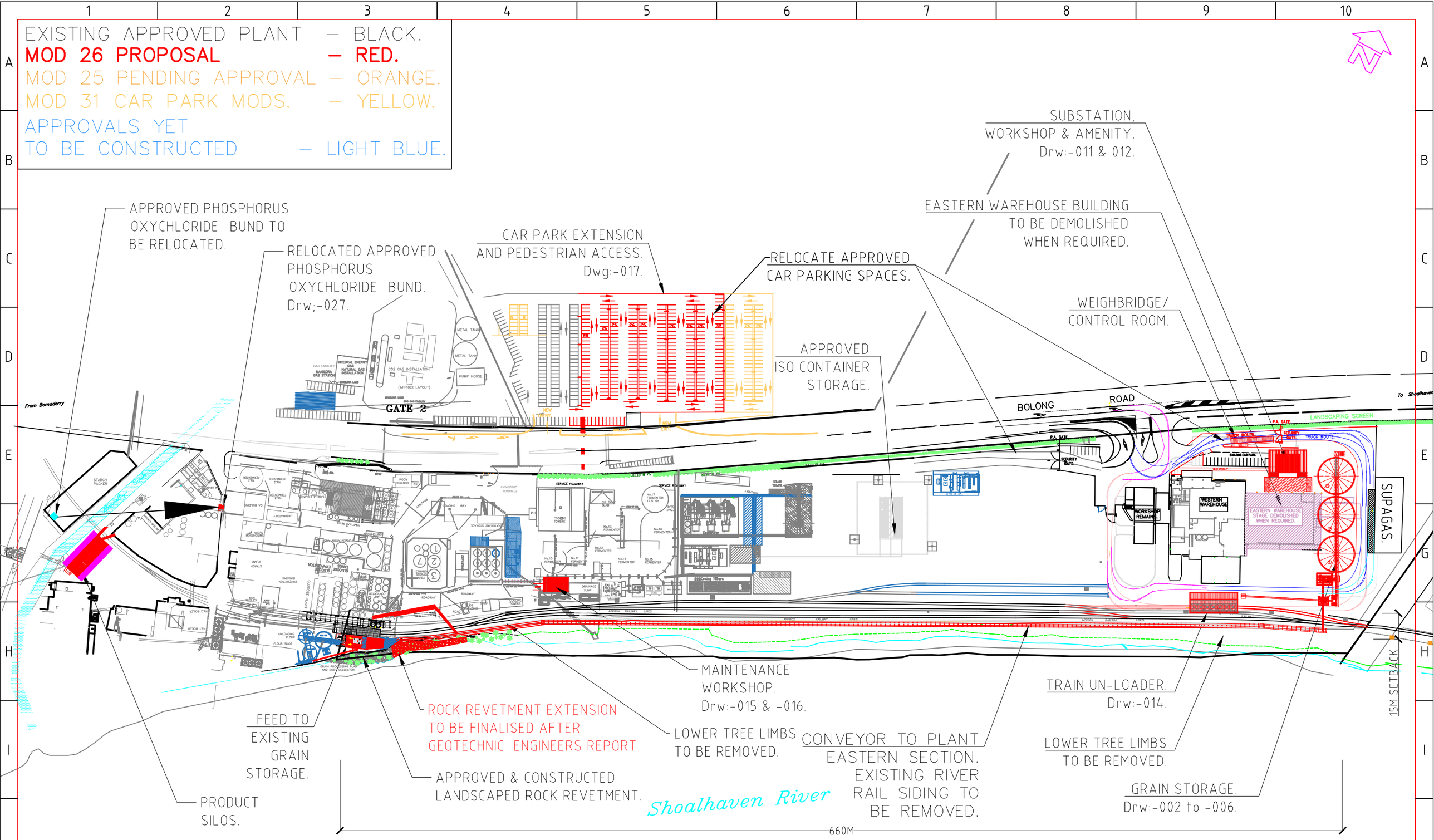
PC Drafting 0439 436508

DRAWN 18/10/2021	DATE	JOB TITLE SHOALHAVEN STARCHES.BOMADERRY. NSW	SHT SIZE A3
CHKD	DATE	DWG TITLE NEW PROPOSALS.MOD 26. O/A SITE PLAN.	REV. P08
APPD	DATE		
	SCALE 1: 7500	7393	DWG No. MN7549–001

EXISTING APPROVED PLANT – BLACK.
MOD 26 PROPOSAL – RED.
MOD 25 PENDING APPROVAL – ORANGE.
MOD 31 CAR PARK MODS. – YELLOW.
APPROVALS YET TO BE CONSTRUCTED – LIGHT BLUE.



REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P20	D6	Mod 31 car park added.	P.C.	12-5-25	JS	
P19	G1	Silos layout amended.	P.C.	28-4-25	JS	
P18	E2	Relocated phosphorus oxychloride bund added.	P.C.	08-04-25	JS	
P17	ALL	Mod 22 removed,Mod 29 now approved.	P.C.	30-01-25	JS	
P16	ALL	Was 5 silo layout.Substations relo.	P.C.	08-01-25	AT	
P15	ALL	Silo size changed,glucose plant removed.	P.C.	02-12-24	JS	

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DRAWN	DATE	JOB TITLE
P.C.	11/10/21	SHOALHAVEN STARCHES.BOMADERRY. NSW
CHKD T.J.	DATE	DWG TITLE: MOD 26. O/A WESTERN SITE PLAN.
APPD	DATE	
	SCALE 1:2250	PROJECT No. 7549SITE
		DWG No. MN7549-002

SHT SIZE A3
REV. P20

EXISTING APPROVED PLANT – BLACK.
MOD 26 PROPOSAL – RED.
APPROVALS YET
TO BE CONSTRUCTED – BLUE.

BOLONG ROAD

From Bomaderry

To Shoalhaven Heads

LANDSCAPING SCREEN

P.A. GATE.

SECURITY GATE.

WALKWAY.

TRUCK ROUTE.

SECURITY GATES.

TRUCK ROUTE.

WEIGHBRIDGE.

EXISTING CAR PARK.

WALKWAY.

OFFICE/AMENITY.

STAIR TOWER.

WEIGHBRIDGE.

7M SETBACK

17M SETBACK

19M SETBACK.

OFFICE/AMENITY.

STAIR TOWER.

SUPAGAS.

WALKWAY.

EXTENT OF DEMOLISHING.

SECURITY FENCE.

SUBSTATION

WESTERN WAREHOUSE REMAINS.

WORKSHOP REMAINS.

EASTERN WAREHOUSE STAGE DEMOLISHED WHEN REQUIRED.

Ø23.68M SILOS.

29M SETBACK

EXTENT OF DEMOLISHING.

TRUCK ROUTE.

TRAIN & TRUCK UN-LOADER.

TRUCK ROUTE.

APPROX RAILWAY LINES

RAILWAY LINES

15M Min. SETBACK

App. TOP OF BANK.

RAILWAY LINE

Shoalhaven River

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P14	ALL	Was 5 silo layout.Substations relo.	P.C.	08-01-25	AT	
P13	ALL	Silo size changed,glucose plant removed.Scale was 1:1000.	P.C.	02-12-24	JS	
P12	E2	Glucose plant added.	P.C.	17-10-24	FT	
P11	ALL	Mod 25 rail lighting amended.	P.C.	05-04-24	JS	
P10	ALL	Car park moved to Mod 22.Sub 0.2 & 0.3 moved to Mod 29.	P.C.	08-02-24	AT	
P09	ALL	Tree canopy added.	P.C.	29-08-23	TJ	
P08	ALL	Substation west added,weighbridge relo.	P.C.	11-08-23	TJ	

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CHKD DATE
APPD DATE
SCALE 1:750

SHOALHAVEN STARCHES.BOMADERRY. NSW

DWG TITLE
MOD 26.
GRAIN HANDLING/GLUCOSE PLANT SITE PLAN.

PROJECT No. 7549SITE

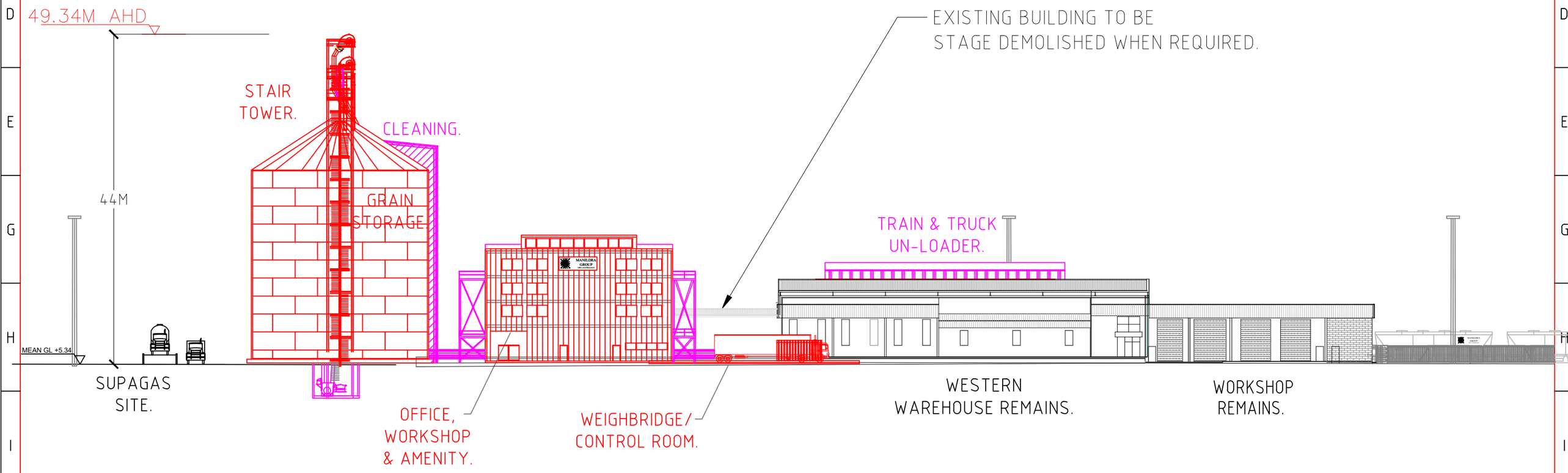
DWG No. MN7549-003

SHT SIZE A3

REV. P14

EXISTING APPROVED PLANT – BLACK.
NEW PROPOSAL – RED.

GRAIN SILO STORAGE.
Model SBHX236821
CAPACITY:9,000 T
Volume: 11577.3 m/3
Diameter: 23.683 m
Eve height: 25.13 m
Overall height: 32 m



GRAIN HANDLING NORTHERN ELEVATION.
VIEWED FROM BOLONG ROAD.

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P12	ALL	Cleaning added.	P.C.	04-03-25	GK	
P11	ALL	2 Silos & 1 substation removed.Office added.	P.C.	13-01-25	JS	
P10	ALL	Silo size changed.	P.C.	02-12-24	JS	
P09	ALL	New rail safety lights mod 25 removed.	P.C.	05-04-23	JS	
P08	ALL	Rail safety lights now mod 25.	P.C.	31-08-23	T.J.	
P07	ALL	Weighbridge relo.	P.C.	14-08-23	T.J.	
P06	ALL	Container storage & western warehouse demo removed.	P.C.	4-08-23	DJ	

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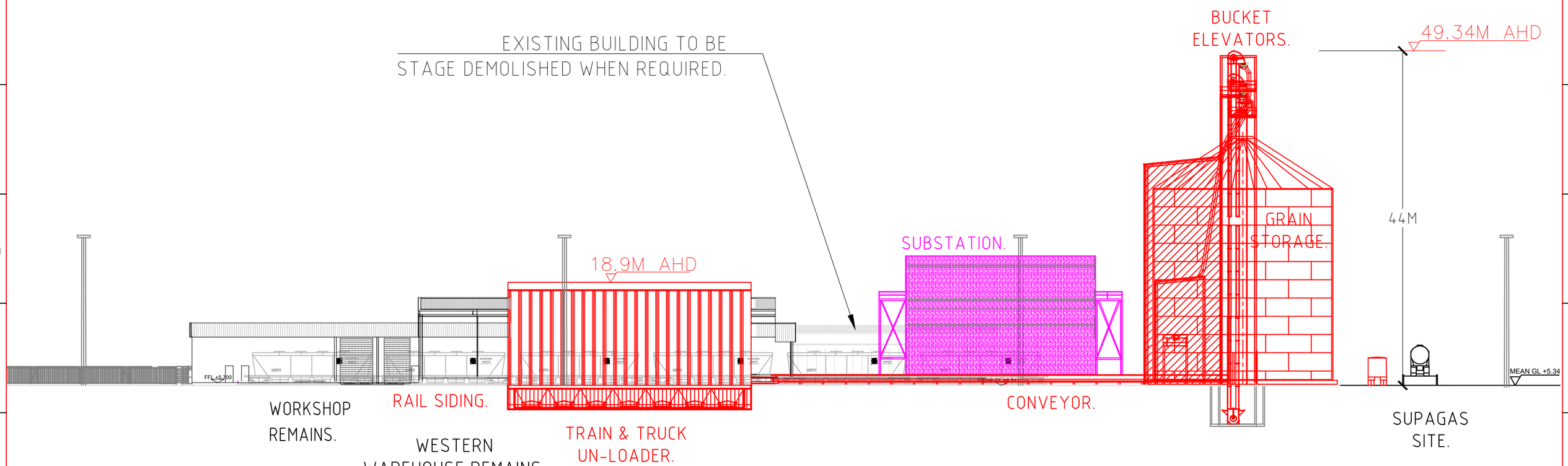
DRAWN P.C.	DATE 11/10/21	JOB TITLE	SHOALHAVEN STARCHES.BOMADERRY. NSW
CHKD T.J.	DATE	DWG TITLE	PROPOSED GRAIN UN-LOADER.MOD 26. GRAIN HANDLING NORTHERN ELEVATION.
APPD	DATE		
	SCALE 1:500	PROJECT No. 7549WAE	DWG No. MN7549-004

SHT SIZE A3
REV. P12

EXISTING APPROVED PLANT – BLACK.
NEW PROPOSAL – RED.

GRAIN SILO STORAGE.
Model SBHX236821
CAPACITY:9,000 T
Volume: 11577.3 m/3
Diameter: 23.683 m
Eve height: 25.13 m
Overall height: 32 m



GRAIN HANDLING SOUTHERN ELEVATION.
VIEWED FROM THE RAIL LINE.

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P12	ALL	Cleaning added.	P.C.	04-03-25	GK	
P11	ALL	2 Silos & 1 substation removed.Office added.	P.C.	13-01-25	JS	
P10	ALL	Silo size changed.	P.C.	02-12-24	JS	
P09	ALL	New rail safety lights mod 25 removed.	P.C.	05-04-23	JS	
P08	ALL	Rail safety lights now mod 25.	P.C.	31-08-23	T.J.	
P07	ALL	Weighbridge removed.	P.C.	15-08-23	T.J.	
P06	ALL	Container storage & western warehouse demo removed.	P.C.	4-08-23	DJ	

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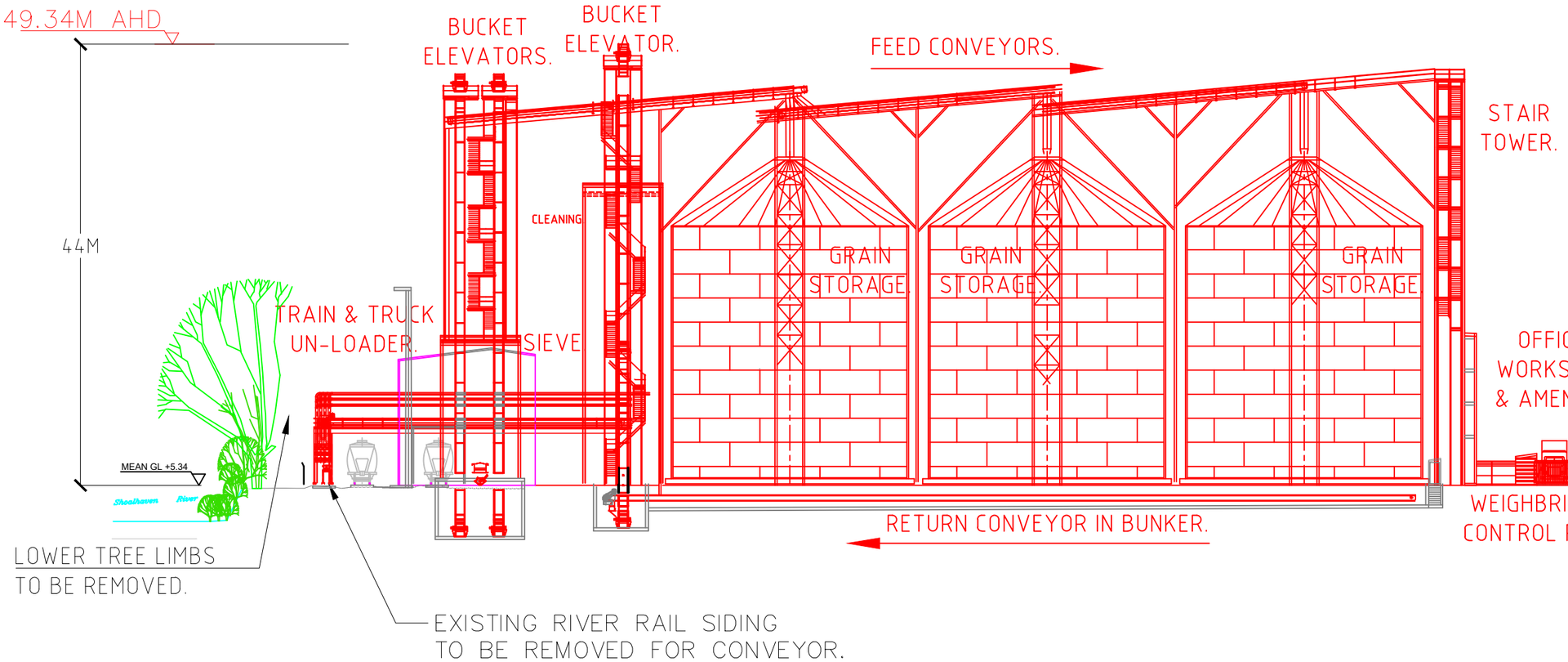
DRAWN P.C.	DATE 11/10/21	JOB TITLE	SHOALHAVEN STARCHES.BOMADERRY. NSW
CHKD T.J.	DATE	DWG TITLE	PROPOSED GRAIN UN-LOADER.MOD 26. GRAIN HANDLING SOUTHERN ELEVATION.
APPD	DATE		
	SCALE 1:500	PROJECT No. 7549WAE	DWG No. MN7549-005

SHT SIZE A3
REV. P12

EXISTING APPROVED PLANT – BLACK.
NEW PROPOSAL – RED.

GRAIN SILO STORAGE.
Model SBHX236821
CAPACITY:9,000 T
Volume: 11577.3 m/3
Diameter: 23.683 m
Eve height: 25.13 m
Overall height: 32 m



GRAIN HANDLING EASTERN ELEVATION.

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P12	ALL	Cleaning added.	P.C.	04-03-25	GK	
P11	ALL	2 Silos & 1 substation removed.Office added.	P.C.	13-01-25	JS	
P10	ALL	Silo size changed.	P.C.	02-12-24	JS	
P09	ALL	New rail safety lights mod 25 removed.	P.C.	05-04-23	JS	
P08	ALL	Rail safety lights now mod 25.	P.C.	31-08-23	T.J.	
P07	ALL	Tree limbs to be removed wording added.	P.C.	29-08-23	T.J.	
P06	ALL	Weighbridge relo.	P.C.	15-08-23	T.J.	

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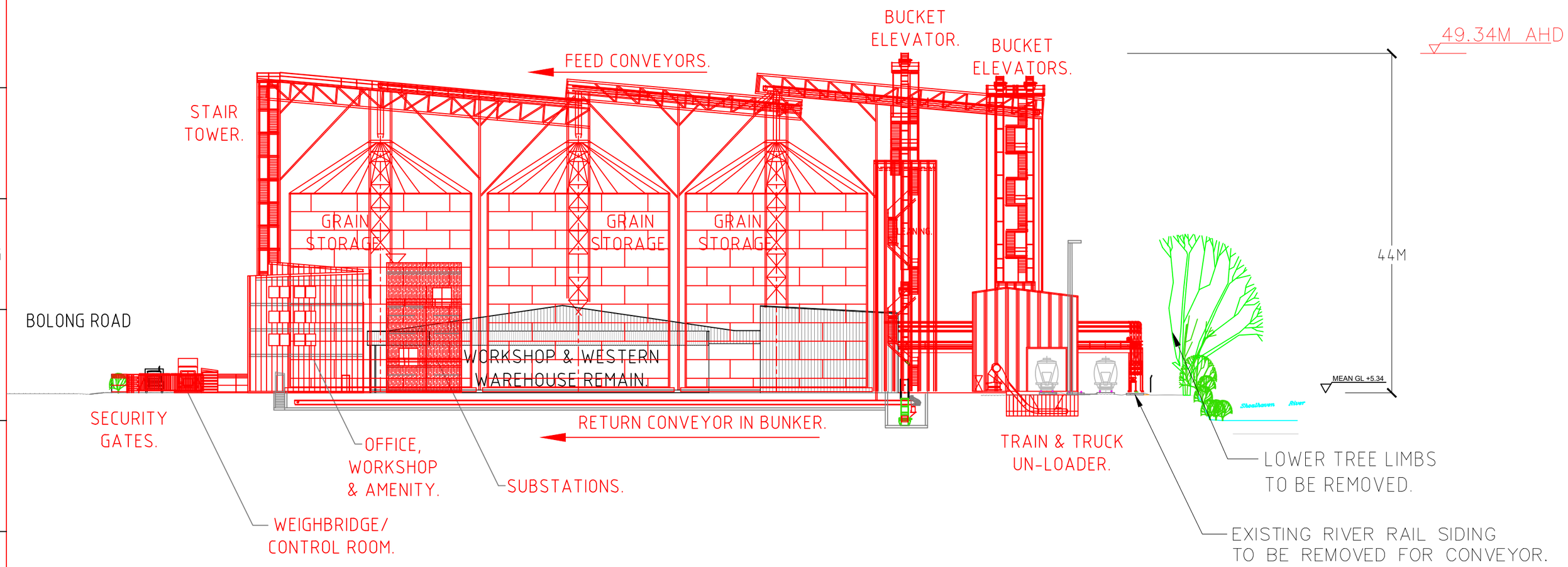
DRAWN P.C.	DATE 11/10/21	JOB TITLE	SHOALHAVEN STARCHES.BOMADERRY. NSW
CHKD T.J.	DATE	DWG TITLE	PROPOSED GRAIN UN-LOADER.MOD 26. GRAIN HANDLING EASTERN ELEVATION.
APPD	DATE		
SCALE 1:500		PROJECT No. 7549WAE	DWG No. MN7549-006

SHT SIZE A3
REV. P12

EXISTING APPROVED PLANT – BLACK.
NEW PROPOSAL – RED.

GRAIN SILO STORAGE.
Model SBHX236821
CAPACITY:9,000 T
Volume: 11577.3 m/3
Diameter: 23.683 m
Eve height: 25.13 m
Overall height: 32 m



GRAIN HANDLING WESTERN ELEVATION.

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P12	ALL	Cleaning added.	P.C.	04-03-25	GK	
P11	ALL	2 Silos & 1 substation removed.Office added.	P.C.	13-01-25	JS	
P10	ALL	Silo size changed.	P.C.	02-12-24	JS	
P09	ALL	New rail safety lights mod 25 removed.	P.C.	05-04-23	JS	

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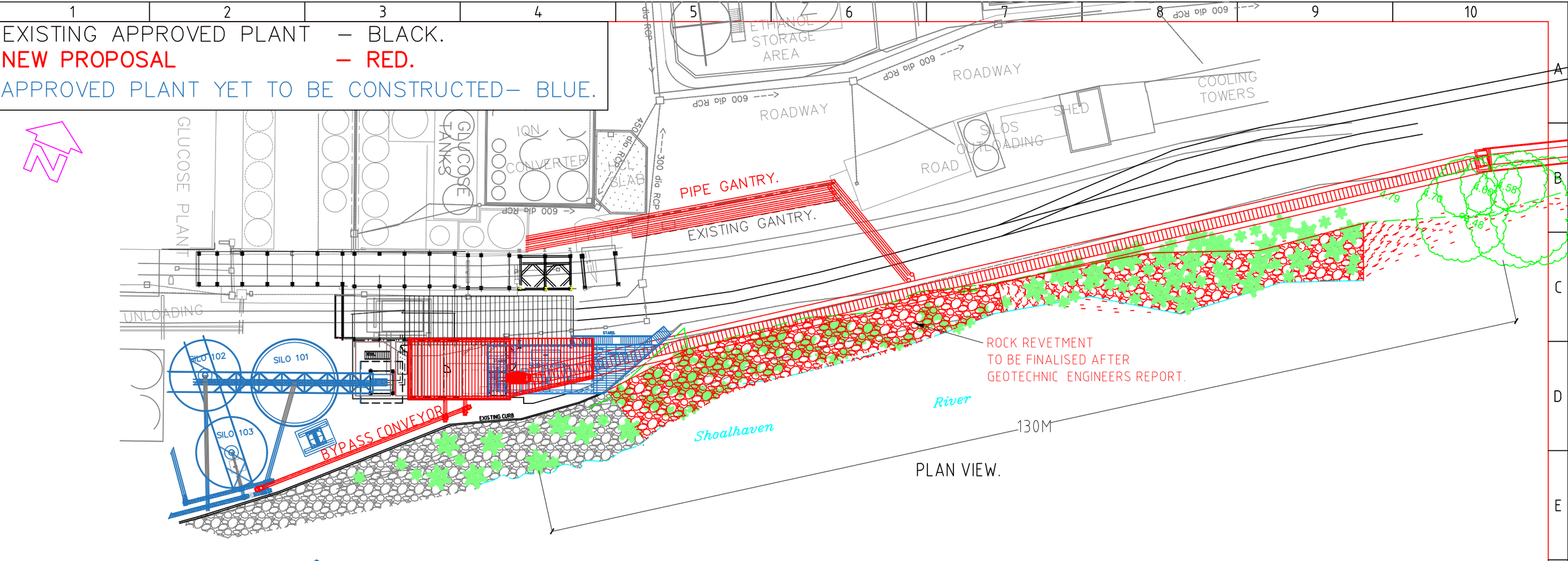
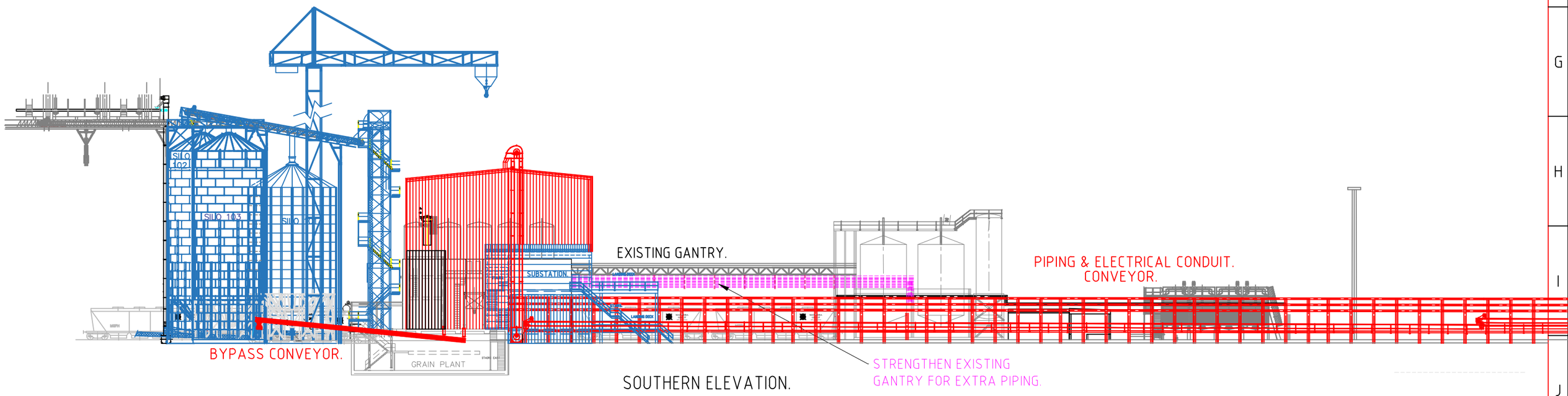
DRAWN	DATE	JOB TITLE
P.C.	11/10/21	SHOALHAVEN STARCHES.BOMADERRY. NSW
CHKD T.J.	DATE	DWG TITLE: PROPOSED GRAIN UN-LOADER.MOD 26. GRAIN HANDLING WESTERN ELEVATION.
APPD	DATE	
SCALE 1:500	PROJECT No. 7549WAE	DWG No. MN7549-007

SHT SIZE A3
REV. P12

EXISTING APPROVED PLANT — BLACK.
NEW PROPOSAL — RED.
APPROVED PLANT YET TO BE CONSTRUCTED— BLUE.





REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P11	ALL	Building extended,bypass conveyor added.	P.C.	01/04/25	GK	
P10	ALL	Route changed back to original.	P.C.	10/03/25	GK	
P09	ALL	New rail safety lights mod 25 removed.	P.C.	05/04/24	B.H.	
P08	ALL	Lighting now Mod 25.Tree limbs to be removed added.	P.C.	31/08/23	B.H.	
P07	ALL	GA drawing now this drawing number.	P.C.	25/06/23	B.H.	

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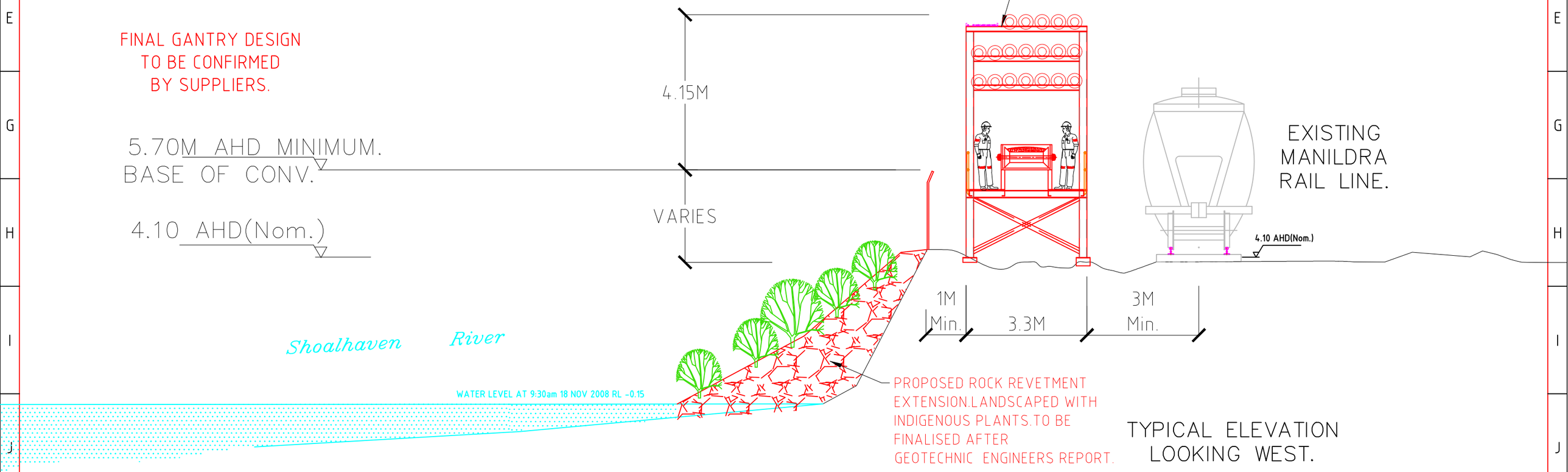
DRAWN P.C.	DATE 11/10/21	JOB TITLE SHOALHAVEN STARCHES.BOMADERRY. NSW	SHT SIZE A3
CHKD T.J.	DATE	DWG TITLE PROPOSED GRAIN UN-LOADER. CONVEYOR TO PLANT GA.	
APPD	DATE		REV. P11
	SCALE 1:500	PROJECT No. 7549D	DWG No. MN7549-008

EXISTING APPROVED PLANT – BLACK.
NEW PROPOSAL – RED.

WESTERN SECTION.



TYPICAL ELEVATION
LOOKING WEST.

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P06	ALL	Conveyor relocated.	P.C.	10/03/25	G.K.	
P05	ALL	New rail safety lights mod 25 removed.	P.C.	05/04/24	JS	
P04	ALL	Lighting now Mod 25.Tree limbs to be removed added.	P.C.	31/08/23		
P03	ALL	Drawing -009 now -015.	P.C.	25-06-23	G.K.	
P01	ALL	New proposal.	P.C.	23-02-23	G.K.	

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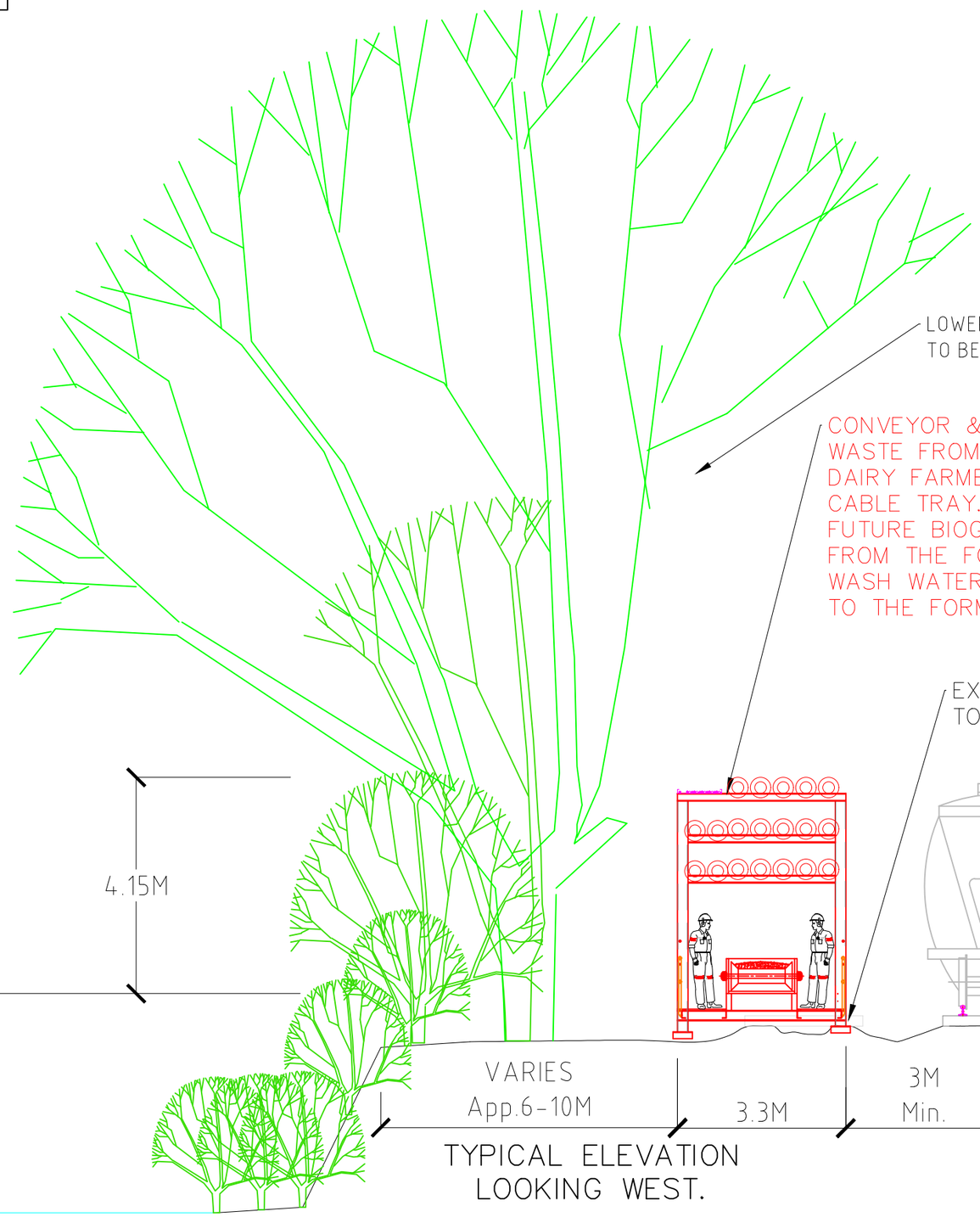
DRAWN P.C.	DATE 11/10/21	JOB TITLE SHOALHAVEN STARCHES.BOMADERRY. NSW	SHT SIZE A3
CHKD T.J.	DATE	DWG TITLE PROPOSED GRAIN UN-LOADER. WESTERN SECTION CONVEYOR & SERVICES GANTRY ELEVATION.	REV. P06
APPD	DATE		
	SCALE 1:100	PROJECT No. 7549D	DWG No. MN7549-009

EXISTING APPROVED PLANT – BLACK.
NEW PROPOSAL – RED.

EASTERN SECTION.



REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P08	ALL	New rail safety lights mod 25 removed.	P.C.	05/04/24	JS	
P07	ALL	Lighting now Mod 25.Tree limbs to be removed added.	P.C.	31/08/23		
P06	ALL	Lighting reinstated,river rail siding now removed,gantry remodeled.	P.C.	25/06/23		
P05	ALL	Proposed train lighting and earth mound removed.	P.C.	08/08/22	B.H.	
P04	I6	Pipe rack shown skinnier & higher.	P.C.	17/05/22	T.J.	
P03	I6	Earth mound shown.	P.C.	14/04/22	T.J.	

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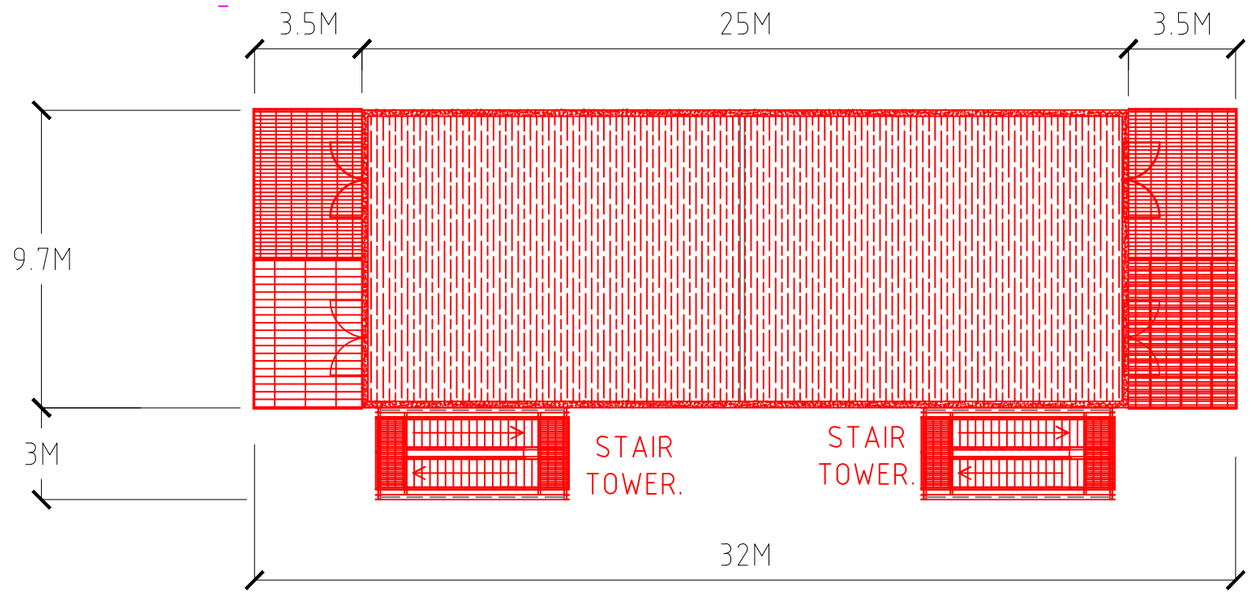
DRAWN P.C.	DATE 11/10/21	JOB TITLE SHOALHAVEN STARCHES.BOMADERRY. NSW	SHT SIZE A3
CHKD T.J.	DATE	DWG TITLE PROPOSED GRAIN UN-LOADER. EASTERN SECTION CONVEYOR & SERVICES GANTRY ELEVATION.	REV. P08
APPD	DATE		
	SCALE 1:100	PROJECT No. 7549D	DWG No. MN7549-010

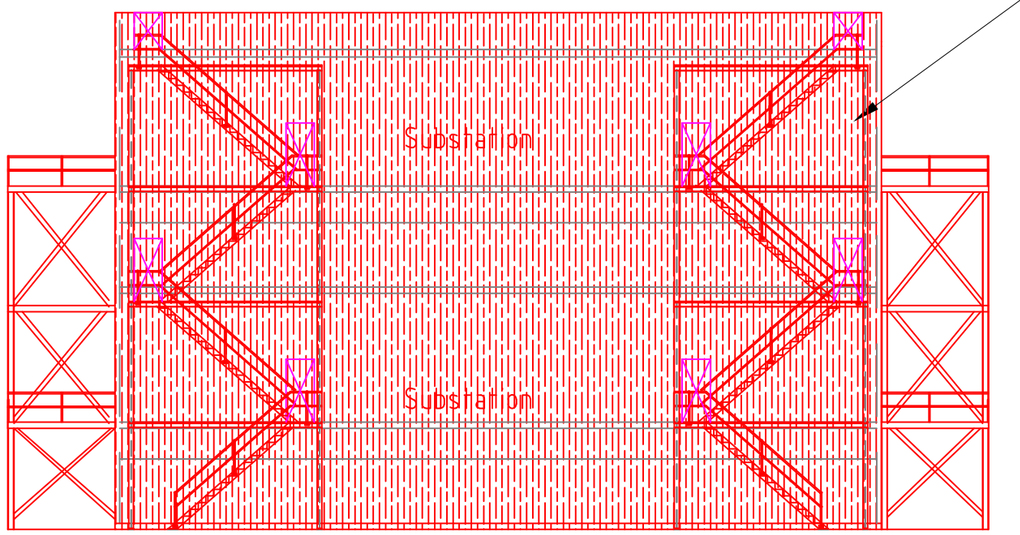
NEW PROPOSAL – RED.



PLAN VIEW.

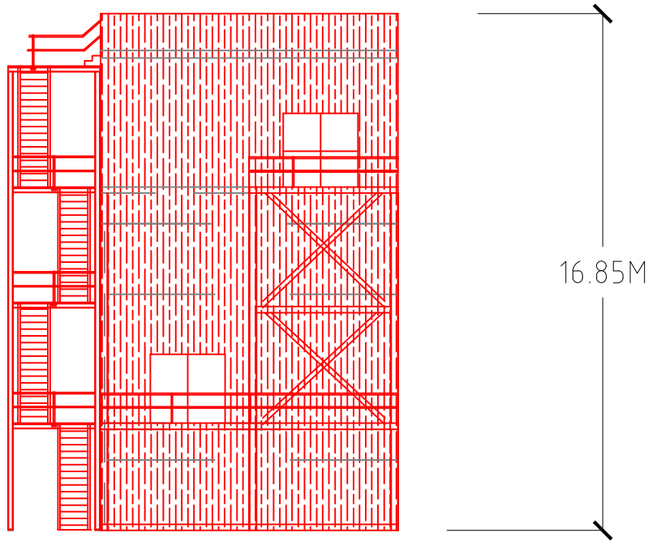
SECOND FLOOR OF SUBSTATION
TO BE CONSTRUCTED AS STAGE 2
WHEN DEMAND REQUIRES CONSTRUCTION.

AC's ON ROOF.



SIDE ELEVATION.

AC's ON ROOF.



END ELEVATION.

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P05	ALL	Workshop & amenity removed.	P.C.	30/01/25	J.C.	
P04	ALL	Wording amended.	P.C.	06/12/24	J.C.	
P03	ALL	Was 7m wide.	P.C.	15/08/23	J.C.	
P02	ALL	New proposal.	P.C.	25/06/23	PW	
P01	ALL	New proposal.	P.C.	1/04/22	T.J.	

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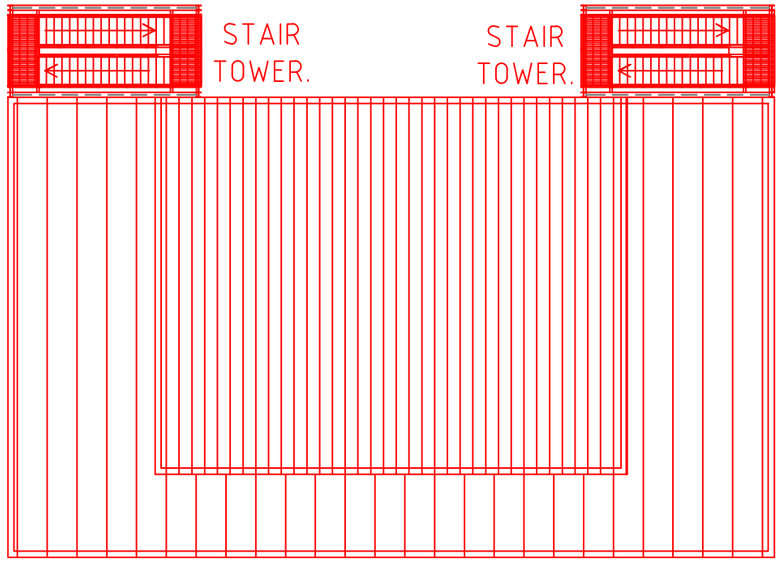
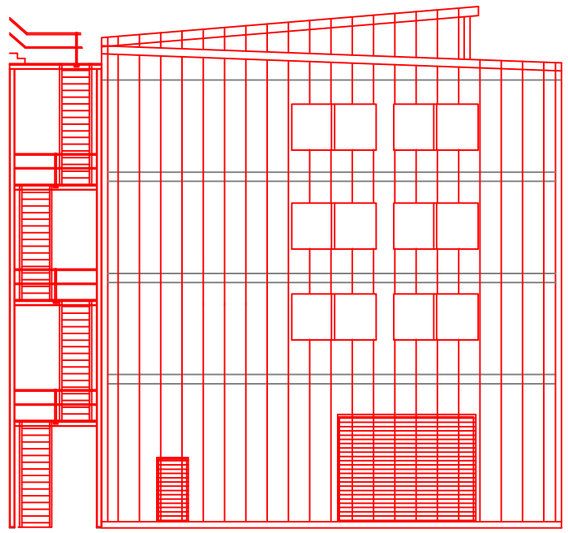
DRAWN P.C.	DATE 25/06/23	JOB TITLE SHOALHAVEN STARCHES.BOMADERRY. NSW	SHT SIZE A3
CHKD T.J.	DATE	DWG TITLE PROPOSED GRAIN UN-LOADER. SUBSTATION.	REV. P05
APPD	DATE		
SCALE 1:200		PROJECT No. 7549WAE	DWG No. MN7549-011

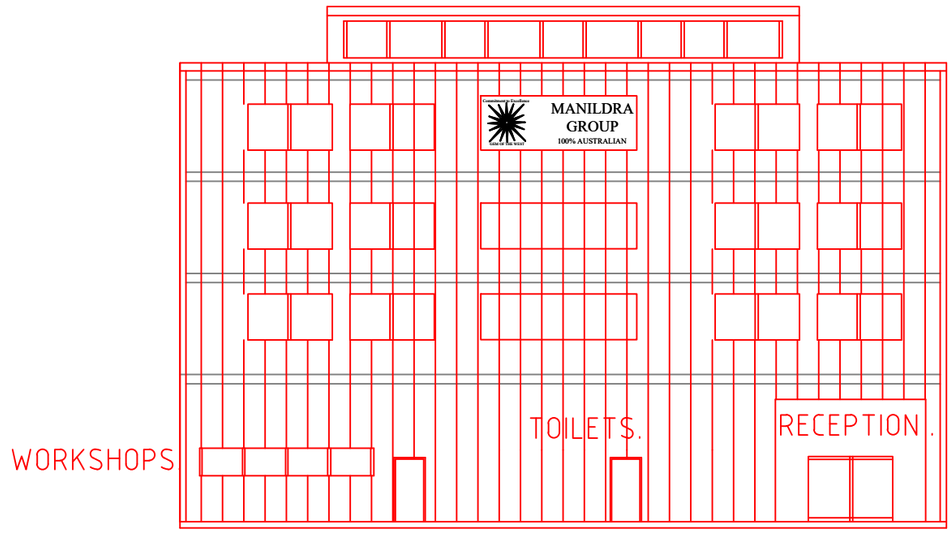
NEW PROPOSAL – RED.



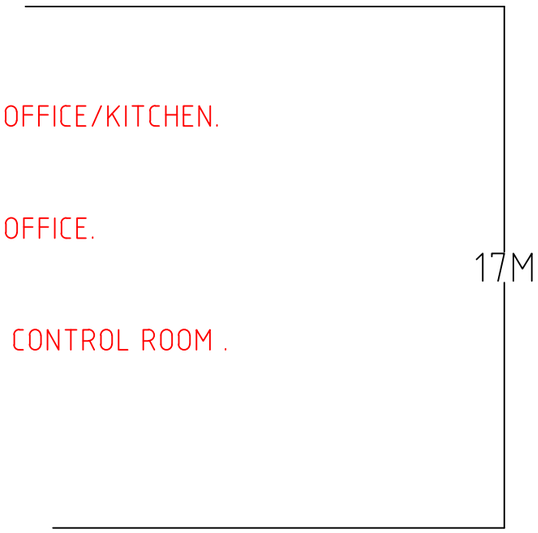




15M



25M



REV	ZONE		DRN	DATE	CHKD	APPD
P04	ALL	Copied and modified to suit from SD6 proposal.	P.C.	30-1-25	TJ	
P03	ALL	Plan reduced.	P.C.	4-9-24	AT	
P01	ALL	Conceptual plan.	P.C.	15-1-24	AT	

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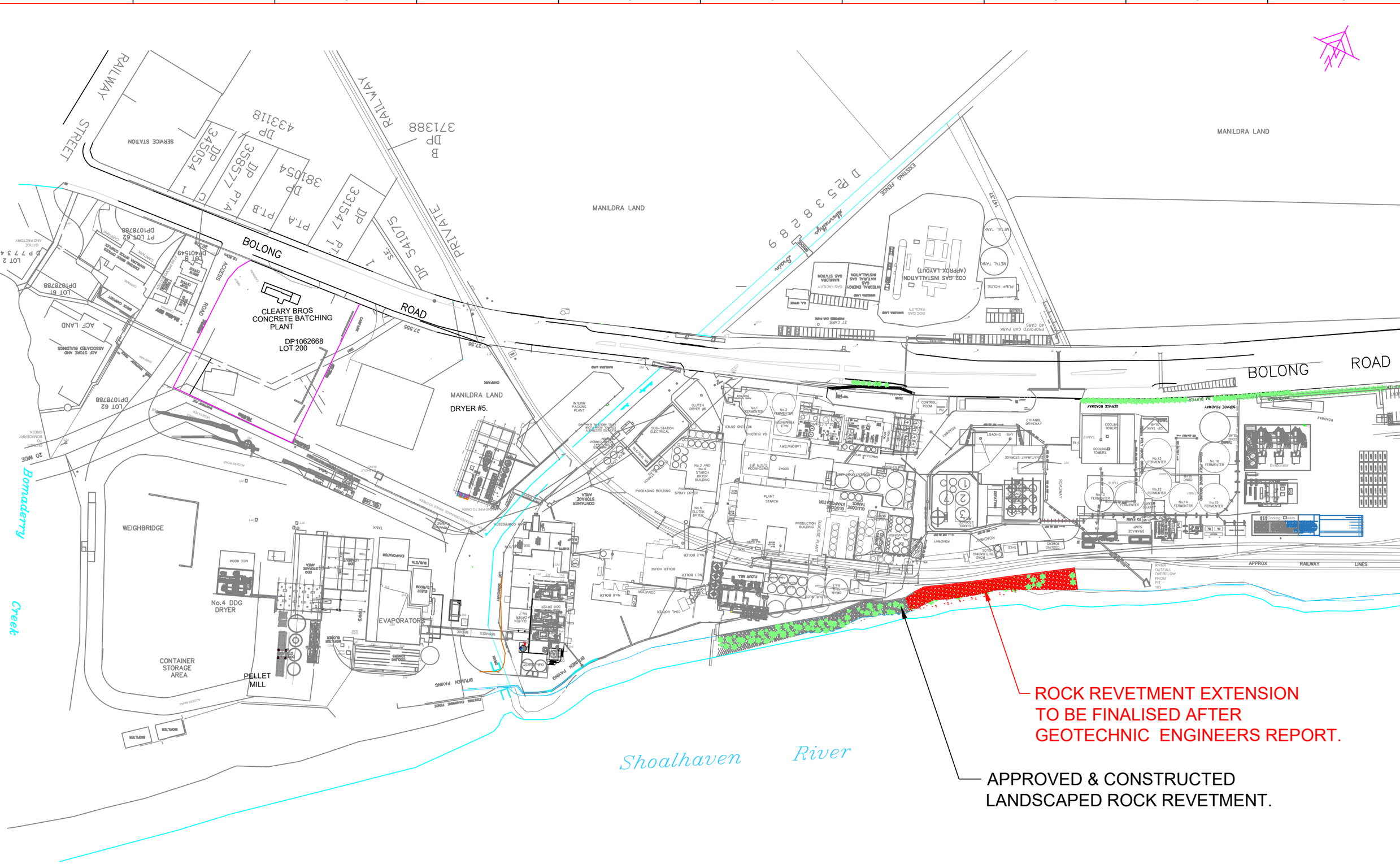
DRAWN P.C.	DATE	JOB TITLE	SHOALHAVEN STARCHES.BOMADERRY. NSW
CHKD T.J.	DATE	DWG TITLE	PROPOSED GRAIN UN-LOADER.
APPD	DATE		CONTROL ROOM/WORKSHOP/OFFICE G.A.
SCALE 1:200		PROJECT No. 7549WAE	DWG No. MN7549-012

SHT SIZE A3

REV. P04



REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P02	ALL	Wall was a 60m extension.	P.C.	14/04/22	B.H.	
P01	ALL	New proposal.	P.C.	01-04-22	B.H.	

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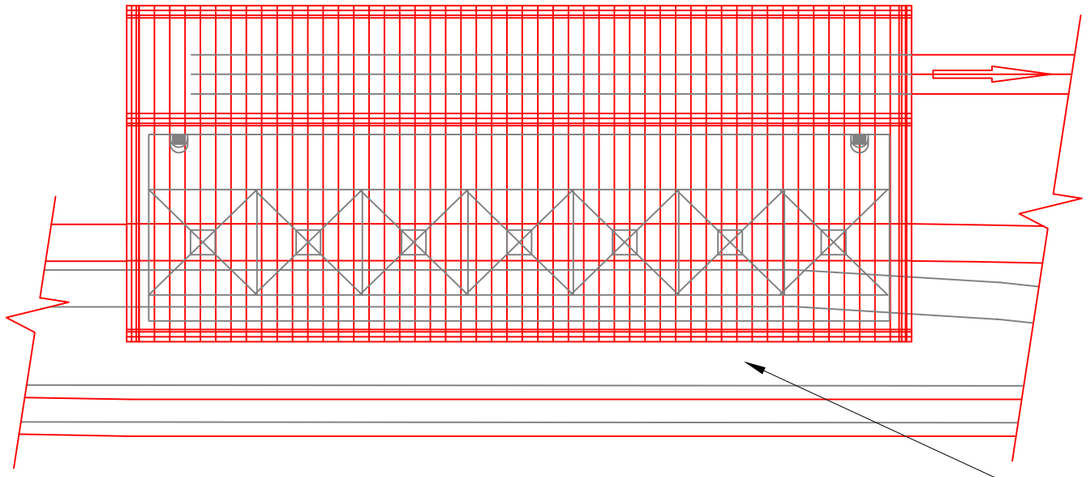
PC Drafting 0439 436508 Est. 2003

DRAWN	DATE	JOB TITLE
P.C.	01/04/22	SHOALHAVEN STARCHES.BOMADERRY. NSW
CHKD B.H.	DATE	DWG TITLE: PROPOSED RIVERBANK STABILISATION. O/A SITE PLAN.
APPD	DATE	
	SCALE 1:2000	PROJECT No. 7549A
		DWG No. MN7549-013

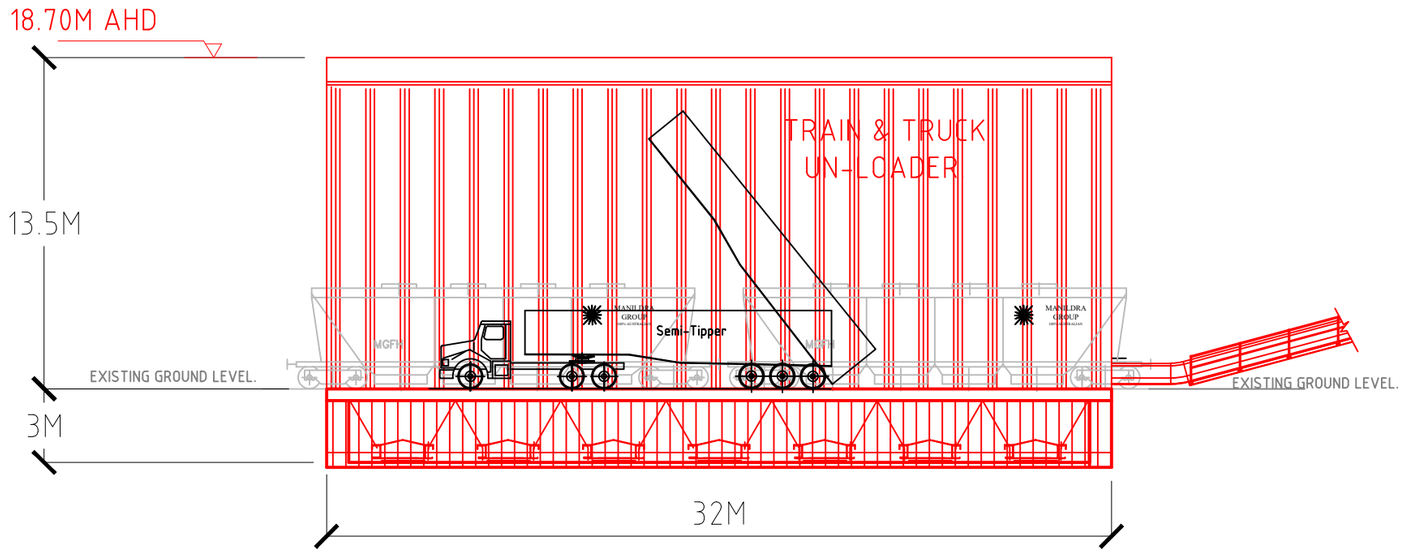
SHT SIZE A3
REV. P02

EXISTING APPROVED PLANT – BLACK.
NEW PROPOSAL – RED.

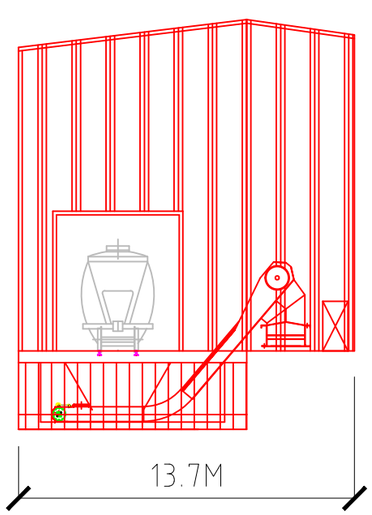


MAINTAIN 3M DISTANCE
FROM STRUCTURE TO
CENTRE OF RAIL.
RELOCATE RAIL
IF REQUIRED.

ROOF PLAN VIEW.



SIDE ELEVATION.



END ELEVATION.

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P01	ALL	New proposal.	P.C.	25/06/23		

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DRAWN P.C.	DATE 25/06/23	JOB TITLE SHOALHAVEN STARCHES.BOMADERRY. NSW	SHT SIZE A3
CHKD	DATE	DWG TITLE PROPOSED GRAIN UN-LOADER. TRUCK AND TRAIN UNLOADER.	REV. P01
APPD	DATE		
	SCALE 1:250	PROJECT No. 7549WAE	DWG No. MN7549-014

EXISTING APPROVED PLANT.

NEW PROPOSAL.

Shoalhaven River

16.5M

22M SETBACK

RAIL

RAIL CONTROL ROOM.

STORM WATER PIT.

9M

COOLING TOWERS

150 CI? RING MAIN 900 DEEP PLUS 2 SPARE ELEC. CONDUITS 1200 DEEP

WALKWAY

DRIVEWAY

REROUTE EXISTING COMPRESSED AIRLINE.

FM

WALKWAY

WALKWAY

FERMENTER

FERMENTER

PLAN VIEW.

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P02	ALL	Proposals pending approval removed.	P.C.	08-08-22	B.H.	
P01	ALL	First issue.	P.C.	2-12-21	B.H.	

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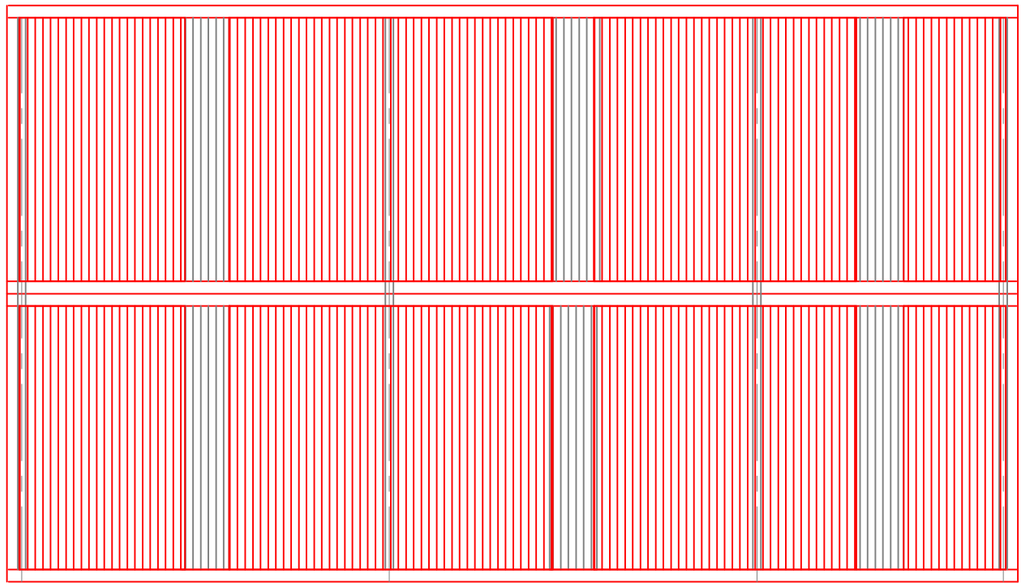
P.C.	02/12/21	SHOALHAVEN STARCHES.BOMADERRY. NSW	A3
CHKD BH	DATE	DWG TITLE ETHANOL MAINTENANCE BUILDING. SITE PLAN.	REV. P02
APPD	DATE		
SCALE 1:200		PROJECT No. 7535	DWG No. MN7549-015

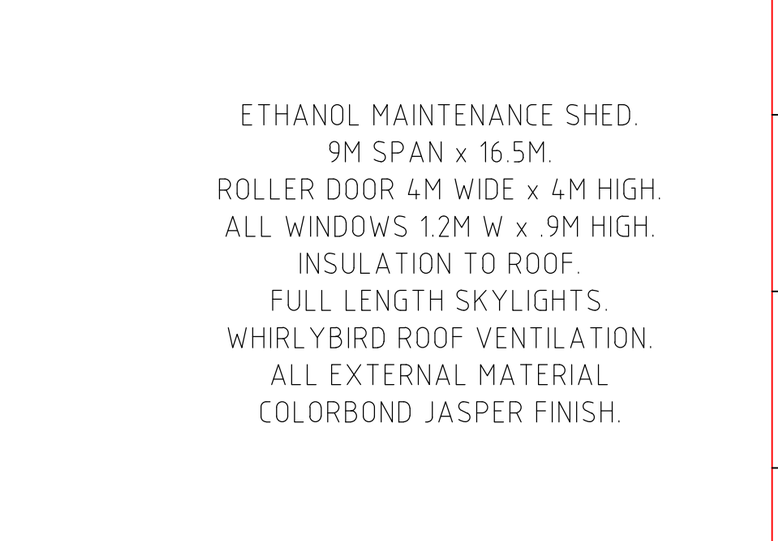
ETHANOL MAINTENANCE SHED.
9M SPAN x 16.5M.
ROLLER DOOR 4M WIDE x 4M HIGH.
ALL WINDOWS 1.2M W x .9M HIGH.
INSULATION TO ROOF.
FULL LENGTH SKYLIGHTS.
WHIRLYBIRD ROOF VENTILATION.
ALL EXTERNAL MATERIAL
COLORBOND JASPER FINISH.



PLAN VIEW.

END ELEVATION.

SIDE ELEVATION.



FRONT ELEVATION.

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P01	ALL	First issue.	P.C.	3-12-21	B.H.	

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P.C.	03/09/21	SHOALHAVEN STARCHES.BOMADERRY. NSW	A3
CHKD BH	DATE	DWG TITLE ETHANOL MAINTENANCE BUILDING. G.A.	REV. P01
APPD	DATE		
SCALE 1:250		PROJECT No. 7535	DWG No. MN7549-016

MOD 26.

MOD 31 CAR PARK.

EXISTING APPROVED PLANT.

TOTAL CAR PARKING SPACES- 428.
Existing- 145.
Mod 26- 283.

283 ADDITIONAL CAR SPACES.
MINIMUM WIDTH OF 90° ANGLE PARKING IS 2.4M x 5.4M LONG.
MINIMUM WIDTH OF ROAD IS 6.2M.
(AS/NZS 2890.1:2004).
AREAS USED FOR CAR PARKS.
LIGHT TOWERS(12).
AHD 16M.

142M
45M
97M
5.5M 7M 5.5M
7M
78M
6M
7M

APPROVED NORTHERN CAR PARK.

METAL TANK
METAL TANK
PUMP HOUSE
CO2 GAS INSTALLATION
BOC GAS FACILITY

GATE 2
APPROVED CAR PARK
NEW ENTRY
NEW EXIT.
WALKWAY
EXISTING ENTRY/ EXIT.
BOLONG
PEDESTRIAN REFUGE ISLAND.
OPENING IN CENTRE FENCE.
ROAD

EXISTING FOOTPATH
EXISTING FOOTPATH
CONTROL ROOM
FM
WATER PIPE
SLAB
WALKWAY
CURB
ROADWAY
LOADING BAY
DRIVEWAY
GATE 5
GATE 3
COOLING TOWERS

REV	ZONE		DRN	DATE	CHKD	APPD
P07	ALL	Mod 31 car park added.	P.C.	12-05-25	JS	
P06	ALL	Car park extended.Pedestrian crossing relo.	P.C.	9-11-22	B.H.	A.T.
P05	ALL	Car park extended.Was drawing No. MN7769-013.	P.C.	4-7-22	B.H.	A.T.
P04	12	Control second stair tower added.	P.C.	21-9-21	B.H.	
P03	12	Control room added.	P.C.	14-9-21	B.H.	
P02	ALL	Car park extended.	P.C.	11-8-21	B.H.	
P01	ALL	Draft.	P.C.	6-7-21	B.H.	

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P.C.	12/11/20	SHOALHAVEN STARCHES.BOMADERRY. NSW
CHKD B.H.	DATE	DWG TITLE: NORTHERN CAR PARK.MOD 26. EXTENSION AND PEDESTRIAN ACCESS.
APPD	DATE	
	SCALE 1:750	PROJECT No. 7549-017
		DWG No. MN7549-017

A3

REV. P07

BOLONG ROAD

To Shoalhaven Heads

LANDSCAPING SCREEN

P.A. GATE.

SECURITY GATE.

TRUCK ROUTE.

SECURITY GATE.

TRUCK ROUTE.

EXISTING CAR PARK.

WALKWAY.

P.A. GATE.

SECURITY GATE.

WESTERN WAREHOUSE

WORKSHOP REMAINS.

EASTERN WAREHOUSE STAGE DEMOLISHED WHEN REQUIRED.

SUPAGA

APPROX RAILWAY LINES

RAILWAY LINES

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P04	ALL	changed.	P.C.	08-03-25	GK	
P02	ALL	Silo size changed.	P.C.	03-12-24	T.J.	
P01	ALL	Truck route was clockwise.	P.C.	01-09-23	T.J.	

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CHKD | DATE

APPD

SCALE 1:1250

SHOALHAVEN STARCHES.BOMADERRY. NSW

DWG TITLE

PROPOSED GRAIN UN-LOADER.MOD 26.

TRAFFIC MOVEMENTS.SITE PLAN.

A3

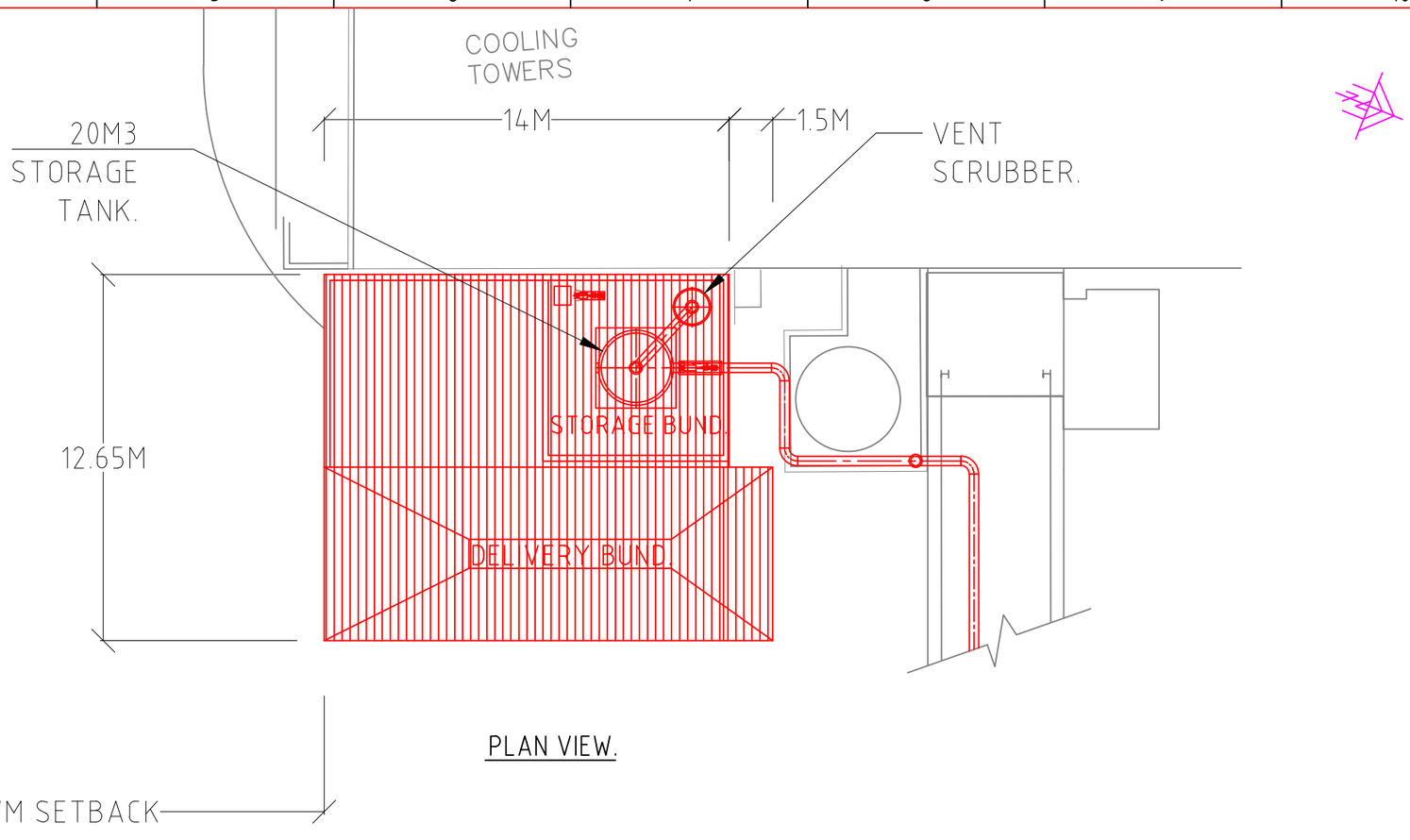
REV. P04

PROJECT No. 7549-017

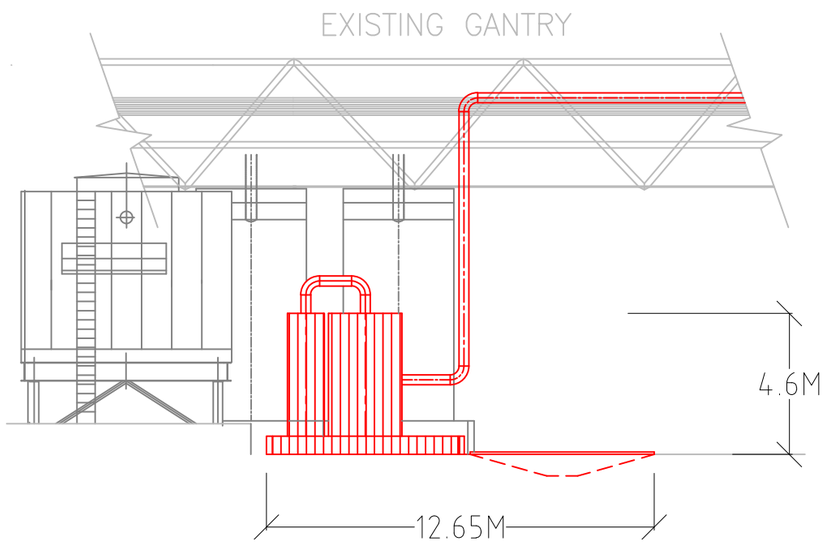
DWG No. MN7549-018

EXISTING
APPROVED PLANT.

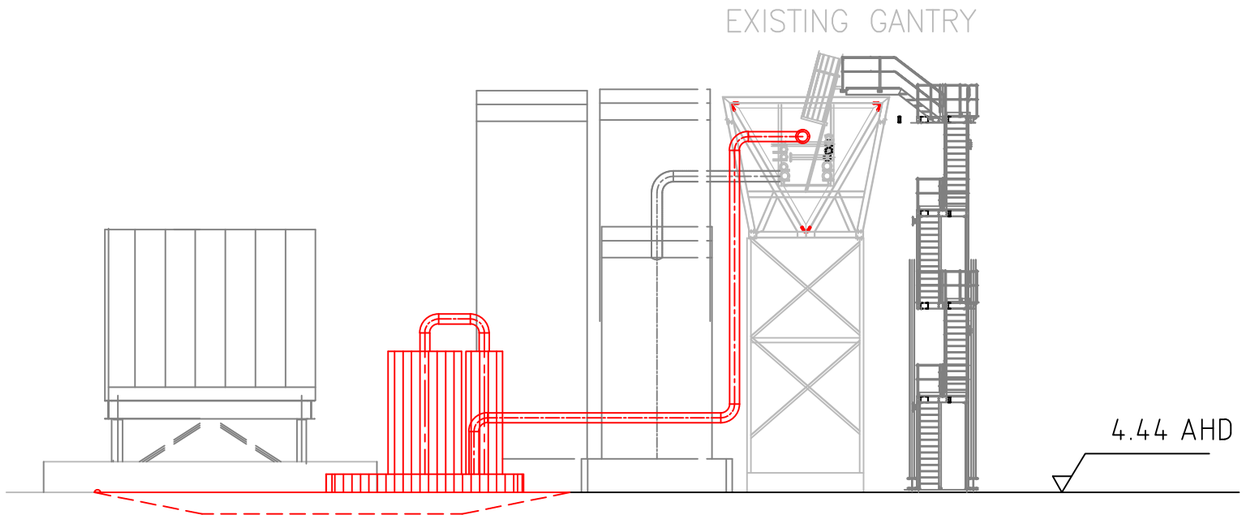
MOD 26.



PLAN VIEW.



ELEVATION LOOKING NORTH.



ELEVATION LOOKING WEST.

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P06	ALL	Bund reshaped.	P.C.	24-11-22	J.S.	
P05	ALL	Was MN-7532-015.	P.C.	16-11-22	B.H.	
P04	ALL	Was MN-7462-025.	P.C.	25-07-22	B.H.	
P03	ALL	Was product feed tanks.	P.C.	17-01-22	B.H.	
P02	ALL	Was MN7079-009.	P.C.	10-11-21	B.H.	
P01	ALL	First issue.	P.C.	20-08-21	B.H.	

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PC Drafting
0439 436508

DRAWN P.C.	DATE 20/08/21	JOB TITLE	SHT SIZE A3
CHKD BH	DATE	DWG TITLE MOD 26.NEW PROPOSALS. NITRIC ACID STORAGE & BUND.	
APPD	DATE		REV. P06
	SCALE 1:200	PROJECT No. 7079WAE	DWG No. MN7549-019

SHOALHAVEN STARCHES.BOMADERRY. NSW

EXISTING APPROVED PLANT —BLACK.
MOD 25 PENDING APPROVAL —ORANGE.
MOD 26 RAIL MAINTENANCE BUILDING—RED.

RAIL MAINTENANCE BUILDINGS.—021.

BOLONG ROAD

PROPOSED CONCRETE PLANT BY OTHERS.

ACCESS ROAD.

ACCESS ROAD

FENCE.

A
DP 384559

1
DP 544730

1
DP 531429

1
DP 730968

MANILDRA OLD PAPER MILL SITE.

LOT BOUNDARY.

EXISTING SHED

EXISTING SHED

EXISTING SHEDS

EXISTING PIT

EXISTING SEWER MANHOLES

EXISTING SHED

EXISTING ABOVE GROUND TANK

EXISTING PITS

Wire Mesh Fence

Stone

RAIL FUEL & PROVISIONS.

Shoalhaven River

REV	ZONE		DRN	DATE	CHKD	APPD
P19	B9	Rail maintenance wagon building extended & relo.	P.C.	19-03-25	M.O.	
P18	C9	Fuel & provisions,2nd building added.	P.C.	11-03-25	M.O.	
P16	E8	Seaweed removed.	P.C.	24-02-23	JS	
P15	B9	Rail maintenance building & seaweed added.	P.C.	13-02-23	M.O.	
P14	ALL	Track reworked.	P.C.	9-05-22	B.H.	

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P.C.	12/5/21	SHOALHAVEN STARCHES.BOMADERRY. NSW	A3
CHKD B.H.	DATE	DWG TITLE PAPER MILL RAIL MAINTENANCE BUILDING.MOD 26. SITE PLAN.	REV. P19
APPD	DATE		
	SCALE 1:2500	PROJECT No. 7464	DWG No. MN7549—020

EXISTING APPROVED PLANT —BLACK.
MOD 25 PENDING APPROVAL —ORANGE.
MOD 26 RAIL MAINTENANCE BUILDINGS—RED.

BOLONG ROAD

RAIL LOCO MAINTENANCE BUILDING.

LOT BOUNDARY.

24M SETBACK

10.465M

9.M

21M SETBACK

25M

30M SETBACK

30.507M

33.5M SETBACK

40.507M

12M x 3M AMENITY BUILDING & CAR PARKING.

CLEARY BROS. CONCRETE PLANT.

ACCESS ROAD.

RAIL WAGON MAINTENANCE BUILDING.

LOT BOUNDARY.

GATES.

ACCESS ROAD.

MESH FENCE

MESH FENCE

3.0

REV	ZONE		DRN	DATE	CHKD	APPD
P07	D8	Rail maintenance wagon building extended & relo.	P.C.	19–03–25	M.O.	
P06	ALL	Wagon maintenance building added,fuel removed.	P.C.	23–02–23	M.O.	
P05	G7	Fuel & provisions added.	P.C.	03–12–24	JS	
P04	ALL	Maintenance building added.	P.C.	23–02–23	B.H.	
P03	ALL	Seaweed removed.	P.C.	23–02–23	B.H.	
P02	ALL	Maintenance moved 25m south.	P.C.	17–02–23	B.H.	M.O.
P01	ALL	First drawn.	P.C.	14–02–23	B.H.	M.O.

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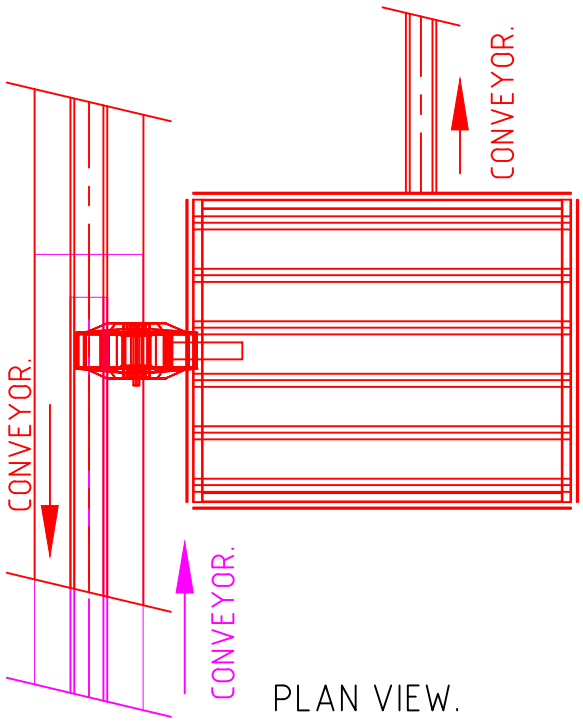
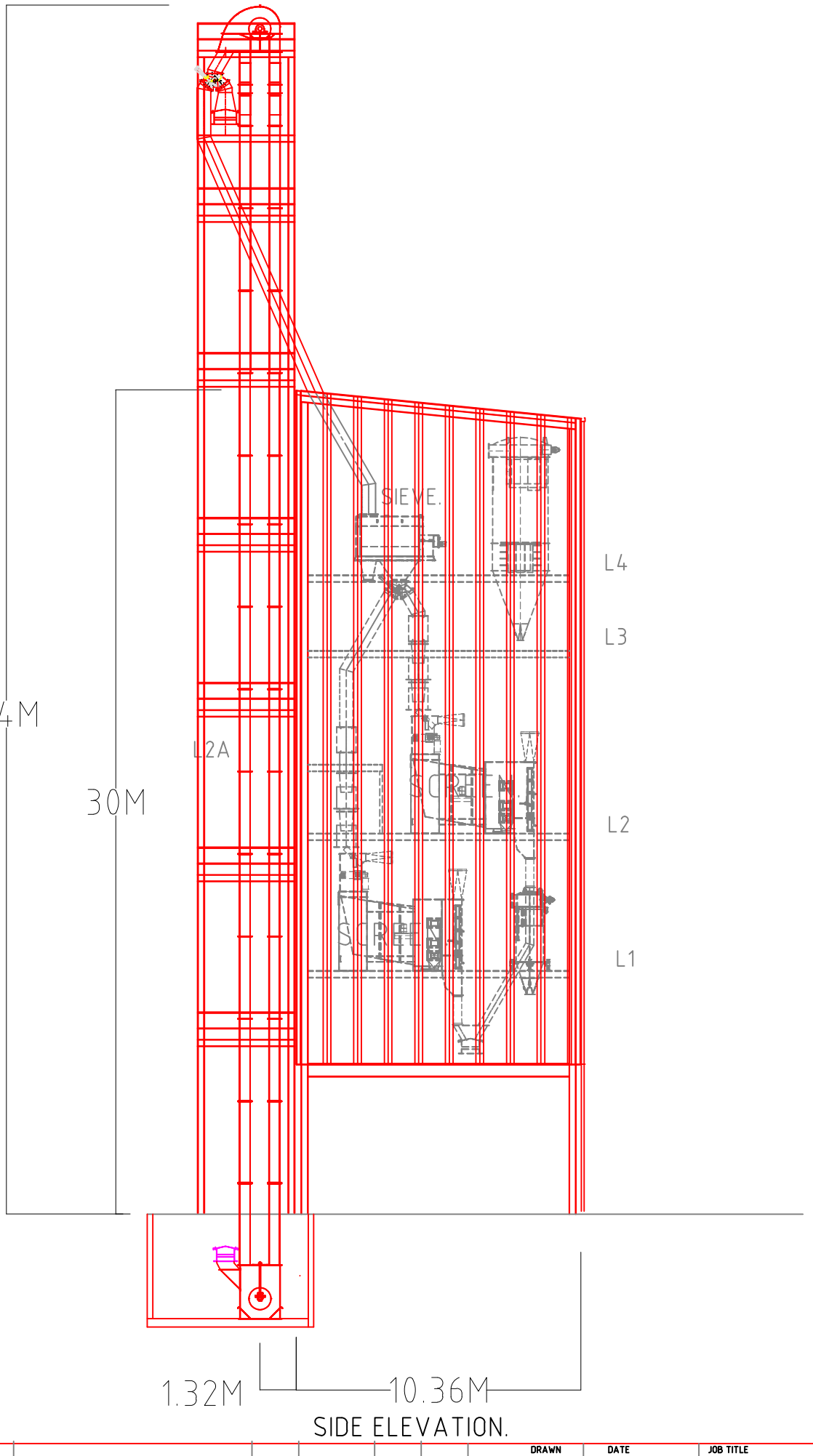
P.C.	12/5/21	SHOALHAVEN STARCHES.BOMADERRY. NSW
CHKD B.H.	DATE	DWG TITLE: PAPER MILL RAIL MAINTENANCE BUILDING.MOD 26. LAYOUT.
APPD	DATE	
SCALE 1:750	PROJECT No. 7464	DWG No. MN7549–021

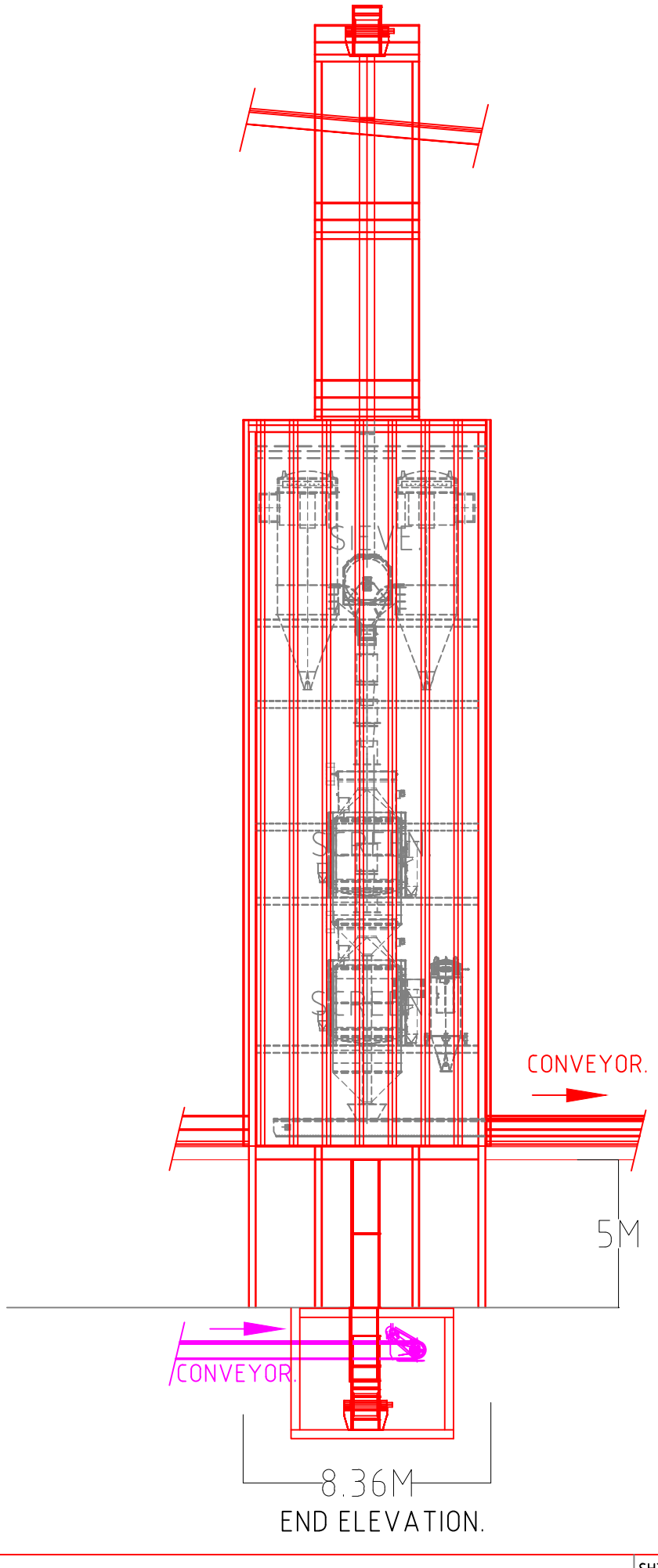
A3
REV. P07



PLAN VIEW.



SIDE ELEVATION.



END ELEVATION.

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P01	ALL	For review.	P.C.	08/03/25	G.K.	

DRAWN: P.C. DATE: 08/03/25
CHKD DATE
APPD DATE
SCALE 1:200

JOB TITLE: SHOALHAVEN STARCHES.BOMADERRY. NSW

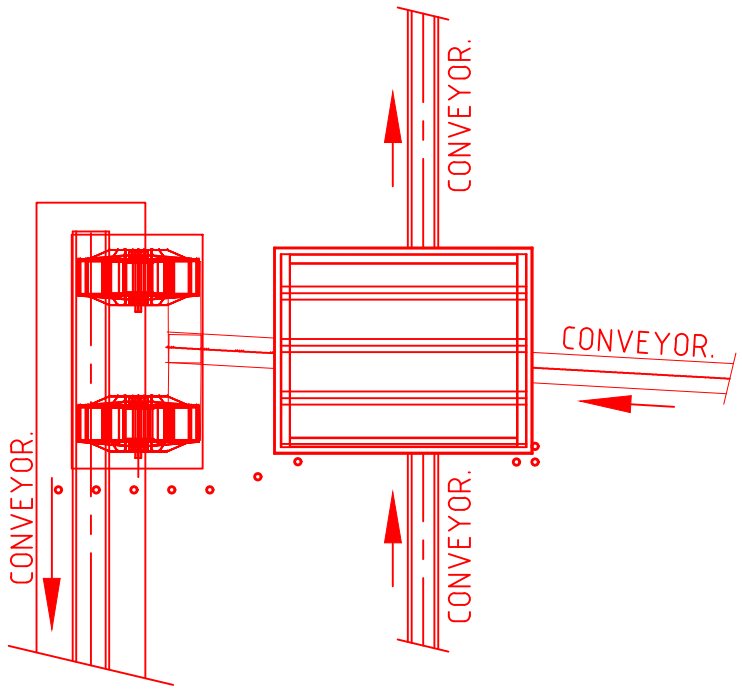
DWG TITLE: PROPOSED GRAIN UN-LOADER.
FIRST STAGE SILO GRAIN SCREENING BUILDING.

PROJECT No. 7549WAE

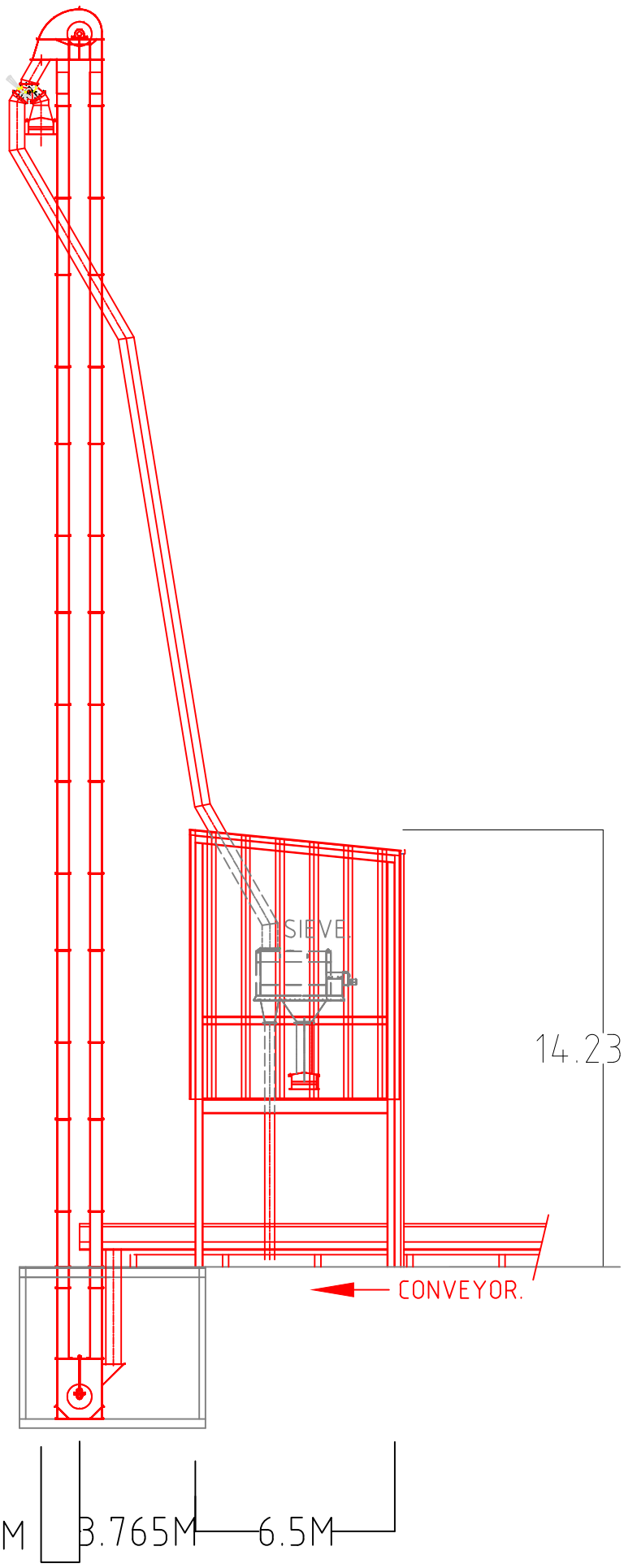
DWG No. MN7549-022

SHT SIZE A3

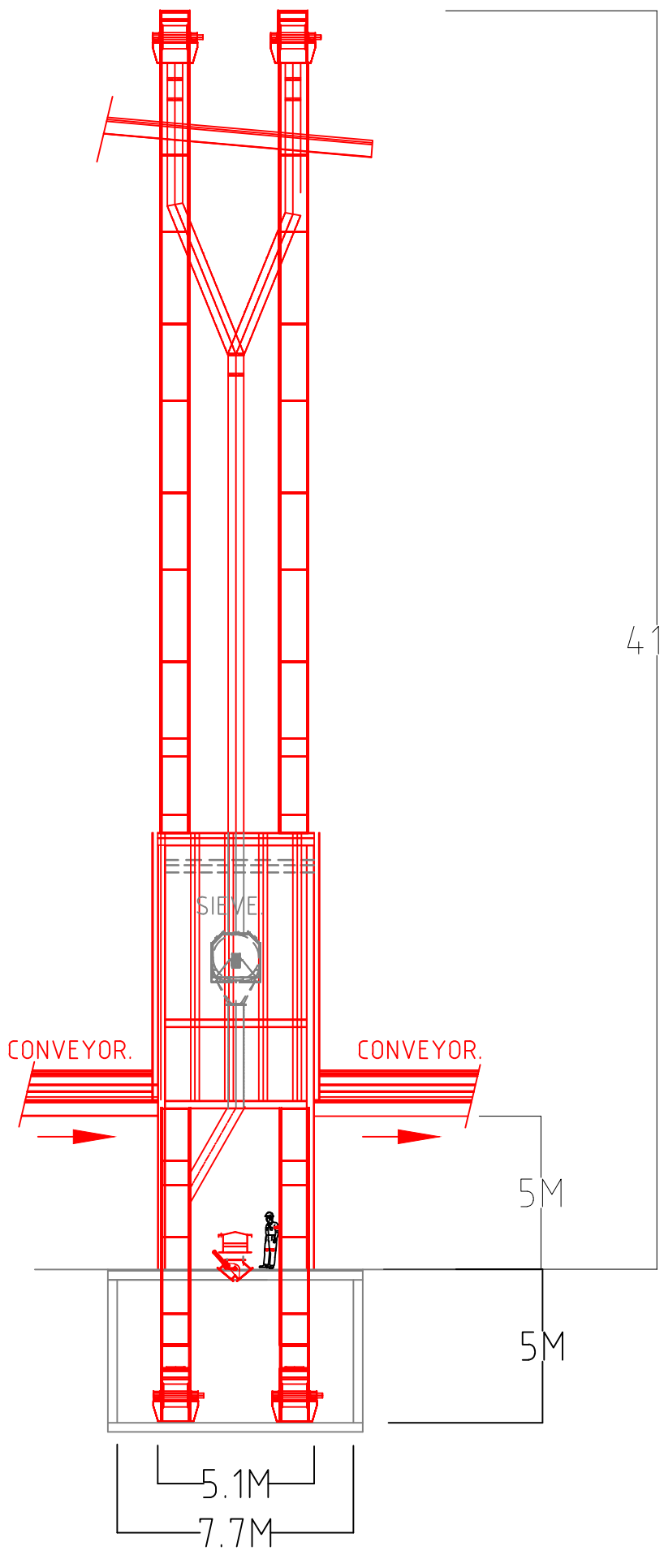
REV. P01



PLAN VIEW.



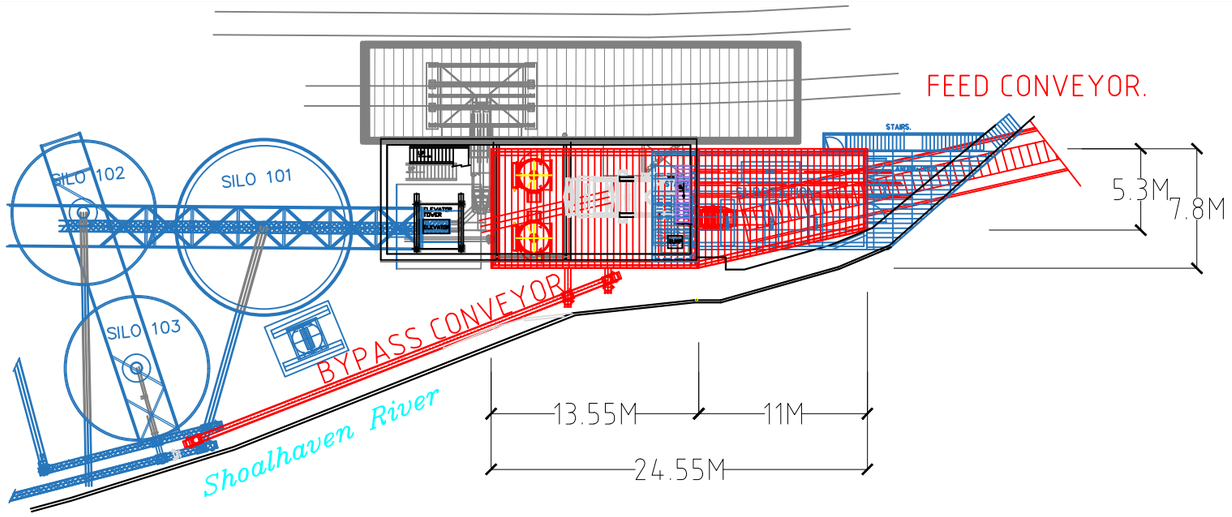
SIDE ELEVATION.



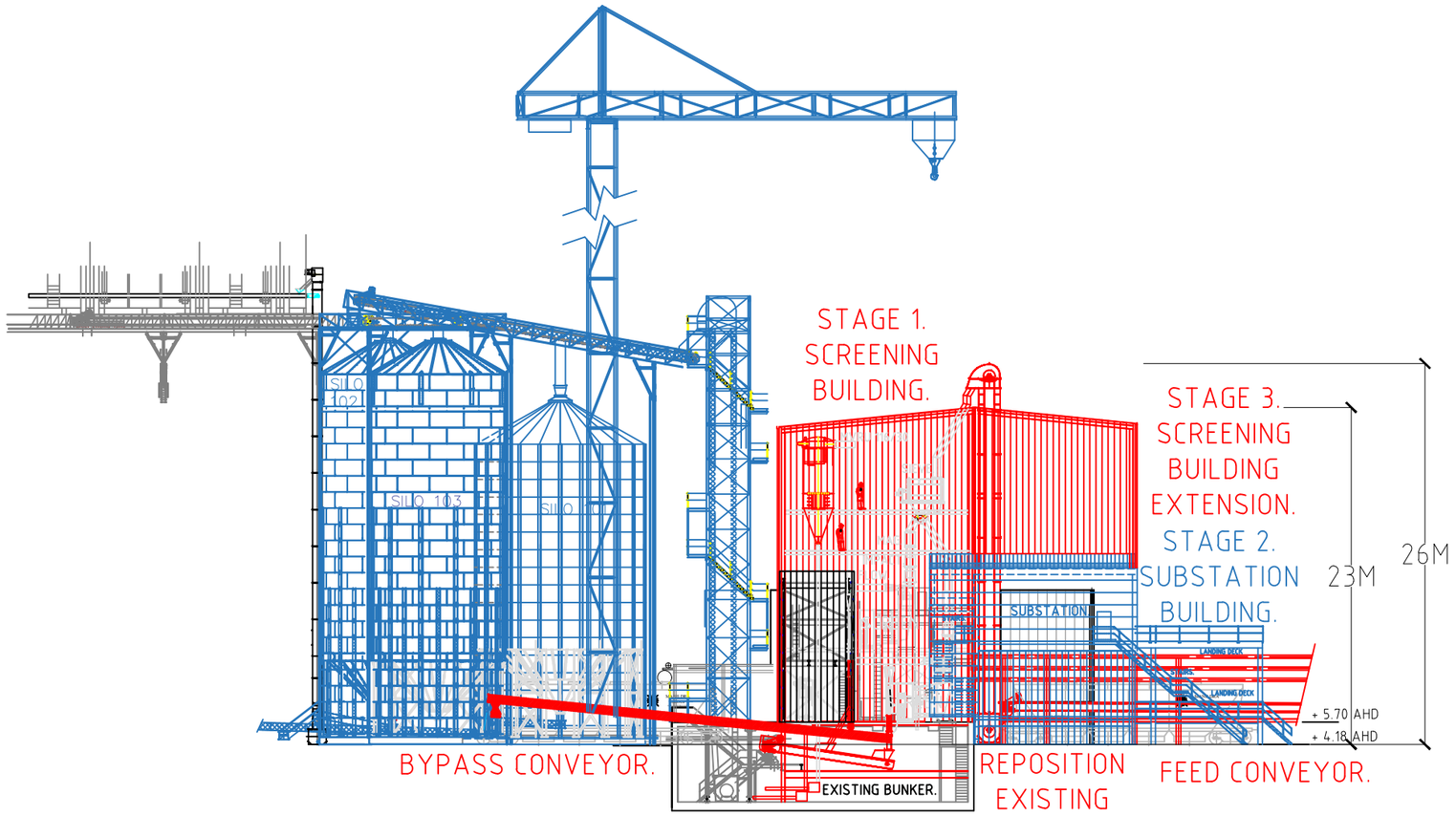
END ELEVATION.

P01	ALL	For review.	P.C.	08/03/25	G.K.		DRAWN P.C.	DATE 08/03/25	JOB TITLE SHOALHAVEN STARCHES.BOMADERRY. NSW	SHT SIZE A3
REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD	CHKD	DATE	DWG TITLE PROPOSED GRAIN UN-LOADER. SILO GRAIN SIEVE BUILDING.	REV. P01
							APPD	DATE		
								SCALE 1:200	PROJECT No. 7549WAE	DWG No. MN7549-023

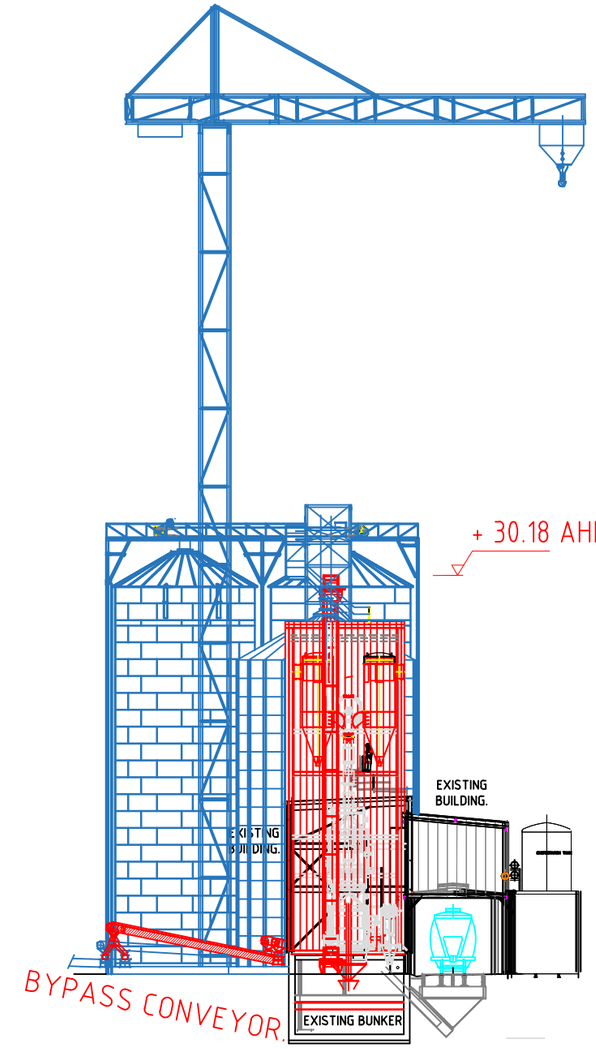
EXISTING APPROVED PLANT - BLACK.
NEW PROPOSAL - RED.
APPROVED PLANT YET TO BE CONSTRUCTED - BLUE.



PLAN VIEW.



SOUTHERN ELEVATION



EASTERN ELEVATION

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P02	ALL	Stage 3 and bypass conveyor added.	P.C.	28/03/25	GK	
P01	ALL	PROPOSAL.	P.C.	10/03/25	GK	

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DRAWN P.C.	DATE	JOB TITLE	SHOALHAVEN STARCHES.BOMADERRY. NSW
CHKD	DATE	DWG TITLE	PROPOSED GRAIN UN-LOADER. SECONDARY SCREENING BUILDING.
APPD	DATE		
SCALE 1:400		PROJECT No. 7549-022	DWG No. MN7549-024

SHT SIZE A3
REV. P02

EXISTING STRUCTURES.
MOD 26.

14 SILOS.2.2M x 5M.
5 SILOS.5M x 5M.
TO BE CONSTRUCTED IN STAGES
TO MATCH PRODUCT DEMAND.

TAPIOCA

COOLING
DDG

STAIR
TOWER.

5M
SETBACK

2.3M
SETBACK

FLAT WAGON
WHARF

HYSTER
32.00

DOORWAY

PACKAGING BUILDING

PIPE
BRIDGE.

PIPE
BRIDGE.

10.8M

17M

1.4M
SETBACK

4.5M
SETBACK

29.4M

Drain

Abernethys

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P03	ALL	Silos layout amended.	P.C.	28-4-25	CJ	
P02	ALL	Silos layout amended.	P.C.	22-4-25	CJ	
P01	ALL	First issue.	P.C.	14/3/25	AT	

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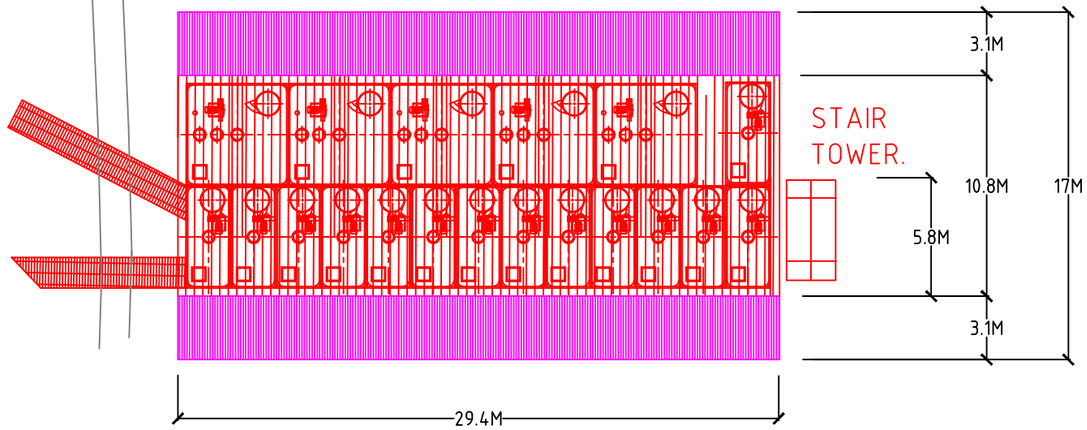
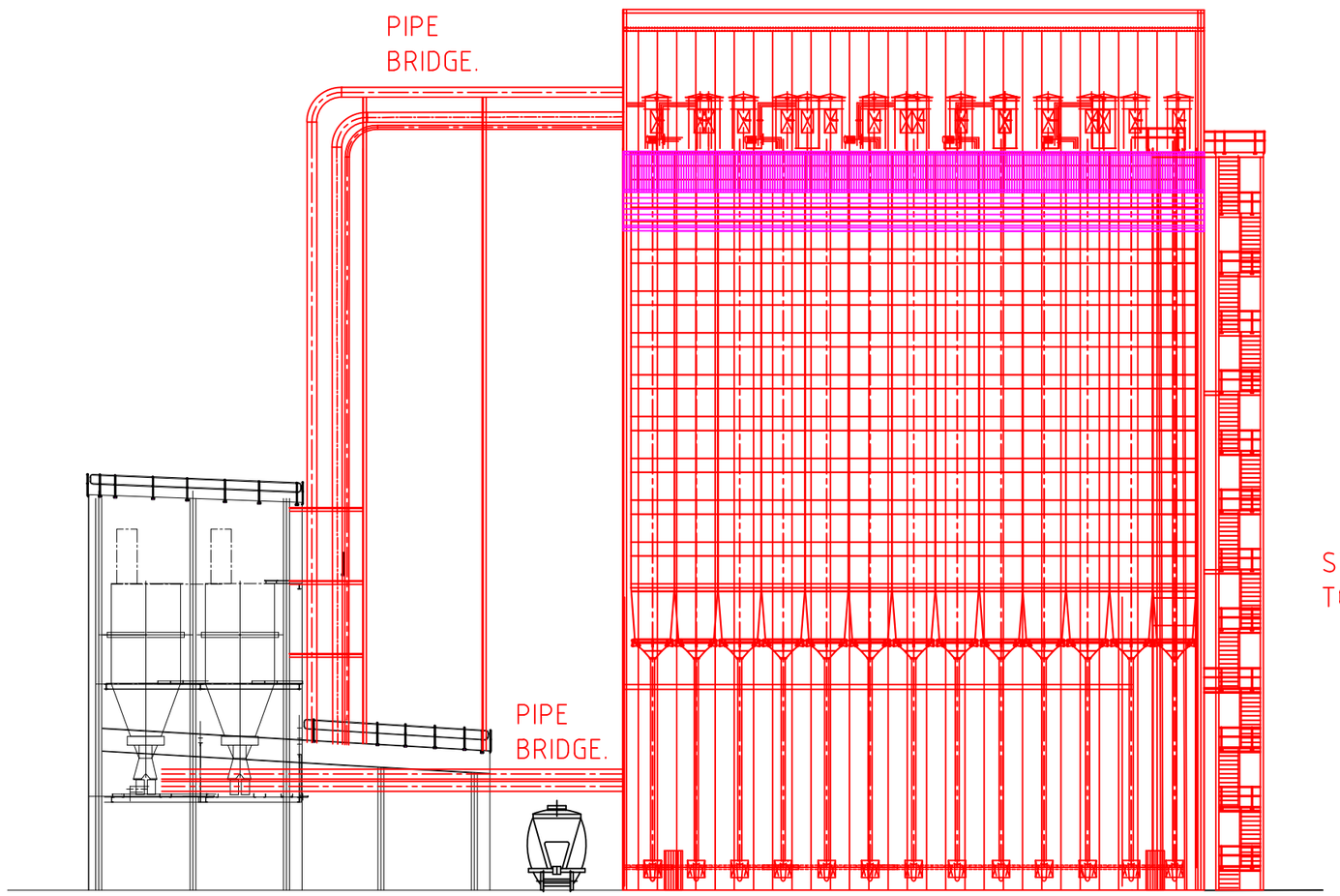
P.C.		SHOALHAVEN STARCHES.	SHT SIZE A3
CHKD M.P.	DATE 14/3/25	DWG TITLE MOD 26. PRODUCT SILOS SITE PLAN.	
APPD	DATE		REV. P03
SCALE 1:200		PROJECT No. 7462-011	DWG No. MN7549-025

EXISTING STRUCTURES.
MOD 26.

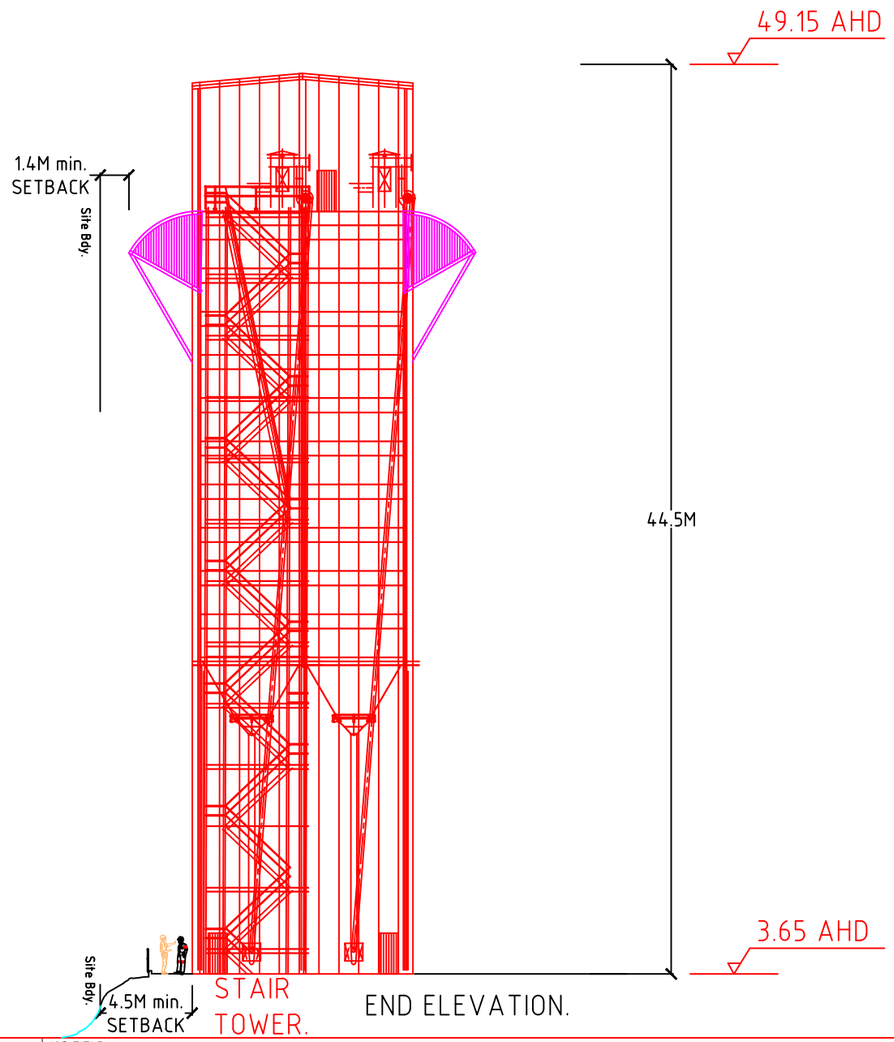


PLAN VIEW.

14 SILOS.2.2M x 5M.
5 SILOS.5M x 5M.
TO BE CONSTRUCTED IN STAGES
TO MATCH PRODUCT DEMAND.



SIDE ELEVATION.



END ELEVATION.

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P06	ALL	Silos layout amended.	P.C.	28-4-25	CJ	
P05	ALL	Silos layout amended.	P.C.	22-4-25	CJ	
P04	ALL	Height increased for 22m silos.	P.C.	17-3-25	DJ	
P03	ALL	Now 16 silos.	P.C.	14-3-25		
P01	ALL	New proposal.	P.C.			

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DRAWN P.C.	DATE 14/03/25	JOB TITLE SHOALHAVEN STARCHES.BOMADERRY. NSW	SHT SIZE A3
CHKD	DATE	DWG TITLE MOD 26. PRODUCT SILOS GA.	
APPD	DATE		REV. P06
	SCALE 1:300	PROJECT No. 7462-011	DWG No. MN7549-026

EXISTING APPROVED PLANT.
MOD 26 PROPOSAL.

N

No.3 AND No.4
STARCH DRYER
BUILDING

TANK

TANK

EXTEND
BUND.

H

RELOCATED
APPROVED PHOSPHORUS
OXYCHLORIDE BUND.

3.75M

H

TANK

TANK

EXISTING
BUND.

3.2M

No.6
GLUTEN DRYER
BUILDING

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P01	ALL	First issue.	P.C.	08/04/2025	JS	

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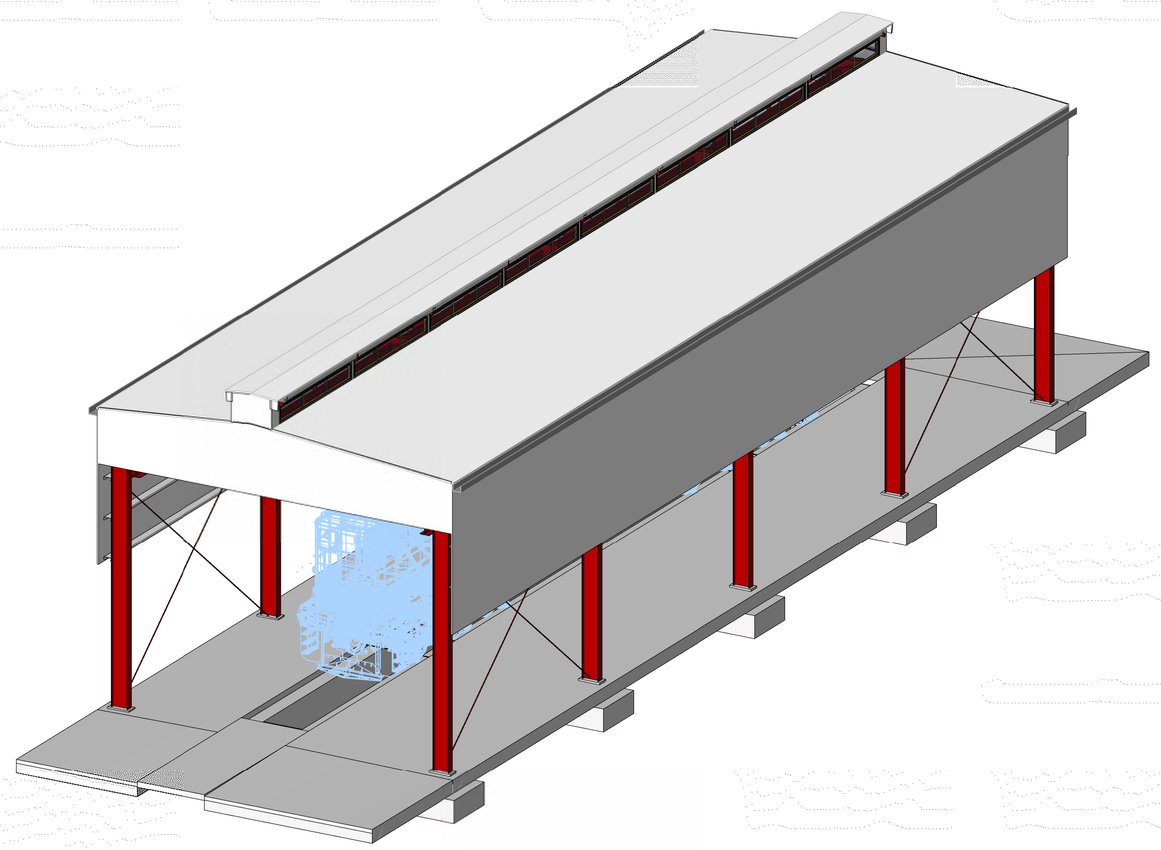
DRAWN 08/04/2025	DATE	JOB TITLE SHOALHAVEN STARCHES.BOMADERRY. NSW	SHT SIZE A3
CHKD	DATE	DWG TITLE NEW PROPOSALS.MOD 26. PHOSPHORUS OXYCHLORIDE SITE PLAN.	
APPD	DATE		REV. P01
	SCALE 1:50	7393 DWG No. MN7549-027	

MANILDRA RAIL MAINTENANCE BUILDING

BOLONG ROAD. BOMADERRY, NSW

BUILDING DRAWINGS

BUILDING DRAWING LIST	
SHEET No.	SHEET NAME
A0001	FACE SHEET AND DRAWING INDEX
A0010	SITE PLAN
A0020	GENERAL ARRANGEMENT PLANS - SHEET 1
A0021	GENERAL ARRANGEMENT PLANS - SHEET 2
A0030	BUILDING ELEVATIONS
A0040	SECTIONS AND DETAILS



Rev	Description	Date	By	App
P1	ISSUED FOR INFORMATION	11.08.23	TF	

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Project Name: MANILDRA RAIL MAINTENANCE BUILDING BOLONG ROAD. BOMADERRY, NSW

Drawing Title: FACE SHEET AND DRAWING INDEX

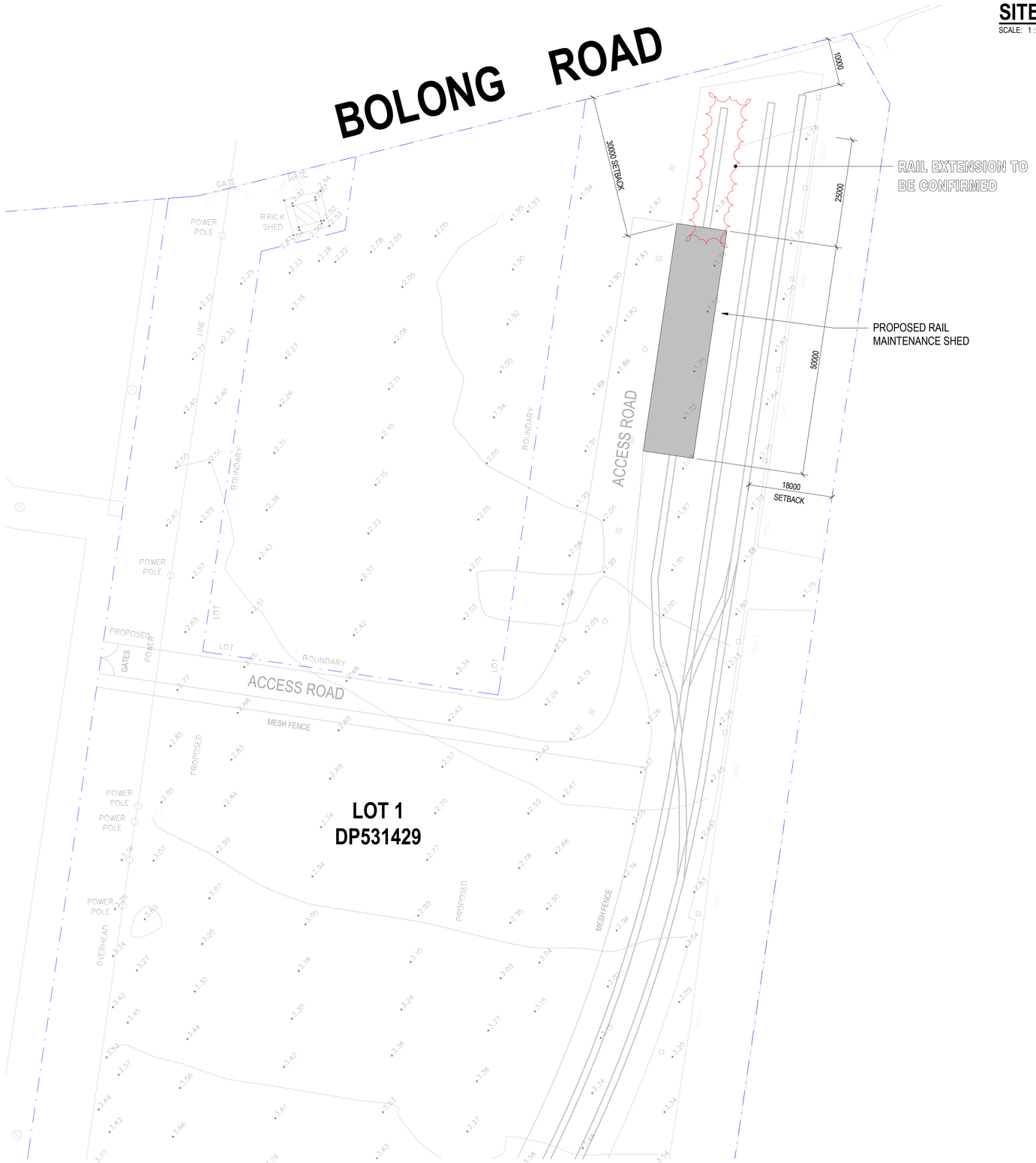
FOR INFORMATION ONLY

Designed	JR	Project Director Approved	Date / North
Drawn	TF		
Scale	1:75	Project Ref.	Drawing No. / Rev
Date	11/08/23	131012	A0001 / P1
Sheet	A1		

A1

SITE PLAN

SCALE: 1 : 500



Rev	Description	Date	By	App
P1	ISSUED FOR INFORMATION	11.08.23	TF	

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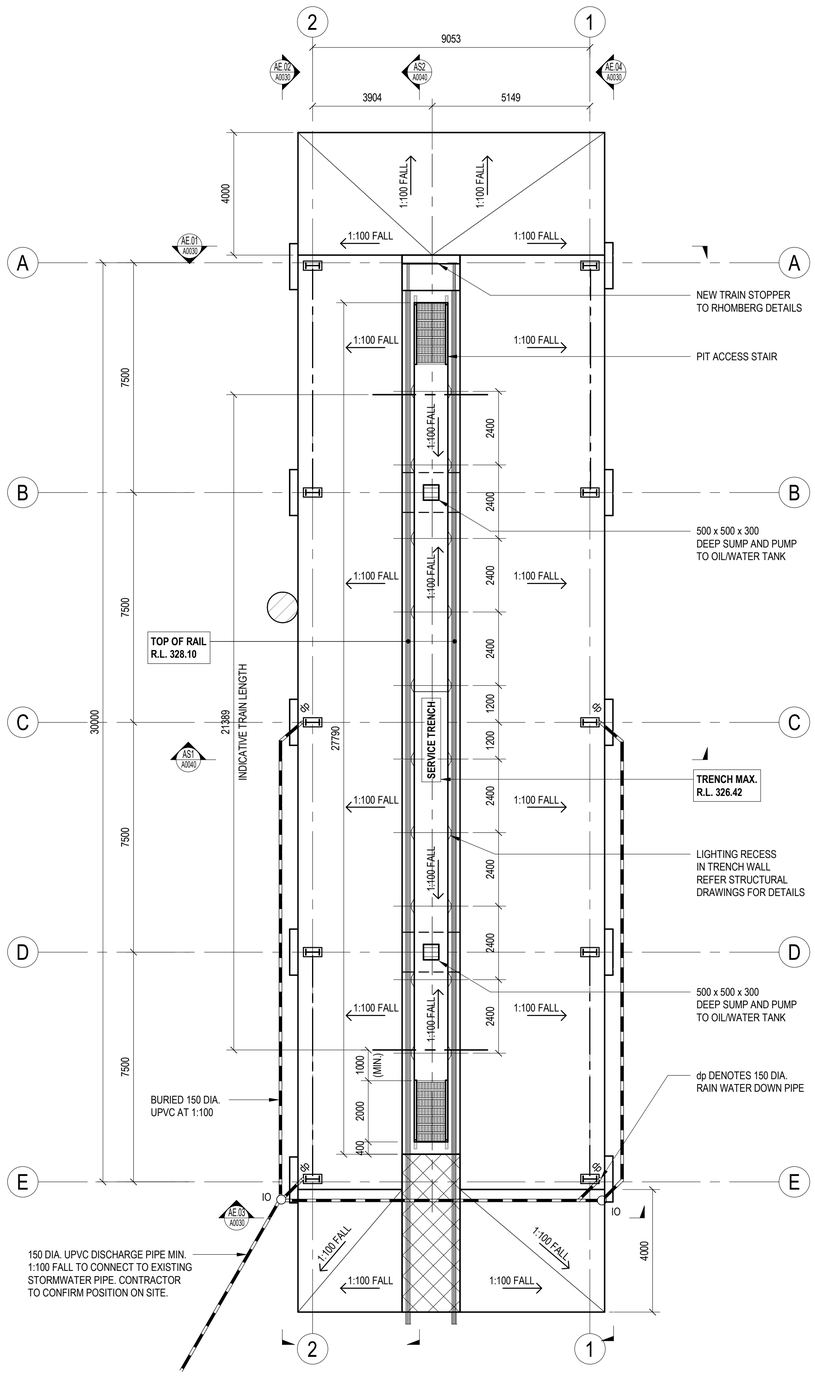
Project Name: MANILDRA RAIL MAINTENANCE BUILDING BOLONG ROAD. BOMADERRY, NSW

Drawing Title: SITE PLAN

FOR INFORMATION ONLY

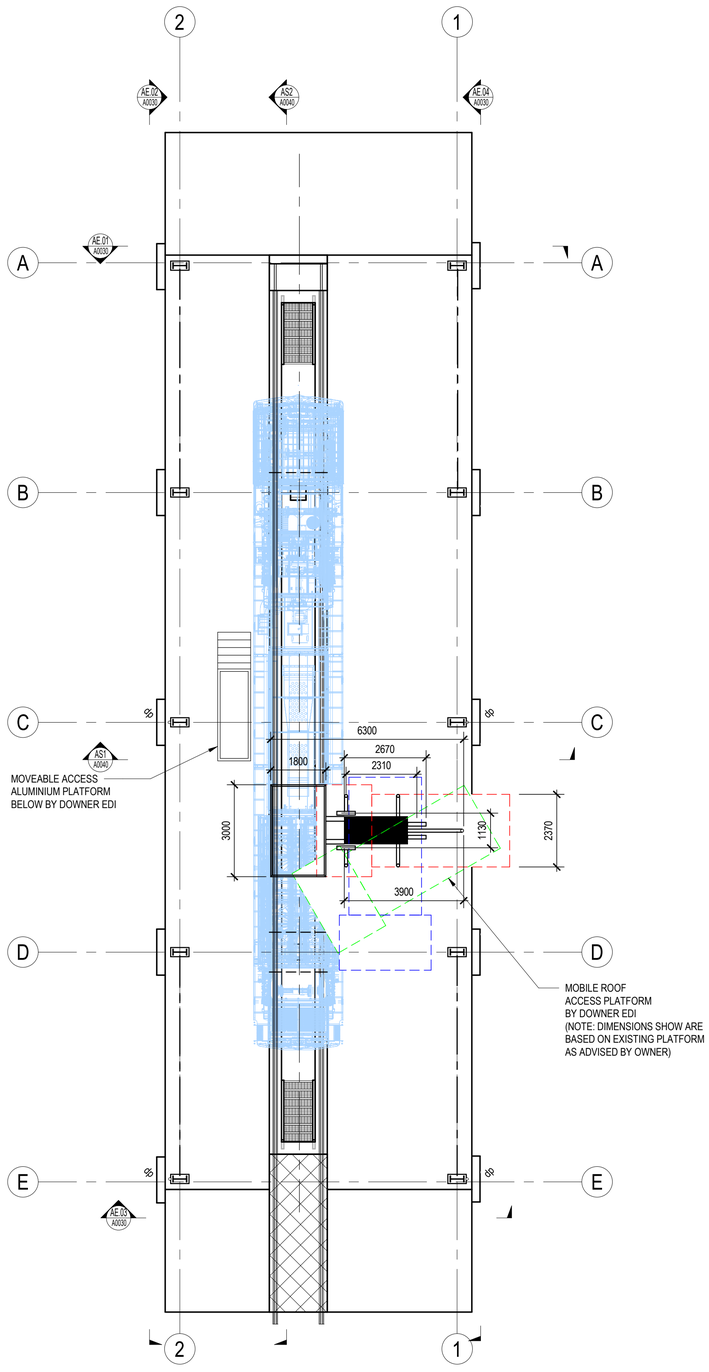
Designed	JR	Project Director Approved	Date
Drawn	TF		North
Scale	1:500	Project Ref.	Drawing No. / Rev
Date	11/08/23	131012	A0010 P1
Sheet	A1		

A1



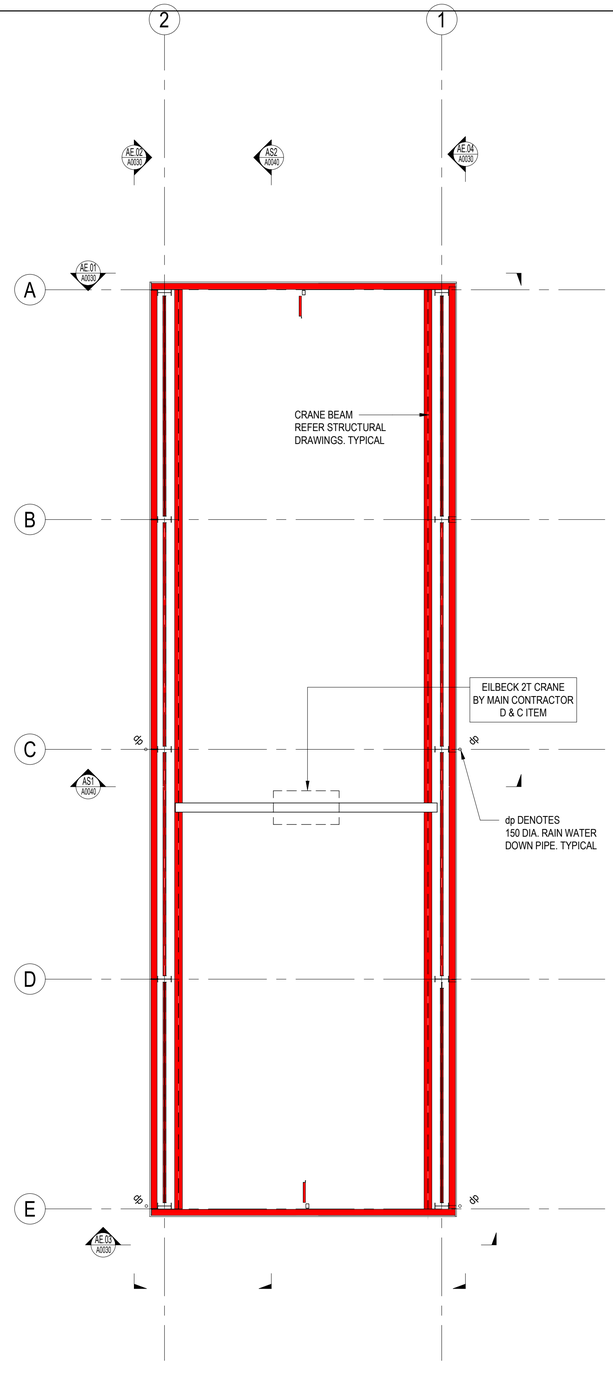
GROUND FLOOR GENERAL ARRANGEMENT PLAN

SCALE: 1 : 100



GROUND FLOOR PLAN WITH MOBILE ROOF ACCESS PLATFORM

SCALE 1 : 100



MONOBEAM CRANE GENERAL ARRANGEMENT PLAN

SCALE: 1 : 100

LEGEND (UNLESS OTHERWISE NOTED)

IO	DENOTES INSPECTION OUTLET
	DENOTES LIGHTING RECESS IN TRENCH
	DENOTES BITUMEN INFILL

Rev	Description	Date	By	App
P1	ISSUED FOR INFORMATION	11.08.23	TF	

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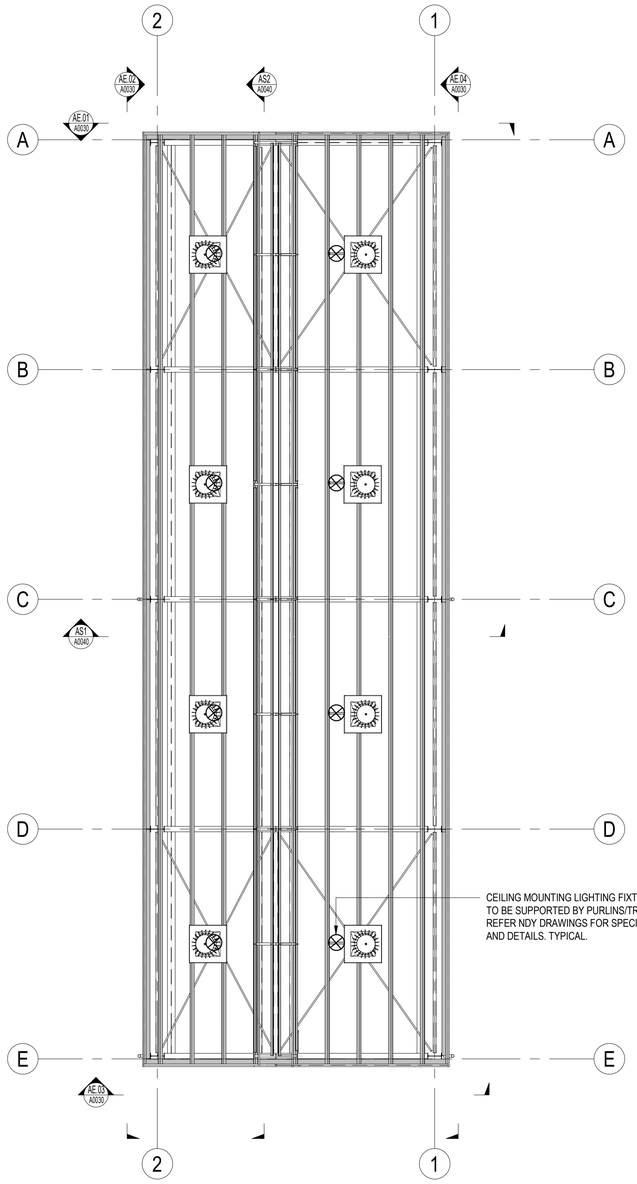
Project Name: MANILDRA RAIL MAINTENANCE BUILDING BOLONG ROAD. BOMADERRY, NSW

Drawing Title: GENERAL ARRANGEMENT PLANS SHEET 1

FOR INFORMATION ONLY

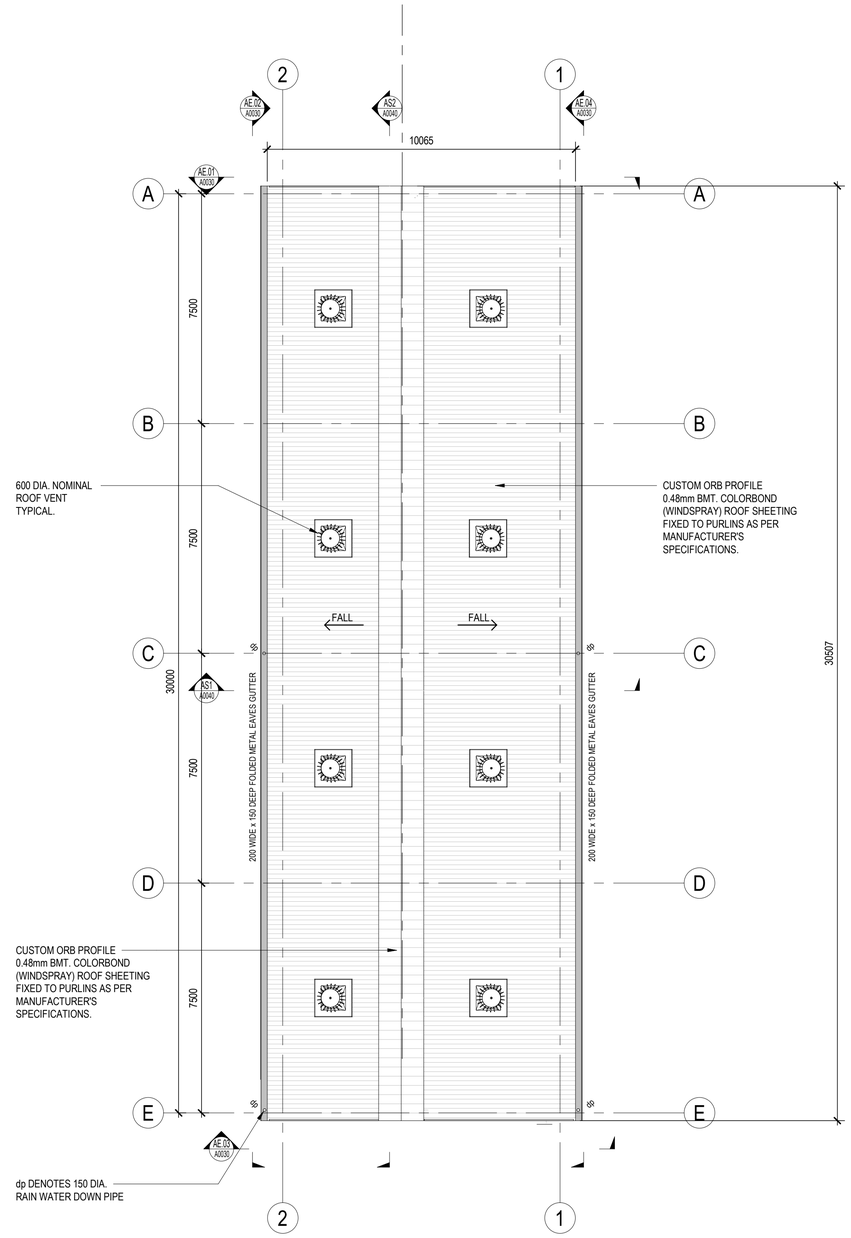
Designed	JR	Project Director Approved	Date
Drawn	TF		North
Scale	1:100	Project Ref.	Drawing No. / Rev
Date	11/08/23	131012	A0020 / P1
Sheet	A1		

A1



REFLECTED CEILING GENERAL ARRANGEMENT PLAN

SCALE: 1 : 100



ROOF GENERAL ARRANGEMENT PLAN

SCALE: 1 : 100

Rev	Description	Date	By	App
P1	ISSUED FOR INFORMATION	11.08.23	TF	

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Project Name	MANILDRA RAIL MAINTENANCE BUILDING BOLONG ROAD. BOMADERRY, NSW
Drawing Title	GENERAL ARRANGEMENT PLANS SHEET 2

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Designed	JR	Project Director Approved	Date
Drawn	TF		
Scale	1:100		
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Project Ref.	Drawing No.	Rev
131012	A0021	P1

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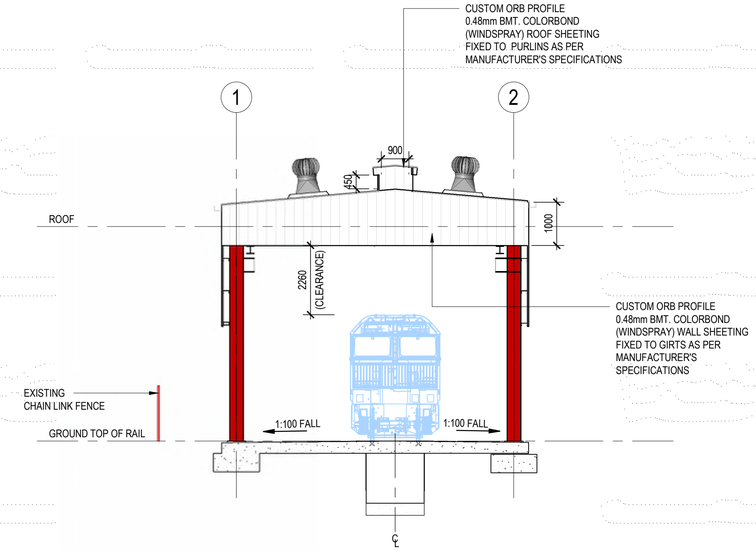

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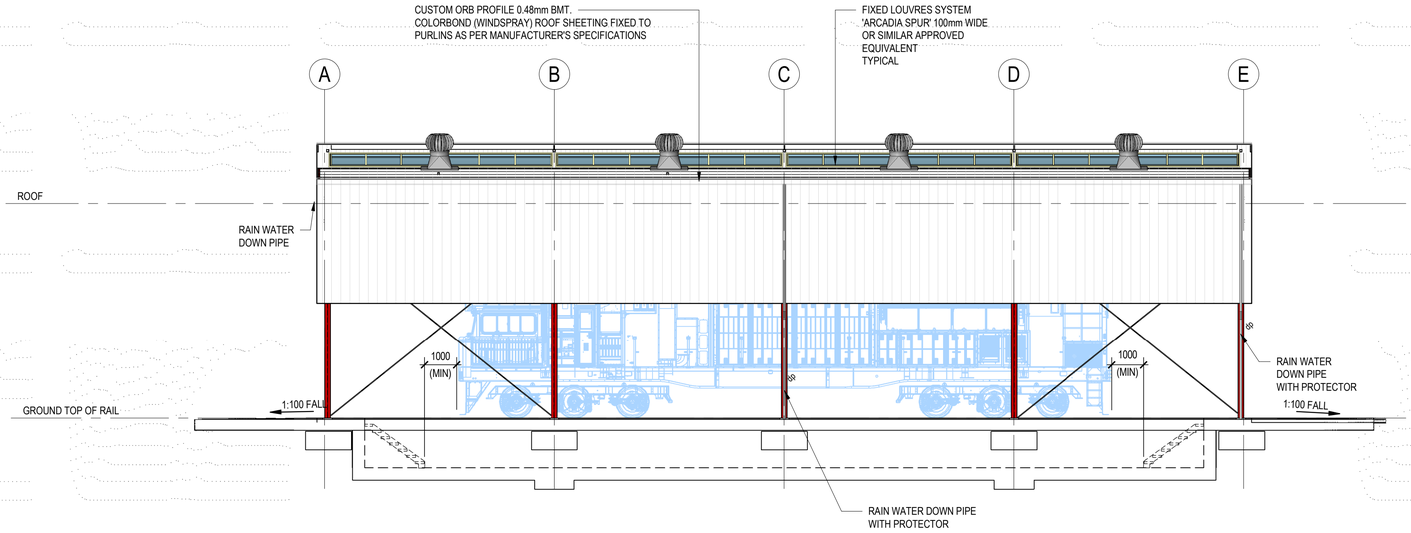

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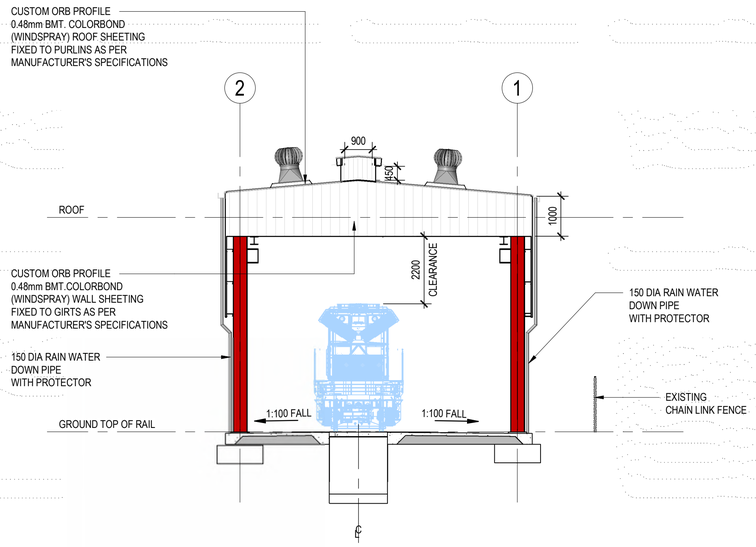

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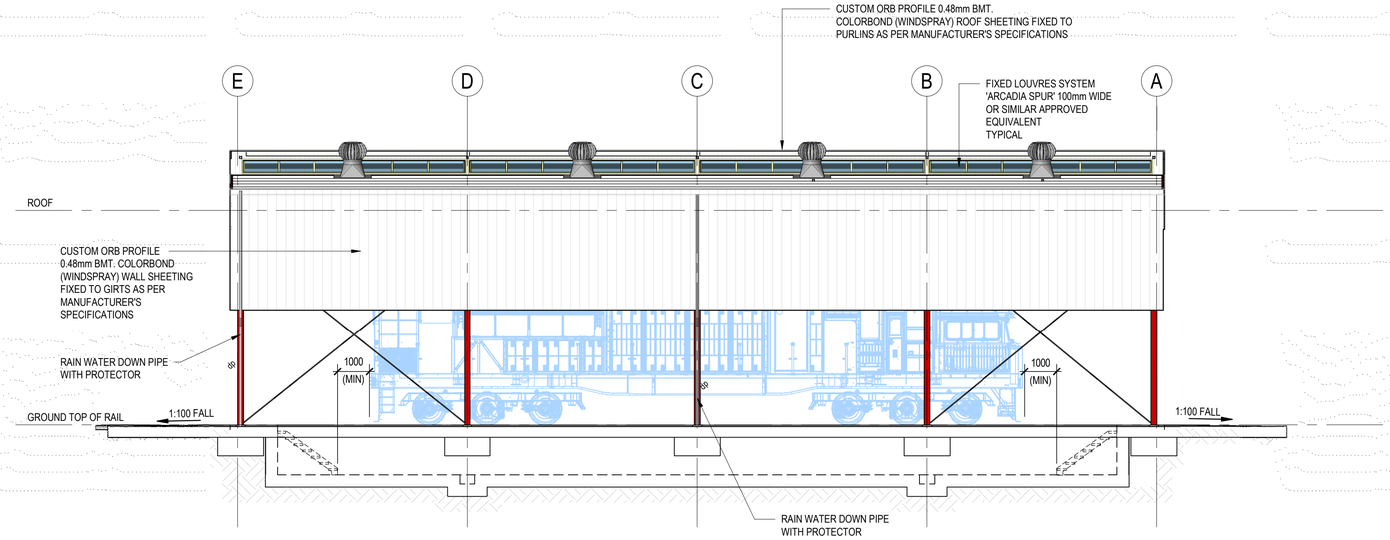

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P1	ISSUED FOR INFORMATION	11.08.23	TF	

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Project Name: MANILDRA RAIL MAINTENANCE BUILDING BOLONG ROAD. BOMADERRY, NSW

Drawing Title: BUILDING ELEVATIONS

FOR INFORMATION ONLY

Designed	JR	Project Director Approved	Date	North
Drawn	TF			
Scale	1:100	Project Ref.	Drawing No.	Rev
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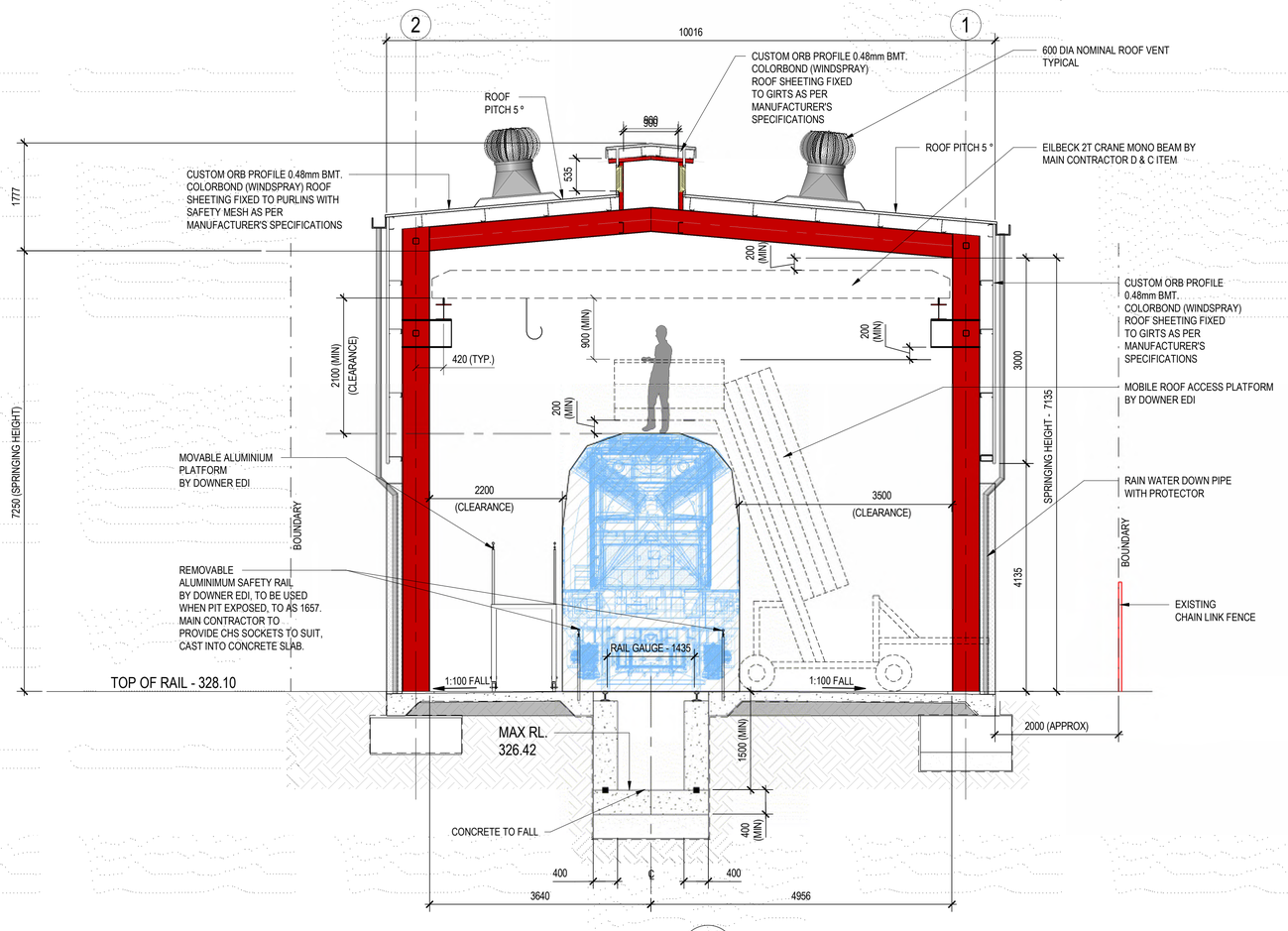

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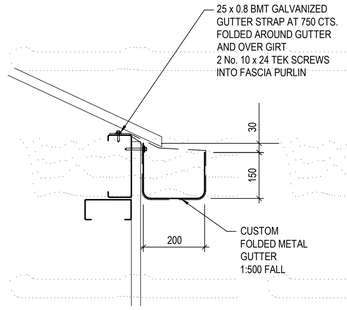
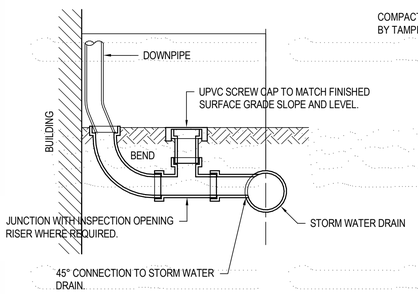
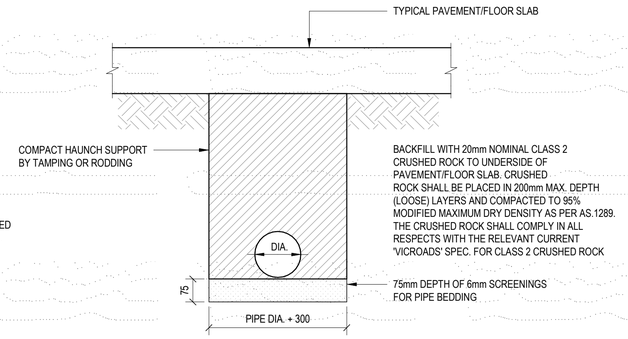


TYPICAL EAVES GUTTER DETAIL
SCALE 1:10

NOTE:
FOR SAFETY PURPOSES PERSONS ARE NOT BE WITHIN ROOF SPACE WHILST LOCOMOTIVE IS OPERATIONAL

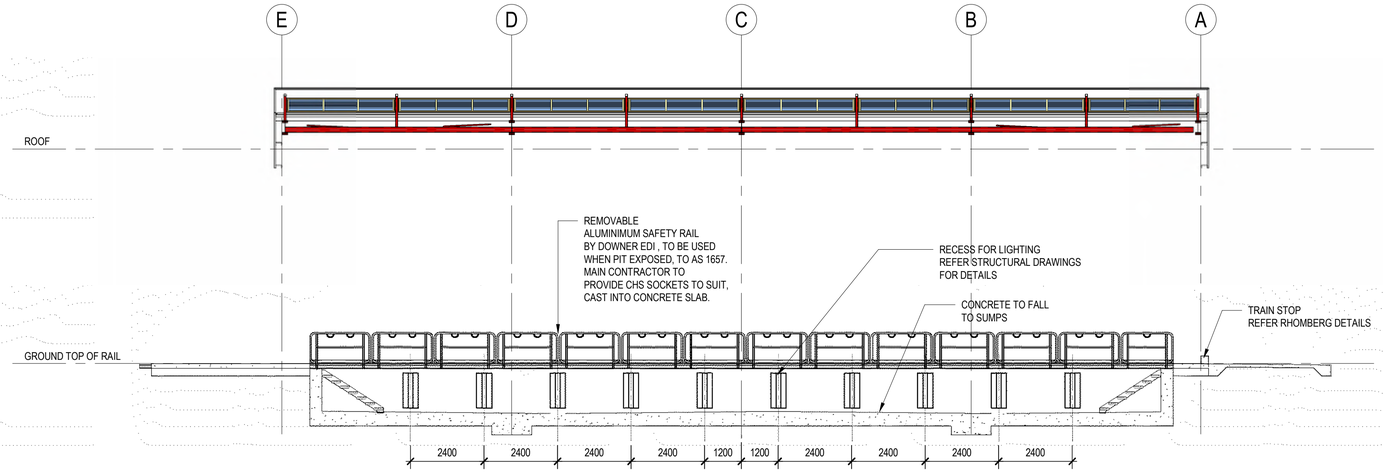


DOWNPIPE CONNECTION AND INSPECTION OPENING DETAIL
N.T.S.



NOTE:
AVOID RUNNING CONSTRUCTION EQUIPMENT OVER THE PIPES UNTIL BACKFILL MATERIAL IS 300mm MIN. ABOVE CROWN OF PIPE.

PIPE LAYING DETAILS
UNDER ALL PAVEMENTS/FLOORS
N.T.S.



SECTION AS2
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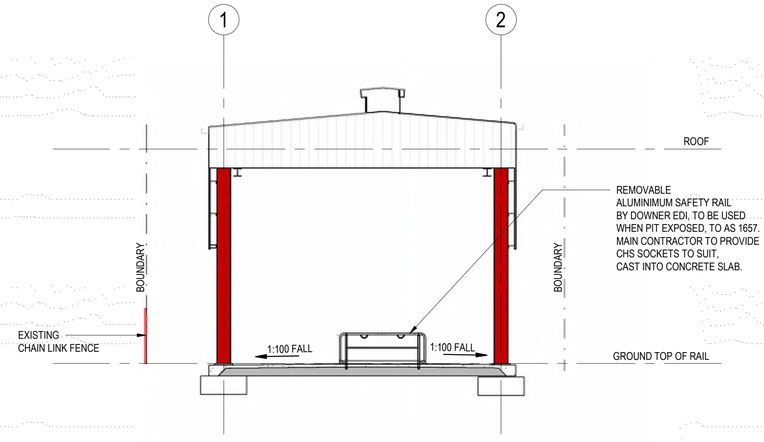

EAST ELEVATION - WHEN THE PIT IS EXPOSED
SCALE: 1 : 100

Rev	Description	Date	By	App
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Project Name: MANILDRA RAIL MAINTENANCE BUILDING BOLONG ROAD. BOMADERRY, NSW

Drawing Title: SECTIONS AND DETAILS

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Designed	JR	Project Director Approved	Date
Drawn	TF		North
Scale	1:10, 1:50, 1:100	Project Ref.	Drawing No. Rev
Date	11/08/23	131012	A0040 P1
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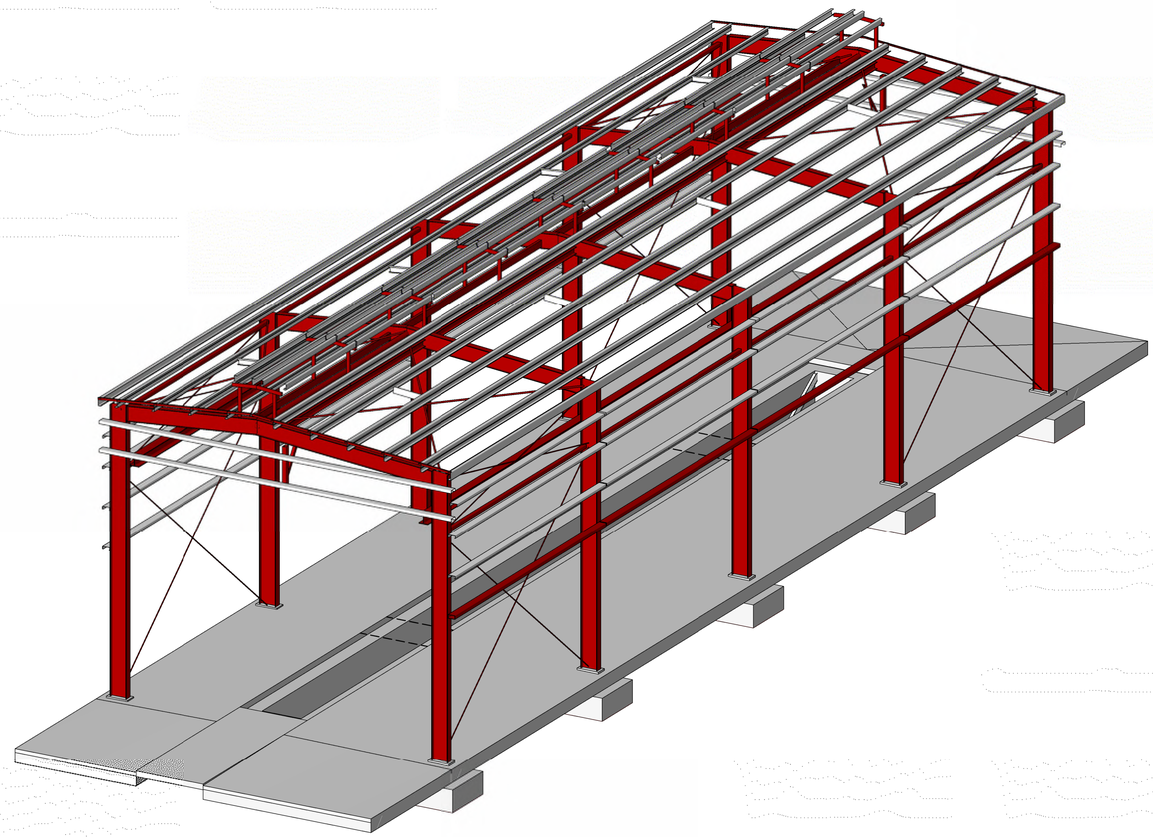
MANILDRA RAIL MAINTENANCE BUILDING

BOLONG ROAD. BOMADERRY, NSW

STRUCTURAL DRAWINGS

STRUCTURAL DRAWING LIST	
SHEET No.	SHEET NAME
S0001	FACE SHEET AND DRAWING INDEX
S0002	GENERAL NOTES
S0020	GROUND FLOOR PROFILE PLAN
S0025	GROUND FLOOR DETAILS - SHEET 1
S0026	GROUND FLOOR DETAILS - SHEET 2
S0030	ROOF FRAMING PLAN
S0040	STEELWORK ELEVATIONS
S0045	STEELWORK DETAILS - SHEET 1
S0046	STEELWORK DETAILS - SHEET 2



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Project Name: MANILDRA RAIL MAINTENANCE BUILDING BOLONG ROAD. BOMADERRY, NSW

Drawing Title: FACE SHEET AND DRAWING INDEX

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Designed	JR	Project Director Approved	Date / North
Drawn	TF		
Scale	1:75	Project Ref.	Drawing No. / Rev
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STRUCTURAL NOTES

STANDARD NOTES:

GENERAL

G1 THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ARCHITECTURAL AND OTHER CONSULTANTS DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS OR SKETCHES AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE SUPERINTENDENT BEFORE PROCEEDING WITH WORK.

G2 MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE SPECIFICATION, CURRENT SAA CODES, BUILDING REGULATIONS AND THE REQUIREMENTS OF ANY OTHER RELEVANT STATUTORY AUTHORITIES.

G3 THESE DRAWINGS MUST NOT BE SCALED. ALL DIMENSIONS ARE IN mm. ALL SET OUT DIMENSIONS AND LEVELS, INCLUDING THOSE SHOWN ON THESE DRAWINGS SHALL BE IN ACCORDANCE WITH THE ARCHITECT'S DRAWINGS AND VERIFIED ON SITE.

G4 THE CONSULTING ENGINEER HAS DESIGNED THE PERMANENT STRUCTURE. THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN, IMPLEMENTATION AND CERTIFICATION OF ALL TEMPORARY WORKS, PROPPING, NEEDLING, FALSE WORK, BRACING, BACK-PROPPING, AND SO FORTH, NECESSARY TO COMPLETE THE WORK.

G5 DURING CONSTRUCTION THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED. THE CONTRACTOR SHALL ALLOW TO ENGAGE A CHARTERED (NPER-3) ENGINEER TO DESIGN, INSPECT THE TEMPORARY WORKS AND VERIFY THE TEMPORARY STABILITY OF THE STRUCTURE.

G6 THE APPROVAL OF A SUBSTITUTION SHALL BE SOUGHT FROM THE SUPERINTENDENT BUT IS NOT AN AUTHORIZATION OF A COST VARIATION. THE SUPERINTENDENT MUST APPROVE ANY COST VARIATION INVOLVED BEFORE ANY WORK STARTS.

G7 THESE DRAWINGS SHALL NOT BE USED FOR CONSTRUCTION UNTIL ISSUED AS "FOR CONSTRUCTION" BY THIS OFFICE.

G8 THE CONTRACTOR RETAINS RESPONSIBILITY OF THE WORKS EVEN IF THE ENGINEER HAS INSPECTED THE WORKS DURING CONSTRUCTION.

G9 WHERE ADDITIONAL CONSTRUCTION LOADS, SUCH AS TEMPORARY SHORING, MOBILE CRANES, ETC. ARE TO BE IMPOSED ON THE STRUCTURE, THE CONTRACTOR SHALL SUBMIT FULL DETAILS OF THE PROPOSED TEMPORARY SUPPORTS TO THE ENGINEER FOR REVIEW. SUCH INFORMATION MUST BE PROVIDED A MINIMUM OF 7

G10 WORKING DAYS PRIOR TO THE PROPOSED WORKS COMMENCING.

G11 IF THE CONTRACTOR INTENDS TO VARY THE SCOPE OR METHOD OF WORKS OR MATERIALS USED, THE CONTRACTOR SHALL SUBMIT FULL DETAILS OF THE PROPOSAL TO THE DESIGN SUPERINTENDENT FOR DESIGN CHECK.

G12 ALL PROPRIETARY PRODUCTS SHALL BE INSTALLED STRICTLY IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

ALL REQUIRED TESTS TO COMPLETE THE WORKS SHALL BE AT THE CONTRACTOR'S EXPENSE.

HEALTH AND SAFETY

H1 THE OBLIGATION OF BONACCI GROUP PTY LTD [OR OTHER RELEVANT BONACCI ENTITY] (BONACCI) AS THE DESIGN ENGINEER IS LIMITED TO ENSURING THAT THOSE PARTS OF THE STRUCTURE THAT ARE TO BE USED AS A WORKPLACE ARE, AS FAR AS REASONABLY PRACTICABLE, DESIGNED TO BE SAFE AND WITHOUT RISKS TO THE HEALTH OF THOSE PERSONS USING THE STRUCTURE AS A WORKPLACE FOR THE PURPOSE FOR WHICH IT WAS DESIGNED IN ACCORDANCE WITH SECT. 28 OF THE OCCUPATIONAL HEALTH AND SAFETY ACT 2004 (VIC).

H2 BONACCI IS NOT RESPONSIBLE FOR THE OCCUPATIONAL HEALTH AND SAFETY OF PERSONS AT THE SITE AS THOSE OBLIGATIONS RESIDE WITH THE CONTRACTORS AND/OR SUBCONTRACTORS WHO OCCUPY OR HAVE CONTROL OF THE SITE IN ACCORDANCE WITH APPLICABLE OCCUPATIONAL HEALTH AND SAFETY LEGISLATION, CODES OR PRACTICE, GUIDANCE NOTES, AUSTRALIAN STANDARDS AND OTHER RELEVANT DOCUMENTATION.

H3 ANY ADVICE OR GUIDANCE CONCERNING OCCUPATIONAL HEALTH AND SAFETY ISSUES ARISING AT THE SITE SHOULD BE DIRECTED TO THE HEALTH AND SAFETY EXECUTIVE OR OFFICER NOMINATED FOR THE PROJECT.

FOUNDATIONS

F1 REFER TO THE GEOTECHNICAL REPORT FOR A DESCRIPTION OF THE ANTICIPATED SITE CONDITIONS. THE BUILDER IS TO STUDY THE REPORT AND MAKE HIS OWN EVALUATION ON THE SITE CONDITIONS. ANY ADDITIONAL COSTS INCURRED SHALL BE BORNE BY THE BUILDER.

F2 ALL FOOTINGS SHALL BE FOUNDED AT 600mm MINIMUM DEPTH BELOW NATURAL GROUND LEVEL INTO THE STIFF UNDISTURBED NATURAL CLAY. THE ALLOWABLE BEARING CAPACITY SHALL BE AS STATED BELOW. THE TOPS OF FOOTINGS SHALL BE A MINIMUM OF 300mm BELOW THE LOWEST ADJACENT STRUCTURAL FLOOR LEVEL UNLESS NOTED OTHERWISE.

F3 THE ALLOWABLE BEARING CAPACITY SHALL BE VERIFIED BY GEOTECHNICAL ENGINEER, WHO SHALL BE EMPLOYED BY THE BUILDER, BEFORE ANY CONCRETE IS PLACED. WHEREVER THE BEARING CAPACITY AT THE FOOTING BASE IS INADEQUATE, EXCAVATION SHALL CONTINUE UNTIL SUITABLE MATERIAL IS FOUND OR THE FOOTING IS ENLARGED TO THE ENGINEER DETAILS.

F4 BASES OF ALL FOOTINGS SHALL BE CLEANED OF ALL LOOSE MATERIAL PRIOR TO POURING OF CONCRETE. IN WET CONDITIONS, A 300 x 300 x 300 PIT SHALL BE DUG AT THE CORNER OF THE FOOTING FOR DEWATERING THE EXCAVATION BEFORE CONCRETING. A 50mm MINIMUM BLINDING LAYER OF N15 GRADE CONCRETE SHALL BE USED, UNLESS OTHERWISE APPROVED BY THE ENGINEER.

F5 WHENEVER A FOOTING IS LOCATED CLOSE TO A BATTER , AN EXISTING FOOTING, EXISTING OR NEW SERVICES, A LINE DRAWN AT THE BOTTOM OF THE FOOTING AT 40 DEGREES TO THE HORIZONTAL SHALL FALL BELOW THE BATTER, EXISTING FOOTING OR SERVICES. IF THIS DOES NOT HAPPEN THE FOOTING BASE SHALL BE DEEPENED AS REQUIRED TO ACHIEVE THE FORMER.

F6 THE OVER BREAK BETWEEN THE APPROVED FOUNDING LEVEL AND THE UNDERSIDE OF THE FOOTING SHALL BE FILLED WITH GRADE N15 CONCRETE. ANY OVER BREAK AT THE SIDES OF THE FOOTING SHALL BE FILLED WHEN CONCRETING THE FOOTING.

F7 THE BUILDER SHALL REMOVE ALL SPOIL FROM THE SITE, AND DEWATER THE EXCAVATION AS REQUIRED.

F8 EARTHWORKS TO COMPLY WITH ARTC ENGINEERING STANDARDS (RCP 01 - RIC STANDARD : C1100).

F9 FOR TRACK WORK REFER TO RHOMBERS RAIL DRAWINGS AND SPECIFICATIONS.

CONCRETE GRADE

PAD AND STRIP FOOTINGS:	N32
SLAB ON GROUND & TRENCH:	N40

FOUNDATION DESIGN CRITERIA

PAD FOOTINGS:	100kPa
STRIP FOOTINGS:	100kPa

FOUNDED INTO STIFF UNDISTURBED NATURAL CLAYS

STRUCTURAL DESIGN BASED ON GEOTECHNICAL REPORT No: GEOTWOLL0258AV-AA

BY: COFFEY GEOTECHNICS PTY LTD
DATED: 7 MAY 2015

SLAB ON GROUND NOTES

SOG1 ALL CONCRETE WORK TO COMPLY WITH AS 3600 CONCRETE CODE, AND BCA SECTIONS 3.1 AND 3.2

SOG2 CONCRETE GRADE N20 MINIMUM (RESIDENTIAL)
CONCRETE GRADE N32 MINIMUM (ALL OTHER STRUCTURES)

SOG3 ALL VEGETATION SHALL BE STRIPPED TO A MINIMUM DEPTH OF 150mm. ANY SOFT SPOTS OR DELETERIOUS MATERIAL SHALL BE REMOVED AND REPLACED WITH APPROVED GRANULAR FILLING COMPACTED TO 100% AS. STANDARD COMPACTION. MINOR FILLING (800 MAXIMUM) SHALL BE PROVIDED WHERE REQUIRED TO BRING SUB GRADE TO REQUIRED LEVEL IN ACCORDANCE WITH LIMITS STATED IN AS 2870 AND BCA. FILLING SHALL BE APPROVED GRANULAR MATERIAL PLACED IN 150mm AND COMPACTED TO 100% AS. STANDARD

SOG4 COMPACTION.
A 0.2mm VAPOUR BARRIER SHALL BE USED, LAPPED A MINIMUM OF 200mm AT JOINTS AND TAPED AROUND SERVICES FITTINGS WITH ADHESIVE TAPE NOT INFERIOR TO DOUBLE SIDED BUTYL ADHESIVE TAPE. THE VAPOUR BARRIER SHALL BE PLACED ON A 50mm MINIMUM SAND BED OR SIMILAR APPROVED

SOG5 MATERIAL. PROTECT MEMBRANE FROM DAMAGE.
TRENCH MESH IN BEAMS SHALL BE OVERLAPPED BY THE WIDTH OF FABRIC AT 'T' AND 'L' INTERSECTIONS AND SPLICED WITH A LAP OF 500mm. RANDOM LAP N12 BARS BY 500mm STAGGERED. THE OUTER BAR AT 'L' INTERSECTION MUST BE

SOG6 BENT AND CONTINUED FOR 500mm AROUND THE CORNER
SLAB FABRIC TO BE LAPPED SUCH THAT THE TWO OUTERMOST TRANSVERSE WIRE OF ONE SHEET OF MESH OVERLAP THE TWO OUTERMOST TRANSVERSE WIRES OF THE SHEET BEING LAPPED BY A MINIMUM OF 25mm AND BE SUPPORTED

SOG7 ON BAR CHAIRS AT 800mm MAXIMUM CENTERS.
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE SITE INVESTIGATION

SOG8 REPORT TO DETERMINE FOUNDING DEPTHS.
SITE CLASSIFICATION TO AS 2870 CLASS H ENGINEERING PRINCIPLES TO

SOG9 SECTIONS 4 OF AS 2870.
LOAD BEARING EXTERNAL AND INTERNAL BEAMS AND LOAD SUPPORT THICKENINGS ARE TO BE FOUNDED ON NATURAL SOIL WITH AN ALLOWABLE

SOG10 BEARING PRESSURE OF NOT LESS THAN 100 kPa.
SLAB PANELS ARE TO BE FOUNDED ON NATURAL SOIL WITH AN ALLOWABLE

SOG11 BEARING PRESSURE OF NOT LESS THAN 50 kPa.

SOG12 TOP OF SLAB SHALL BE 150mm MINIMUM ABOVE THE FINAL GROUND LEVEL.
DRAINAGE AND GRADING AWAY FROM SLAB SHALL BE PROVIDED TO PREVENT WATER COLLECTING ADJACENT TO SLAB. TREATMENT OF AREAS SURROUNDING SLAB SHALL ALSO BE IN ACCORDANCE WITH RECOMMENDATIONS BY THE HOUSING GUARANTEE FUND AND THE OWNER/OCCUPIER SHALL BE PROVIDED

SOG13 WITH A COPY OF CSIRO INFORMATION SHEET No. 10-19.
BRICKWORK CONTROL JOINTS ARE TO BE PROVIDED ON SIDES EXCEEDING 6000mm IN LENGTH OR THROUGH LARGE OPENINGS FROM EAVES TO SLAB OR

SOG14 THROUGH FULL HEIGHT WINDOWS AND DOORS.
WHERE REQUIRED BY COUNCIL PROTECT THE STRUCTURE FROM SUBTERRANEAN TERMITES IN ACCORDANCE WITH AS 3660 AND BCA

STRUCTURAL DESIGN BASED ON GEOTECHNICAL REPORT No: GEOTWOLL0258AV-AA

BY: COFFEY GEOTECHNICS PTY LTD
DATED: 7 MAY 2015

CONCRETE

SHALL COMPLY TO AS3600 AND AS 3610

C1 CONCRETE SIZES DO NOT INCLUDE FINISHES.

C2 NO HOLES, CHASES OR EMBEDMENTS OTHER THAN THOSE SHOWN ON THE DRAWINGS SHALL BE MADE IN CONCRETE ELEMENTS WITHOUT ENGINEER'S APPROVAL.

C3 DEPTHS OF BEAMS ARE GIVEN FIRST AND INCLUDE SLAB THICKNESS, SLABS AND BEAMS SHALL BE CAST TOGETHER UNLESS OTHERWISE NOTED.

C4 CONCRETE SHALL BE KEPT FREE OF SUPPORTING MASONRY WITH TWO LAYERS OF SUITABLE MEMBRANE (MALTHOID OR EQUAL). VERTICAL FACES SHALL BE SEPARATED BY 12mm BITUMINOUS CANEITE. ALL NON - LOAD BEARING WALLS SHALL BE KEPT 20 mm CLEAR OF THE UNDERSIDE OF SLABS AND BEAMS UNLESS NOTED OTHERWISE.

C5 CONSTRUCTION JOINTS SHALL BE PROPERLY FORMED AND LOCATED TO THE SATISFACTION OF THE ENGINEER. BUILDER SHALL ALLOW FOR ALL NECESSARY CONSTRUCTION JOINTS.

C6 WHERE NOTED ON DRAWINGS CAMBER TO SUSPENDED SLABS AND BEAMS SHALL BE 5 FOR EVERY 2500 OF SPAN UNLESS OTHERWISE NOTED. WHERE THE CONCRETE SOFFITS ARE CAMBERED, THE UPPER SURFACE SHALL BE SIMILARLY CAMBERED. DEPTH GAUGES SHALL BE USED TO VERIFY THE SLAB THICKNESS.

C7 REINFORCEMENT IS SHOWN DIAGRAMATICALLY AND IS NOT NECESSARILY IN TRUE PROJECTION. SPLICES TO REINFORCEMENT SHALL BE MADE ONLY AT THE LOCATION SHOWN OR AS OTHERWISE APPROVED BY THE ENGINEER. WELDING OF REINFORCEMENT SHALL BE CARRIED OUT BY A QUALIFIED WELDER IN ACCORDANCE WITH AS/NZS 1554 AND THE REINFORCEMENT SUPPLIER RECOMMENDATIONS. THE INTERPASS TEMPERATURE SHALL BE LESS THAN 200 DEGREES IN ACCORDANCE WITH AS/NZS 1554 PART 3.

C8 THE REINFORCEMENT SYMBOLS ARE:
N NORMAL DUCTILITY CLASS HOT ROLLED 500N DEFORMED BARS WITH fsy = 500 MPa.
R NORMAL DUCTILITY CLASS 250N PLAIN ROUND BARS WITH fsy = 250 MPa.
L LOW DUCTILITY CLASS HARD DRAWN 500L WIRE REINFORCING MESH WITH fsy = 500MPa.
DO NOT USE LOW DUCTILITY CLASS L REINFORCEMENT UNLESS SHOWN ON THE DRAWINGS.
THE NUMBER FOLLOWING THE REINFORCEMENT SYMBOL IS THE NOMINAL BAR DIAMETER IN MILLIMETERS. ALL REINFORCEMENT SHALL COMPLY WITH AS/NZS 4671. STEEL REINFORCING MATERIALS FOR CONCRETE SHALL COMPLY WITH AS/NZS 4671. WHERE APPLICABLE, MATERIALS SHALL BE CUT AND BENT IN ACCORDANCE WITH AS 3600, AS 5100 OR AS 2870.
ACCEPTABLE MANUFACTURERS AND PROCESSORS OF STEEL REINFORCING AND PRESTRESSING MATERIALS MUST ALSO HOLD A VALID CERTIFICATE OF APPROVAL, ISSUED BY THE AUSTRALIAN CERTIFICATION AUTHORITY FOR REINFORCING STEELS LTD (ACRS). MATERIALS CERTIFIED TO AN ALTERNATIVE SYSTEM SHALL NOT BE USED WITHOUT DEMONSTRATED EQUIVALENCE AND SUBSEQUENT WRITTEN APPROVAL FROM THE SPECIFIER. EVIDENCE OF COMPLIANCE WITH THIS CLAUSE MUST BE OBTAINED WHEN CONTRACT BIDS ARE RECEIVED.
HOOKS AND COGS SHALL COMPLY WITH AS3600 UNLESS NOTED OTHERWISE. ALL PULL OUT BARS SHALL BE TEMPCORE BARS OR APPROVED EQUIVALENT.
BENDING AND REBENDING OF BARS SHALL BE CARRIED OUT IN ACCORDANCE WITH AS3600, AS/NZS 4671, THE SPECIFICATIONS AND THE REINFORCEMENT SUPPLIER RECOMMENDATIONS. BARS SHALL NOT BE HEATED ABOVE 400 DEGREES WITHOUT THE ENGINEER'S WRITTEN APPROVAL. THERMAL CRAYONS SHALL BE USED TO

C10 ENSURE COMPLIANCE WITH THIS TEMPERATURE LIMIT.
COVER TO REINFORCEMENT (IN mm) AND CONCRETE GRADES SHALL BE AS FOLLOWS UNLESS NOTED OTHERWISE: THE COVER SHALL NOT BE LESS THAN THE BAR DIAMETER AND:

ELEMENT	FORMED AND INTERNAL	FORMED AND EXPOSED TO WEATHER (1.)	NOT FORMED CAST AGAINST GROUND (2.)
FOOTINGS, PILE CAPS	-	60	75
COLUMNS, PEDESTALS	40	50	75
SLABS, BAND BEAMS	20(3.)	40	60
BEAMS	30	40	60
WALLS			
HORIZONTAL BARS	30	40	60
VERICAL BARS	40	50	60
MINIMUM CONCRETE GRADE	N40	N40	N40 (4.)

(1) FOR EXPOSURE CLASSIFICATION B2 ADD 5mm TO THE COVER AND THE CONCRETE GRADE SHALL BE N40 MINIMUM.
(2) IF THE ELEMENT IS CAST ON A DAMP PROOF MEMBRANE, DECREASE THE COVER BY 20mm.
(3) FOR PRESTRESSING TENDONS THE MINIMUM COVER SHALL BE 25mm.
(4) IN CORROSIVE SOILS AND WATER: N50

NOTES:
(i) COVER IS THE CLEAR DISTANCE BETWEEN ANY REINFORCING (INCLUDING FITMENTS) AND THE FACE OF THE STRUCTURAL ELEMENT.
(ii) FOR ALL EXTERNAL SURFACES, PROVIDE FULLY PLASTIC BAR CHAIRS. TIE WIRE SHALL NOT BE NAILED TO THE FORMS, REINFORCING BARS SHALL NOT BE USED TO KEEP FORMS APART AND A THROUGH TIE SYSTEM SHALL BE USED TO TIE FORMS.
(iii) PROVIDE AN APPROVED VAPOUR BARRIER FOR SLABS, BEAMS AND THICKENING CASTAGAINST THE GROUND.
(iv) THE COVERS SHALL BE MAINTAINED USING APPROVED BAR CHAIRS. BAR CHAIRS SUPPORTING MESH SHALL BE AT 800 x 800mm MAXIMUM CENTRES. BAR CHAIRS SUPPORTING BARS SHALL BE AT 60 BAR DIAMETERS OR 1500 MAXIMUM CENTRES WHICHEVER IS THE LESSER. BAR CHAIRS SHALL BE PROVIDED ALONG THE EDGES OF ALL CONSTRUCTION JOINTS. STOP ENDS SHALL NOT BE USED TO MAINTAIN THE COVERS.
(v) EXTERNAL ELEMENTS ARE THOSE EXPOSED TO WEATHER, RAIN AND WATER PENETRATION AND ARE CLASSIFIED B1 UNLESS NOTED OTHERWISE.

C11 EXTERNAL CONCRETE ELEMENTS SHALL MEET THE FOLLOWING REQUIREMENTS: MINIMUM PORTLAND CEMENT CONTENT 330 kg/m3/, MAXIMUM WATER/CEMENT RATIO 0.5, AND THE CHLORIDE CONTENT RESTRICTED AS PER CLAUSE 4.9 OF AS3600.

C12 ALL CONCRETE SUPPLIED SHALL HAVE A SLUMP OF 80mm AND A MAXIMUM NOMINAL AGGREGATE SIZE OF 20mm. VARIATIONS FROM THESE SHALL BE APPROVED BY THE ENGINEER.

C13 THE MIX DESIGN WITH THE 7 AND 28 DAYS TARGET STRENGTHS AND THE BASIC SHRINKAGE STRAIN AT 56 DAYS SHALL BE SUBMITTED FOR REVIEW PRIOR TO POURING ANY CONCRETE. ALL CONCRETE IN CONTACT WITH AGGRESSIVE SOIL SHALL HAVE SULPHATE RESISTING CEMENT. THE C3A CONTENT OF THE CEMENT SHALL BE LESS THAN 5%.

C14 CONDUITS AND PIPES WHEN CAST IN SLABS OR WALLS ARE TO BE PLACED BETWEEN THE TWO REINFORCEMENT LAYERS. WHERE THERE IS ONLY ONE LAYER OF REINFORCEMENT, PROVIDE 50mm COVER TO CONDUIT. THE CONDUIT LOCATIONS ARE TO BE APPROVED BY THE ENGINEER.

C15 WHERE DISTRIBUTION BARS TO MAIN REINFORCEMENT ARE NOT SHOWN ON DRAWINGS PROVIDE MINIMUM N16 AT 400 CENTRES, LAPPED 500mm AT SPLICES.

C16 FORMWORK SHALL BE DESIGNED, CONSTRUCTED AND SUPPLIED IN ACCORDANCE WITH AS 3610. REFER TO ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR CLASSES OF SURFACE FINISHES.

C17 STRIPPING AND BACKPROPPING OF SOFFITS SHALL NOT OCCUR UNTIL CONCRETE HAS REACHED 75% OF SPECIFIED STRENGTH. BACK PROPPING (OR A SECOND SET OF TABLE FORMS) IS TO EXTEND DOWN SO THAT EACH NEW FLOOR IS SUPPORTED BY AT LEAST 3 FINISHED FLOORS OR AS CALCULATED. DO NOT STRIP BAYS ADJACENT CONSTRUCTION JOINTS UNTIL THE ADJACENT BAYS ARE AT LEAST 3 DAYS OLD. CALCULATIONS ON THE BACKPROPPING REQUIREMENTS SHALL BE SUBMITTED FOR APPROVAL.

C18 CURING OF THE CONCRETE ELEMENTS SHALL BE STARTED AS SOON AS THE CONCRETE HAS HARDENED AND SHALL COMPLY WITH THE SPECIFICATIONS.

C19 PROVIDE A 25mm x 25mm CHAMFER TO ALL CORBELS, UNLESS OTHERWISE INDICATED ON THE DRAWING. ENSURE THAT POLYSTYRENE IS PLACED AROUND THE BEARING, SO THAT THE CONCRETE SURFACES ARE NOT IN CONTACT. SUBMIT CONFIRMATION OF THE SPECIFICATIONS OF ALL BEARING MATERIALS TO THE ENGINEER.

C20 ENSURE ALL MOVEMENT JOINTS ARE INSTALLED WITH THE SPECIFIED ARCHITECTURAL FINISH, INCLUDING SEALANT, FILLERS, EXPANSION MATERIALS AND REBATES AS REQUIRED.

STEELWORK SHALL COMPLY TO AS 4100, AS/NZS 4600 AND AS/NZS 3828

S1 THE FABRICATOR SHALL BE RESPONSIBLE FOR SUBMITTING SHOP DRAWINGS, WHICH SHALL COMPLY WITH THE CONTRACT DRAWINGS AND SPECIFICATIONS, FOR REVIEW BEFORE FABRICATION IS STARTED. REVIEW DOES NOT INCLUDE CHECKING OF DIMENSIONS, NOR TAKE RESPONSIBILITY FOR CONTRACTORS OBLIGATIONS. ALLOW 3 WORKING DAYS MINIMUM FOR REVIEW.

S2 WHERE CONNECTION FORCES (IN KILONEWTONS) ARE SHOWN ON THE DRAWINGS, CONNECTIONS SHALL BE PROVIDED TO TRANSMIT THESE FORCES. CONNECTIONS SHALL PROVIDE FOR A MINIMUM FORCE OF 40kN.

S3 ALL DETAILS, GAUGE LINES, ETC. WHERE NOT SPECIFICALLY SHOWN SHALL BE IN ACCORDANCE WITH AISC DESIGN CAPACITY TABLES FOR STRUCTURAL STEEL AND AISC STANDARDIZED STRUCTURAL CONNECTIONS.

S4 UNLESS OTHERWISE NOTED: WELDS TO BE 6mm CONTINUOUS FILLETS LAID DOWN WITH APPROVED COVERED ELECTRODES. ALL WELDS SHALL BE CATEGORY SP UNLESS OTHERWISE NOTED. WELDS SHALL CONFORM TO AS/NZS 1554 AND ELECTRODES TO AS/NZS 1553. GUSSET PLATES TO BE 10mm THICK. BOLTS TO BE M20-8.8/S IN 22mm DIAMETER HOLES. PROVIDE A MINIMUM OF TWO BOLTS PER CONNECTION.

S5 FABRICATOR SHALL PROVIDE ALL FIXINGS FOR ARCHITECTURAL ELEMENTS ETC. WITHOUT WEAKENING STRUCTURAL MEMBER IN ANY WAY.

S6 CAMBER SHALL BE PROVIDED TO ALL ROOF BEAMS, TRUSSES, AND PORTALS ETC. AT 5 PER 2000 OF SPAN UNLESS OTHERWISE NOTED, FOR ALL MEMBERS SPANNING IN EXCESS OF 6m. NO MEMBER SHALL BE ERECTED WITH NEGATIVE CAMBER, UNLESS SPECIFICALLY NOTED. FOR CONCRETE SLABS ON TOP OF STEELWORK DEPTH GAUGES SHALL BE USED TO VERIFY THE SLAB THICKNESS.

S7 ALL STEELWORK BELOW GROUND SHALL BE ENCASED BY CONCRETE WITH MIN. COVER OF 75mm. CONCRETE ENCASED STRUCTURAL STEEL TO BE WRAPPED WITH PRE-GALVANIZED G444HS MESH PLACED 25mm CLEAR OF STEEL. PROVIDE 50mm MINIMUM COVER.

S8 ALL STEELWORK NOT TO BE ENCASED IN CONCRETE OR GALVANIZED SHALL BE GIVEN ONE SHOP COAT OF AN APPROVED PRIMER UNLESS OTHERWISE NOTED. FACES OF FRICTION GRIP CONNECTIONS SHALL NOT BE PAINTED.

S9 THE BOLTING PROCEDURE IS DESIGNATED AS FOLLOWS:
- 4.6/S REFERS TO COMMERCIAL BOLTS OF STRENGTH GRADE 4.6 TO AS/NZS 1111 TIGHTENED USING A STANDARD WRENCH TO A SNUG-TIGHT CONDITION.
- 8.8/S REFERS TO HIGH STRENGTH BOLTS OF STRENGTH GRADE 8.8 TO AS/NZS 1252 TIGHTENED USING A STANDARD WRENCH TO A SNUG-TIGHT CONDITION.
- 8.8/TF REFERS TO HIGH STRENGTH BOLTS OF STRENGTH GRADE 8.8 TO AS/NZS 1252 FULLY TENSIONED TO AS 1511, DESIGNED AS A FRICTION TYPE JOINT.
- 8.8/TB REFERS TO HIGH STRENGTH BOLTS OF STRENGTH GRADE 8.8 TO AS/NZS 1252 FULLY TENSIONED TO AS 1511, DESIGNED AS A BEARING TYPE JOINT.

S10 LOAD INDICATING WASHERS SHALL BE USED TO VERIFY TIGHTENING OF BOLTS IN TF AND TB CONNECTIONS. A HARDENED WASHER SHALL BE USED UNDER THE BOLT HEAD OR NUT, WHICHEVER IS ROTATED. FULLY TENSIONED BOLTS SHALL NOT BE RE-USED. WELDING OF CAPTIVE NUTS TO STEELWORK SHALL BE GRADE 4.6S, CLASS 5 NUTS. THE ELECTRODES USED SHALL BE COMPATIBLE WITH THE CHEMISTRY OF THE STEEL INVOLVED (MEMBER OR CONNECTION COMPONENT AND NUT). ALL SUCH WELDS SHALL HAVE 100% VISUAL INSPECTION. GRADE 4.6S BOLTS TO BE USED.

S11 ALL BOLTS SHALL BE OF SUCH LENGTH THAT AT LEAST ONE FULL THREAD IS EXPOSED BEYOND THE NUT AFTER THE NUT HAS BEEN TIGHTENED.
MINIMUM ONE WASHER SHALL BE USED UNDER THE NUT IN ALL SITUATIONS. IF TIGHTENING IS CARRIED OUT AT THE HEAD, AN ADDITIONAL WASHER SHALL BE USED UNDER THE HEAD. FOR SLOTTED HOLES, SHORTER THAN THE LESSER OF 1.33 TIMES THE BOLT DIAMETER OR (BOLT DIAMETER + 10mm) AND NOT WIDER THAN THE BOLT DIAMETER PLUS 2mm, USE HARDENED WASHER UNDER THE NUT AND BOLT HEAD.

S12 UNLESS NOTED OTHERWISE, ALL MATERIAL TO BE:
- GRADE 250 HOT ROLLED PLATES, FLATS
- GRADE 300PLUS UB, UC, PFC,TFB AND ANGLES
- GRADE 300 WB, WC;
- GRADE 350 RHS, CHS.
- STRUCTURAL STEEL SHALL COMPLY WITH AS/NZS 1163, AS/NZS 3678, AS/NZS 3679.1 OR AS/NZS 3679.2. TEST CERTIFICATES RELATING TO THE STRUCTURAL STEEL SUPPLIED, SHALL BE MADE AVAILABLE TO THE SPECIFIER.
ACCEPTABLE MANUFACTURERS OF STRUCTURAL STEEL MUST ALSO HOLD A VALID CERTIFICATE OF APPROVAL, ISSUED BY THE AUSTRALIAN CERTIFICATION AUTHORITY FOR REINFORCING STEELS LTD (ACRS). MATERIALS CERTIFIED TO AN ALTERNATIVE SYSTEM SHALL NOT BE USED WITHOUT DEMONSTRATED EQUIVALENCE AND SUBSEQUENT WRITTEN APPROVAL FROM THE SPECIFIER. EVIDENCE OF COMPLIANCE WITH THIS CLAUSE MUST BE OBTAINED WHEN CONTRACT BIDS ARE RECEIVED.

S13 HOT DIPPED GALVANIZING SHALL BE IN ACCORDANCE WITH AS 4680 MINIMUM COATING THICKNESS OF 85 MICRONS. PROVIDE MEMBERS TO BE GALVANIZED WITH VENT AND DRAINAGE HOLES IN ACCORDANCE TO THE GALVANISER'S RECOMMENDATIONS AND THE ACCEPTANCE OF THE ENGINEER.

S14 THE ENDS OF TUBULAR MEMBERS SHALL BE SEALED WITH NOMINAL THICKNESS PLATES AND CONTINUOUS FILLET WELDED UNLESS NOTED OTHERWISE.

S15 WHERE MEMBERS SHOWN ON THE STRUCTURAL OR ARCHITECTURAL DRAWINGS ARE REQUIRED TO BE CURVED, BENT OR ROLLED, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE METHODS REQUIRED TO ACHIEVE THE REQUIRED SHAPES WITHOUT LOCALIZED DISTORTION OF THE MEMBERS.

S16 THE CONTRACTOR SHALL PROVIDE AND LEAVE IN PLACE, UNTIL PERMANENT BRACING ELEMENTS ARE CONSTRUCTED, SUCH TEMPORARY BRACING AS IS NECESSARY TO STABILIZE THE STRUCTURE DURING ERECTION. REFER TO NOTES G4 AND G5.

S17 SUBMIT DETAILS OF THE MANUFACTURER, MATERIAL AND SECTION PROPERTIES OF THE PURLINS AND GIRTS TO BE USED FOR APPROVAL. PURLIN AND GIRT BOLTS AND BRIDGING SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S DETAILS UNLESS SHOWN OTHERWISE.

S18 TRIMMING MEMBERS FOR MECHANICAL/HYDRAULIC PENETRATIONS, DRAINAGE GUTTERS, SUMPS ETC., ARE NOT NECESSARILY SHOWN. SUPPORT OF HEAVY PIPES AND DUCTS IS TO BE APPROVED BY THE ENGINEER. SERVICES SHALL BE HUNG FROM THE WEB OF PURLINS NOT FLANGES.

S19 THE DESIGN, SUPPLY AND INSTALLATION OF SECONDARY STEELWORK REQUIRED TO SUPPORT/CONNECT THE FACADE TO BASE STRUCTURE IS THE RESPONSIBILITY OF THE CONTRACTOR.
CERTIFICATION OF ARCHITECTURAL FIXINGS/BRACING OF CEILINGS AND NON-STRUCTURAL WALLS TO THE BASE STRUCTURE IS THE RESPONSIBILITY OF THE CONTRACTOR. FORWARD TO THE ENGINEER A CERTIFICATE OF SUFFICIENCY BY THE SUPPLIER FOR THE ARCHITECTURAL FIXTURES/PANELS/DRY-WALL TO RESIST THE PRESSURES DESIGNATED IN THE DESIGN DOCUMENTS.

ALL STEELWORK TO BE H.D. GALVANISED AS GALVANIZERS SPECIFICATIONS.

Rev	Description	Date	By	App
P1	ISSUED FOR INFORMATION	11.08.23	TF	

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Project Name: MANILDRA RAIL MAINTENANCE BUILDING BOLONG ROAD. BOMADERRY, NSW

Drawing Title: GENERAL NOTES

FOR INFORMATION ONLY

Designed	JR	Project Director Approved	Date
Drawn	TF		North
Scale	1:100		
Date	11/08/23		
Sheet	A1		

Project Ref. 131012 | Drawing No. S0002 | Rev P1

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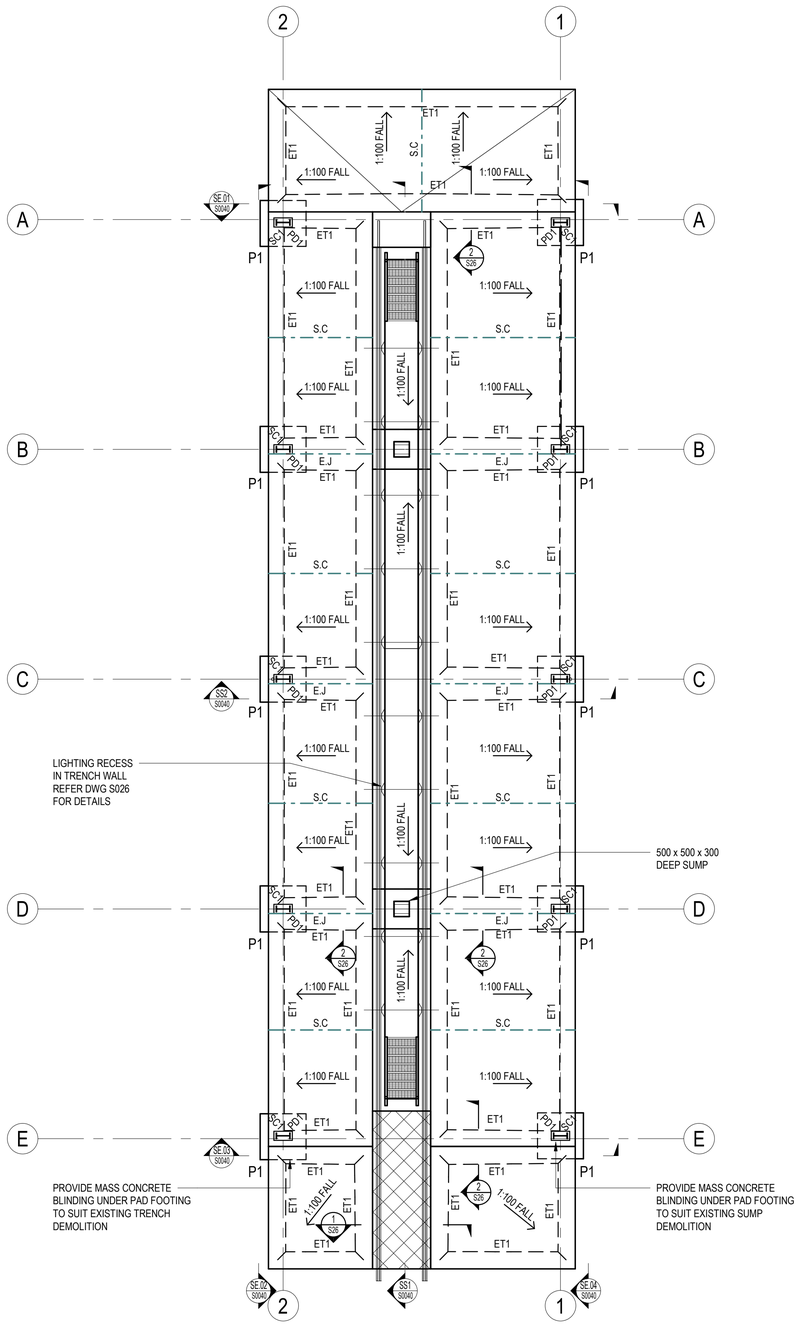

GROUND FLOOR PROFILE PLAN

SCALE: 1 : 100

STRUCTURAL SIZES

(UNLESS OTHERWISE NOTED)

SLAB	GENERALLY 170mm THICK SLAB ON GROUND WITH 1 LAYER SL92 MESH TOP WITH SUBGRADE PREPARATION AND FILLING IN ACCORDANCE WITH GEOTECHNICAL REPORT.

CONCRETE GRADE

FOOTINGS	N32 (DENSEWEIGHT)
SLAB ON GROUND	N40 (DENSEWEIGHT)
PIT WALLS, DRAINS, SUMPS	N40 (DENSEWEIGHT)

LEGEND

(UNLESS OTHERWISE NOTED)

S.C	SAWCUT JOINT
E.J	EXPANSION JOINT
	DENOTES BITUMEN INFILL

FOOTING SCHEDULE

MARK	SIZE	REMARKS
ET1	300 (MIN) WIDE x 400 (MIN) DEEP	EDGE THICKENING
P1	1500 x 1500 x 600 DEEP	PAD FOOTING - REINFORCEMENT AS PER DETAILS
PD1	600 x 300 x 400 DEEP	PEDESTAL - REINFORCEMENT AS PER DETAILS

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P1	ISSUED FOR INFORMATION	11.08.23	TF	

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BOLONG ROAD. BOMADERRY, NSW

Drawing Title: GROUND FLOOR PROFILE PLAN

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Drawn	TF		
Scale	1:100		
Date	11/08/23		
Sheet	A1		

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Project Ref. 131012 | Drawing No. S0020 | Rev P1

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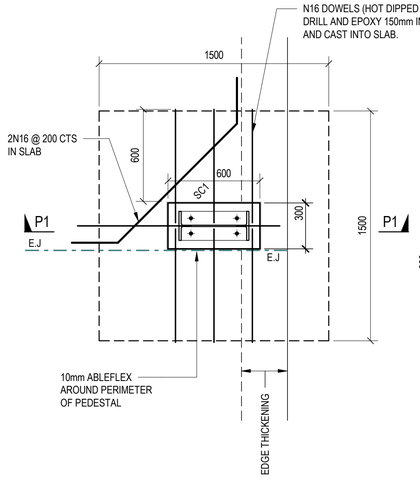
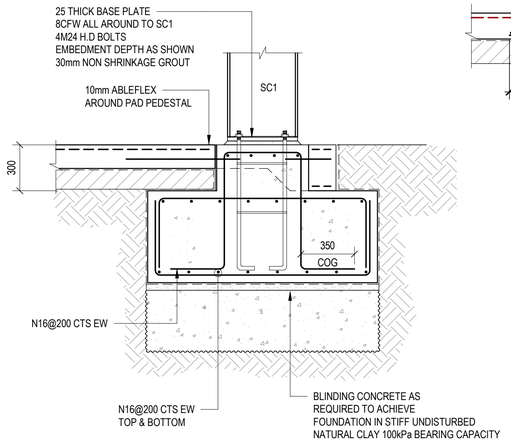


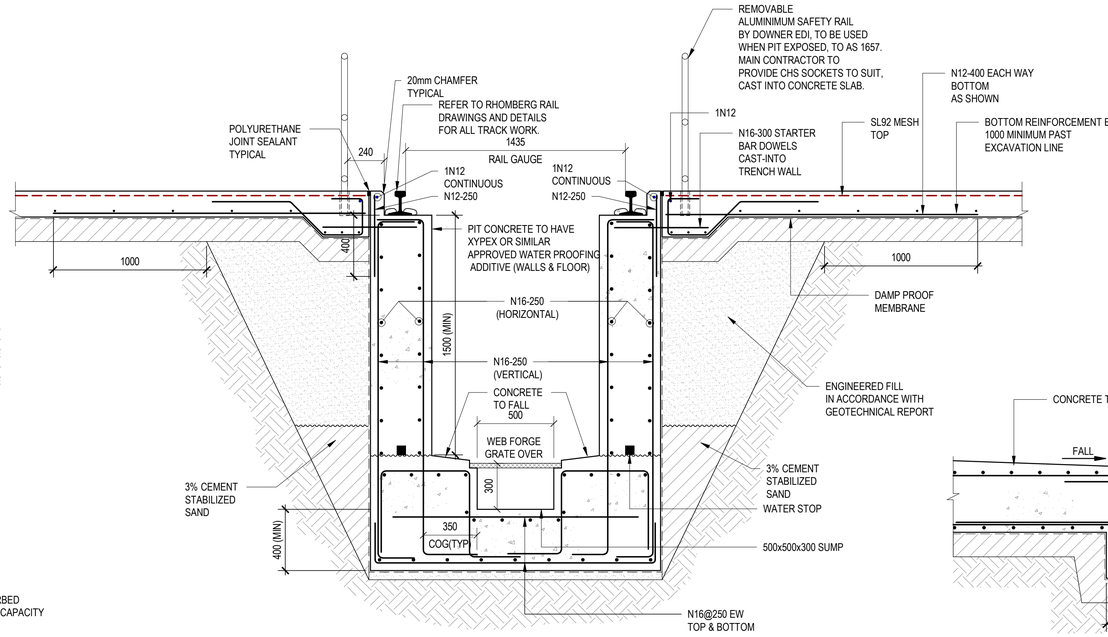
PLAN



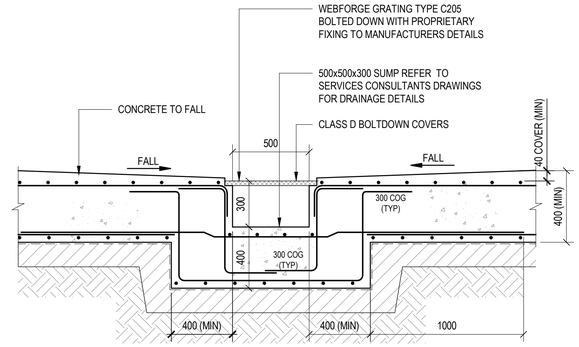
SECTION P1
SCALE 1:20

TYPICAL PAD FOOTING WITH SLAB OVER

SCALE 1:20



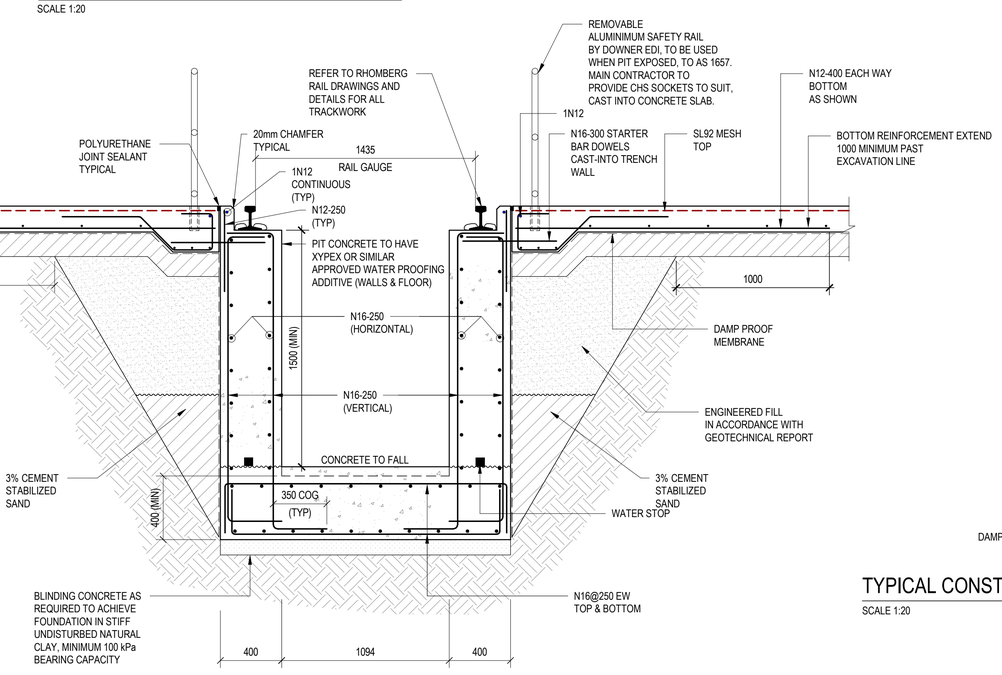
CROSS SECTION



LONG SECTION

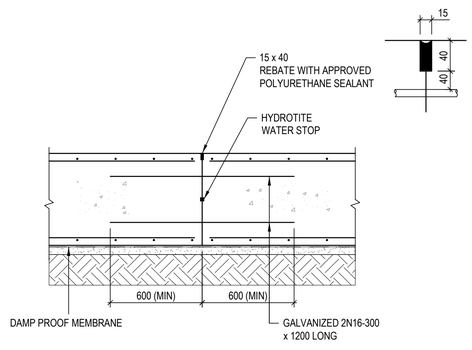
TYPICAL PIT DETAIL AT SUMP

SCALE 1:20



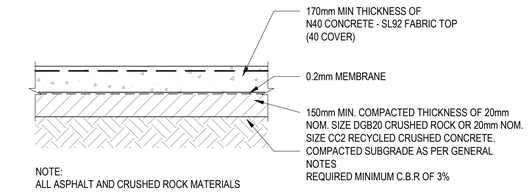
TYPICAL PIT DETAIL

SCALE 1:20



TYPICAL CONSTRUCTION JOINT DETAIL (C.J.) THROUGH TRENCH FLOOR

SCALE 1:20



NOTE:
ALL ASPHALT AND CRUSHED ROCK MATERIALS
AND CONSTRUCTION PROCEDURES SHALL
COMPLY IN ALL RESPECTS WITH THE RELEVANT
'ARTC' AND 'RTA' SPECIFICATIONS.

HEAVY DUTY CONCRETE PAVEMENT

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Project Name: MANILDRA RAIL MAINTENANCE BUILDING BOLONG ROAD. BOMADERRY, NSW

Drawing Title: GROUND FLOOR DETAILS SHEET 1

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Designed	JR	Project Director Approved	Date / North
Drawn	TF		
Scale	1:20	Project Ref.	Drawing No. / Rev
Date	11/08/23	131012	S0025 P1
Sheet	A1		

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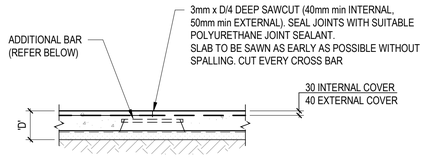
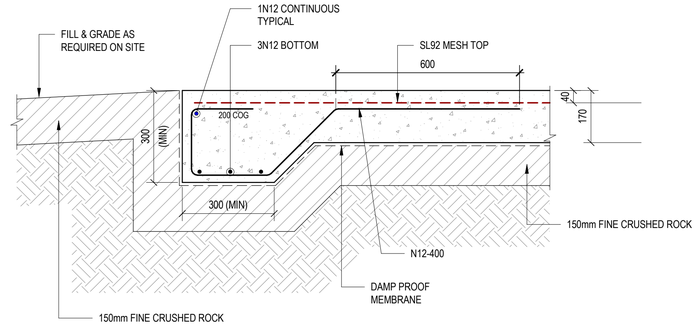
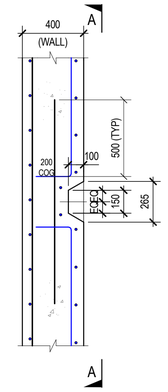


5kPa PROVIDE 'DANLEY' PLATE DOWEL CRADLE AND 6 x 50 GALVANIZED DOWEL AT 450 CTS, INSTALLED TO MANUFACTURER'S INSTRUCTIONS.

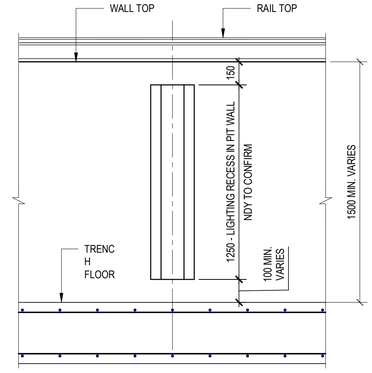
SAWCUT (SC)



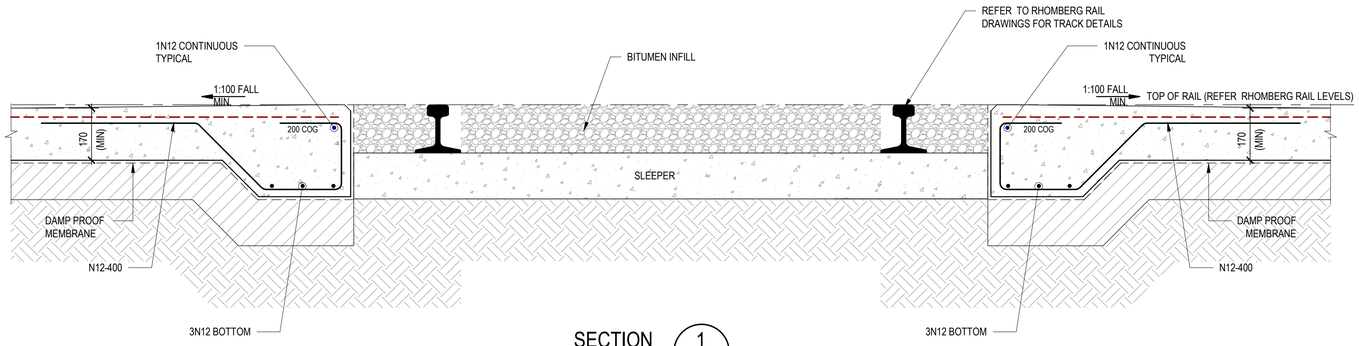
TYPICAL SLAB EDGE THICKENING (NO TRENCH)



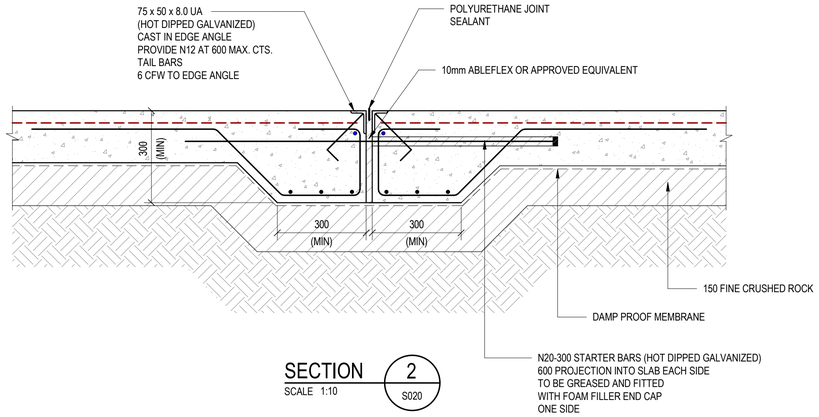
LIGHTING RECESS DETAIL IN PIT WALL



SECTION A-A



SECTION 1 — SCALE 1:10 — S020



SECTION 2 — SCALE 1:10 — S020

TYPICAL EXPANSION JOINT DETAIL

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BOLONG ROAD. BOMADERRY, NSW

Drawing Title: GROUND FLOOR DETAILS
SHEET 2

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Designed	JR	Project Director Approved	Date
Drawn	TF		
Scale	1:10, 1:20		North
Date	11/08/23	Project Ref.	Drawing No. Rev
Sheet	A1	131012	S0026 P1

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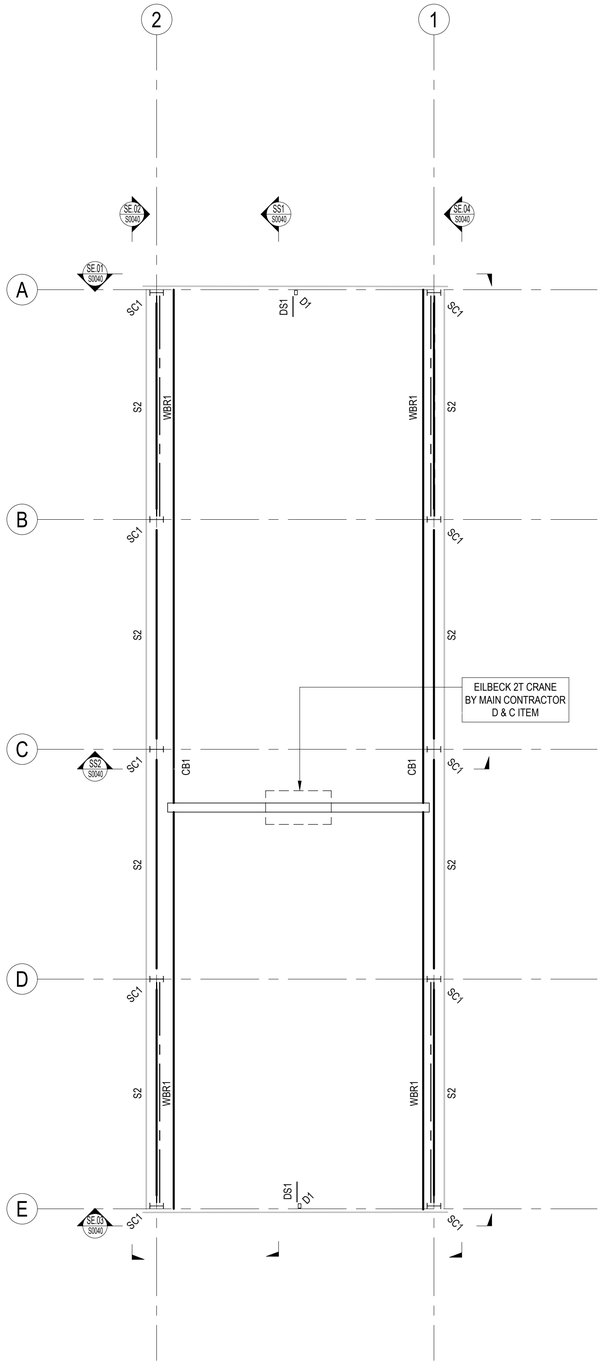
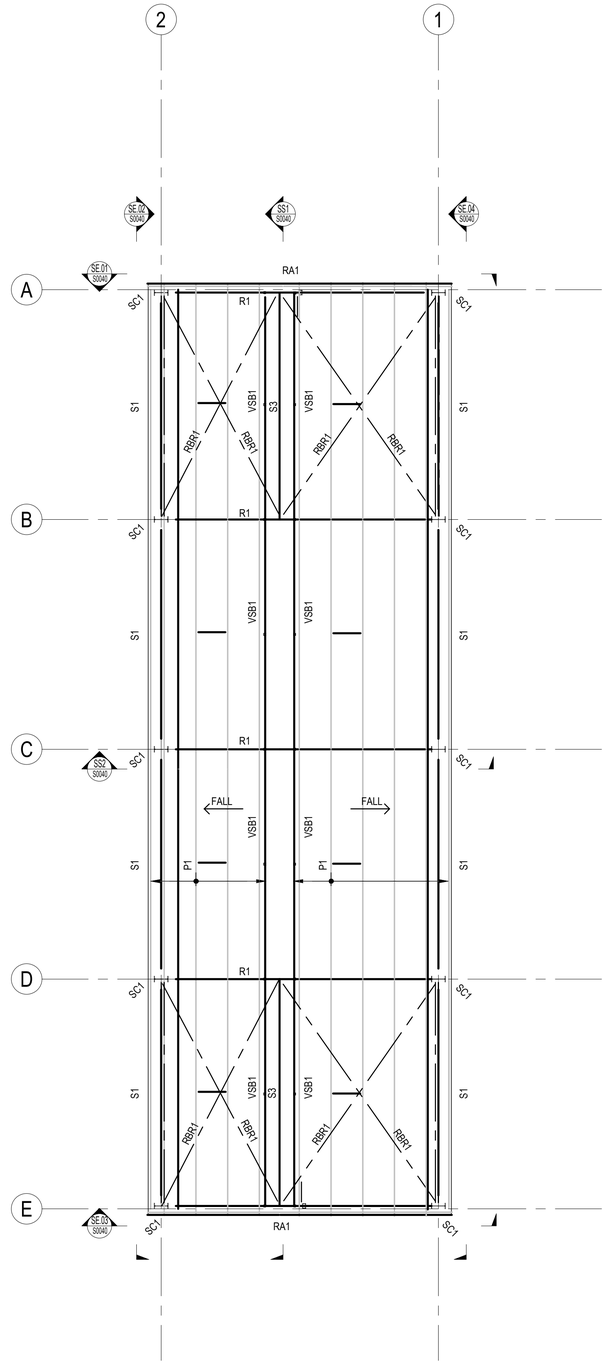


CRANE SUPPORT FRAMING PLAN

SCALE: 1 : 100



ROOF FRAMING PLAN

SCALE: 1 : 100

STEEL FRAMING SCHEDULE

MARK	SIZE	REMARKS
CB1	250 UC 73	CRANE RAIL SUPPORT BEAM
D1	150 x 100 x 5 RHS	DROPPER
DS1	75 x 75 x 8 EA	DROPPER STRUT
FB	50 x 50 x 3 EA	FLY BRACE
FP	C20024	FASCIA PURLIN, LAP 1200 AT SUPPORT, 2 ROWS OF BRIDGING
G1	C20015	GIRTS AT 1000 MAX. CTS., LAP 1200 AT SUPPORT, 2 ROWS OF BRIDGING
G2	200 x 100 x 6 RHS	WITH 50 x 50 x 3 EA WELDED TO SOFFIT FOR SHEETING
P1	Z20015	PURLINS AT 1000 MAX. CTS., LAP 1200 AT SUPPORT, 2 ROWS OF BRIDGING
P2	C15015	PURLINS AT 600 MAX. CTS., LAP 1200 AT SUPPORT
R1	410 UB 60	RAFTER
RA1	50 x 50 x 5 EA	RAKING ANGLE, FIXED TO PURLINS
RBR1	M20 DIA. ROD	ROOF BRACING (GRADE 4.6/s)
S1	100 x 100 x 6 SHS	STRUT
S2	100 x 100 x 6 SHS	STRUT
S3	139.7 x 5.0 CHS	STRUT
SC1	460 UB 75	COLUMN
T1	M12 DIA. ROD	TIE - SAG ROD
VF1	75 x 75 x 5 SHS	VENT FRAME - FULLY WELDED FRAME
VSB1	180 PFC	VENT SUPPORT BEAM
WBR1	M20 DIA. ROD	WALL BRACING (GRADE 4.6/s)

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Project Name: MANILDRA RAIL MAINTENANCE BUILDING
BOLONG ROAD. BOMADERRY, NSW

Drawing Title: ROOF FRAMING PLAN

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Drawn	TF
Scale	1:100
Date	11/08/23
Sheet	A1

Project Director Approved Date North

Project Ref. 131012 | Drawing No. S0030 | Rev P1

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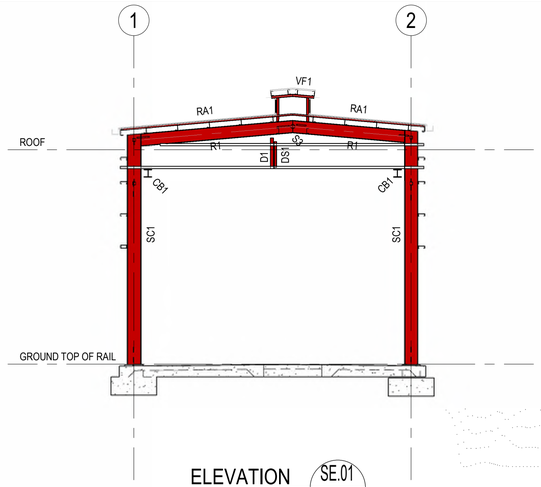

ELEVATION SE.01
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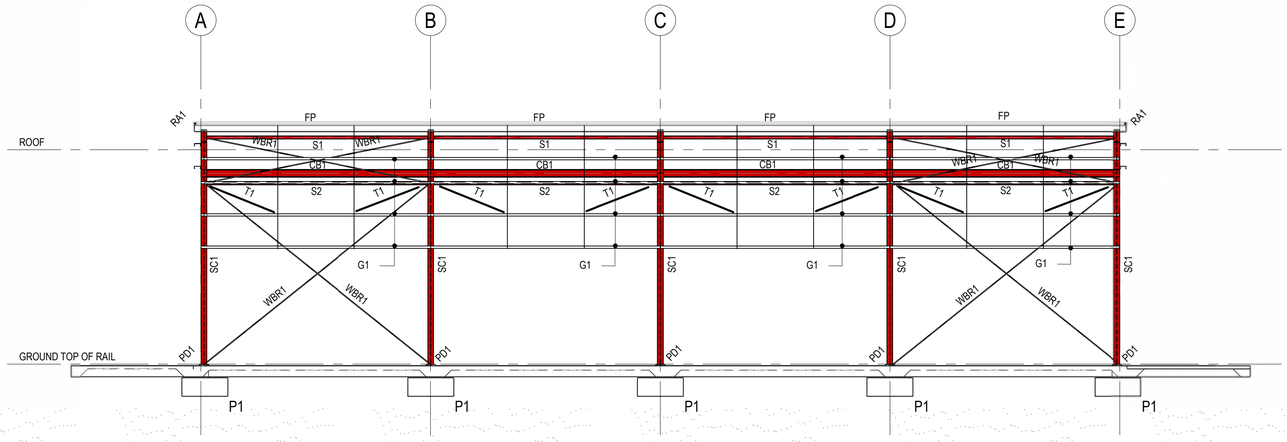
S0020



ELEVATION SE.02
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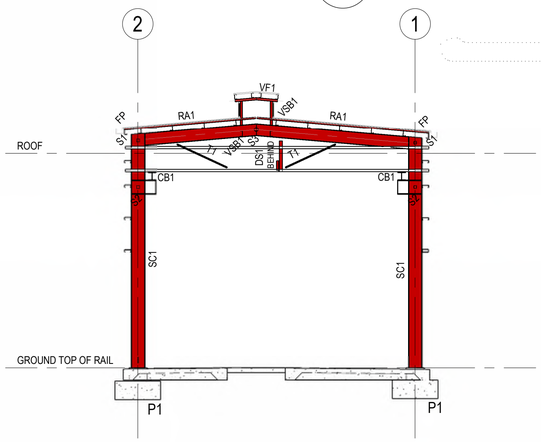
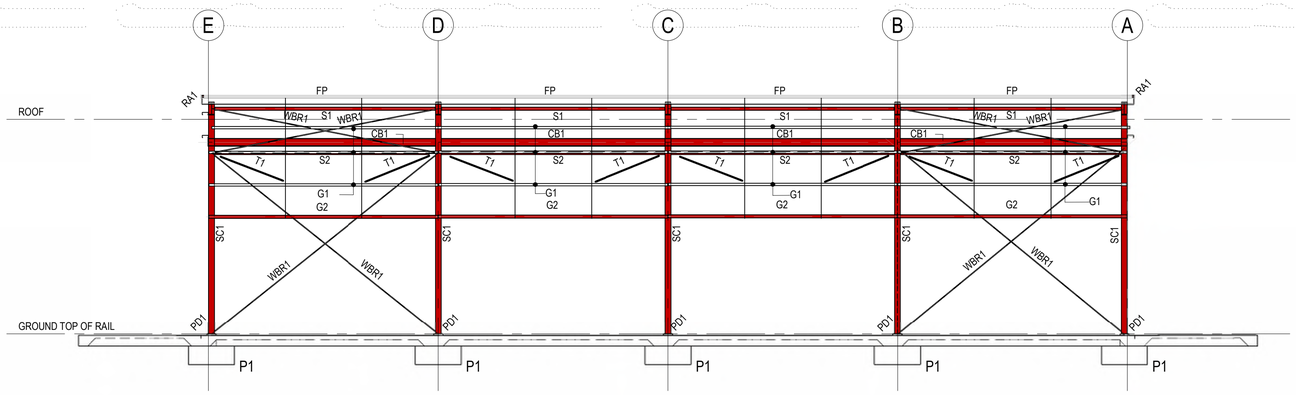
S0020

STEEL FRAMING SCHEDULE

MARK	SIZE	REMARKS
CB1	250 UC 73	CRANE RAIL SUPPORT BEAM
D1	150 x 100 x 5 RHS	DROPPER
DS1	75 x 75 x 8 EA	DROPPER STRUT
FB	50 x 50 x 3 EA	FLY BRACE
FP	C20024	FASCIA PURLIN, LAP 1200 AT SUPPORT, 2 ROWS OF BRIDGING
G1	C20015	GIRTS AT 1000 MAX. CTS., LAP 1200 AT SUPPORT, 2 ROWS OF BRIDGING
G2	200 x 100 x 6 RHS	WITH 50 x 50 x 3 EA WELDED TO SOFFIT FOR SHEETING
P1	Z20015	PURLINS AT 1000 MAX. CTS., LAP 1200 AT SUPPORT, 2 ROWS OF BRIDGING
P2	C15015	PURLINS AT 600 MAX. CTS., LAP 1200 AT SUPPORT
R1	410 UB 60	RAFTER
RA1	50 x 50 x 5 EA	RAKING ANGLE, FIXED TO PURLINS
RBR1	M20 DIA. ROD	ROOF BRACING (GRADE 4.6/s)
S1	100 x 100 x 6 SHS	STRUT
S2	100 x 100 x 6 SHS	STRUT
S3	139.7 x 5.0 CHS	STRUT
SC1	460 UB 75	COLUMN
T1	M12 DIA. ROD	TIE - SAG ROD
VF1	75 x 75 x 5 SHS	VENT FRAME - FULLY WELDED FRAME
VSB1	180 PFC	VENT SUPPORT BEAM
WBR1	M20 DIA. ROD	WALL BRACING (GRADE 4.6/s)



ELEVATION SE.03
SCALE 1 : 100
S0020



ELEVATION SE.04
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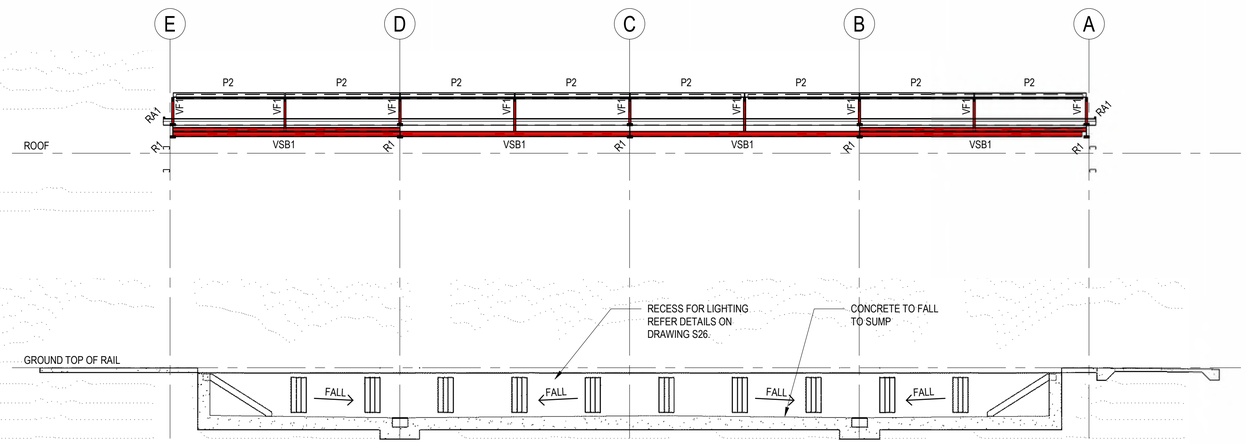
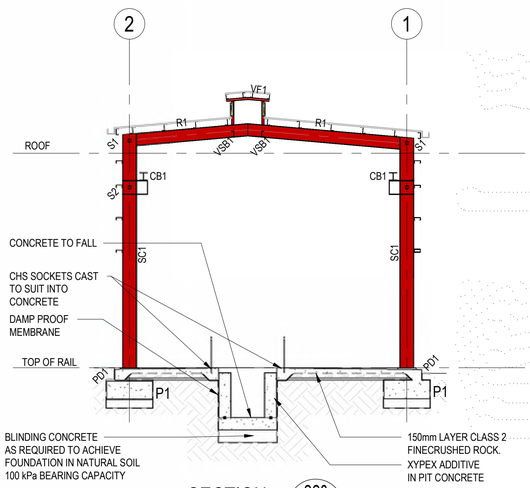
S0020



SECTION SS1
SCALE 1 : 100
S0020



SECTION SS2
SCALE 1 : 100
S0020

Rev	Description	Date	By	App
P1	ISSUED FOR INFORMATION	11.08.23	TF	

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Project Name: MANILDRA RAIL MAINTENANCE BUILDING
BOLONG ROAD. BOMADERRY, NSW

Drawing Title: STEELWORK ELEVATIONS

FOR INFORMATION ONLY

Designed	JR	Project Director Approved	Date
Drawn	TF		
Scale	1:100		North
Date	11/08/23	Project Ref.	Drawing No. Rev
Sheet	A1	131012	S0040 P1

A1

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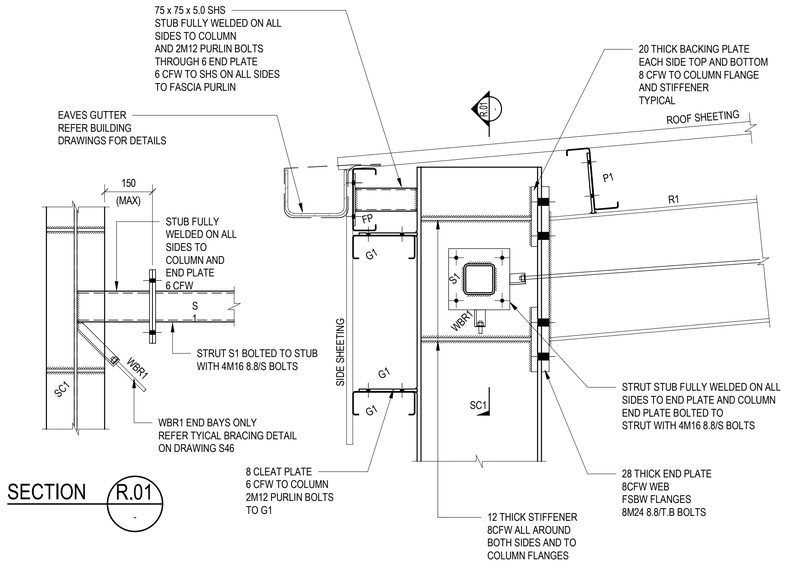
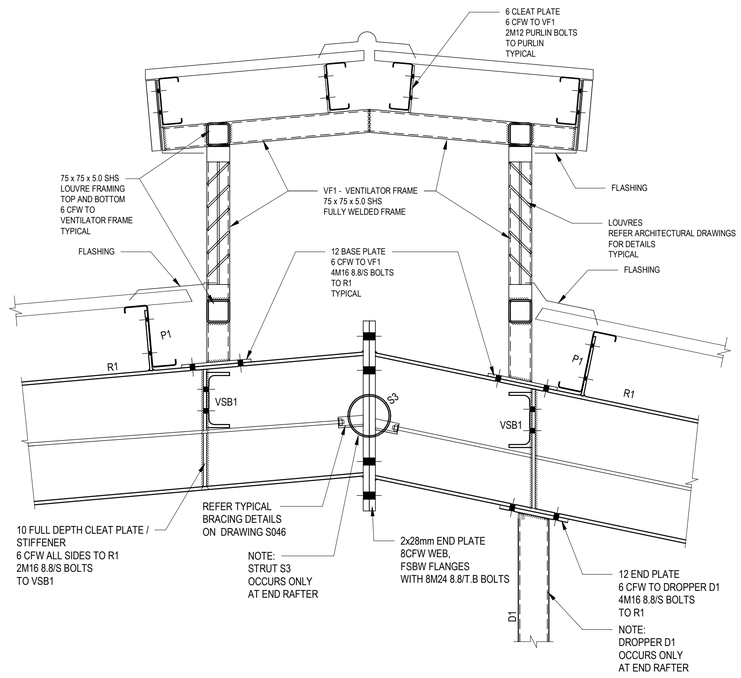
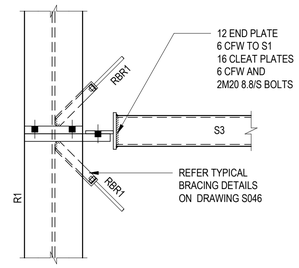
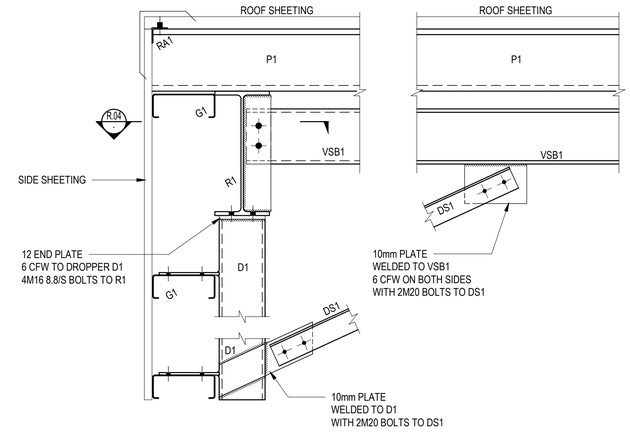


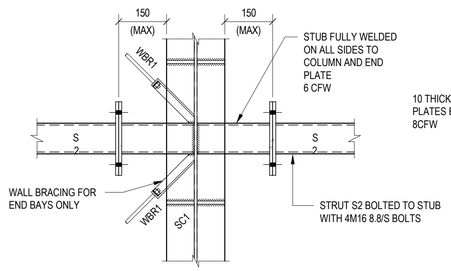
TYPICAL PORTAL KNEE - DETAIL

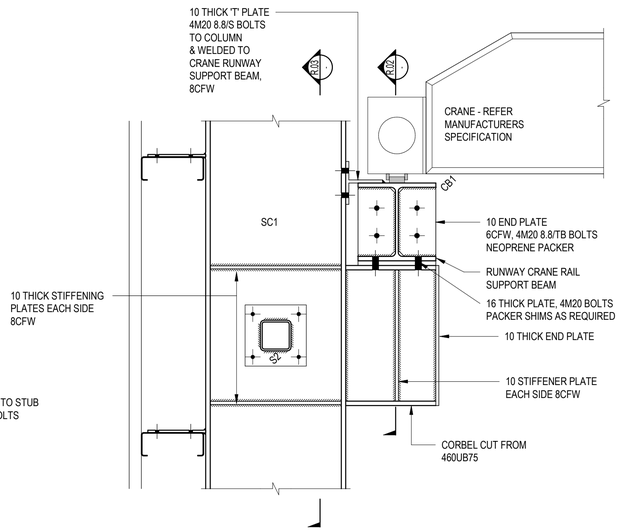


TYPICAL PORTAL APEX - DETAIL

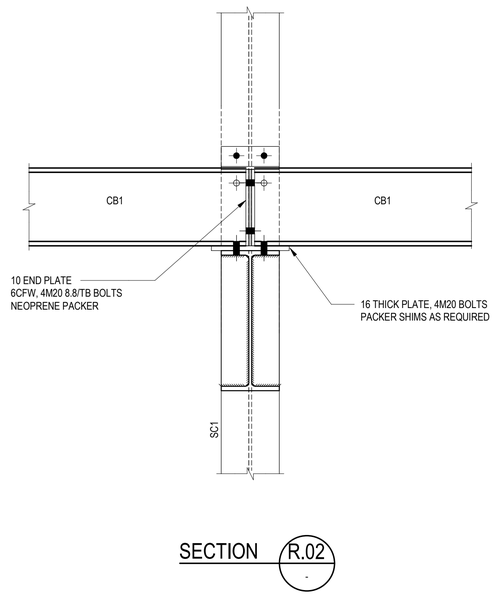


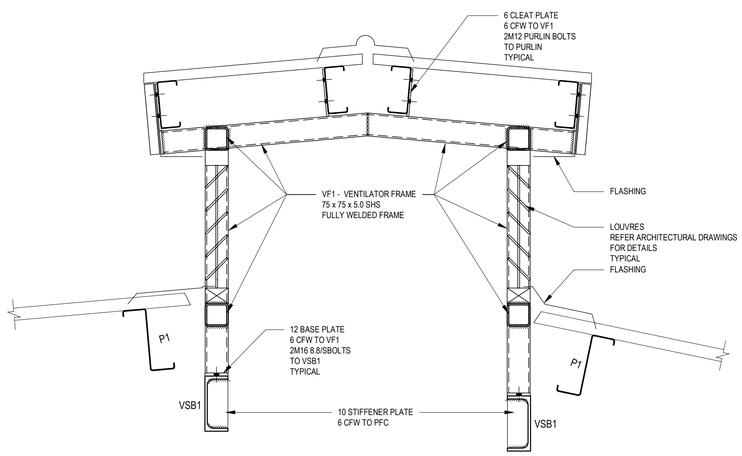






TYPICAL CRANE HAUNCH & RAIL SUPPORT- DETAIL





TYPICAL GABLE END GIRT BRACE - DETAIL

TYPICAL CONNECTION VSB1 TO VF1

Rev	Description	Date	By	App
P1	ISSUED FOR INFORMATION	11.08.23	TF	

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Project Name: MANILDRA RAIL MAINTENANCE BUILDING
BOLONG ROAD. BOMADERRY, NSW

Drawing Title: STEELWORK DETAILS
SHEET 1

FOR INFORMATION ONLY

Designed	JR	Project Director Approved	Date
Drawn	TF		
Scale	1:10		
Date	11/08/23		
Sheet	A1		

North

Project Ref. 131012 | Drawing No. S0045 | Rev P1

A1

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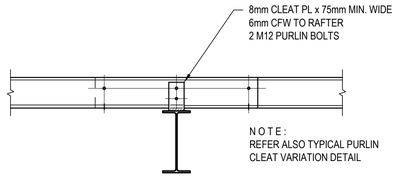
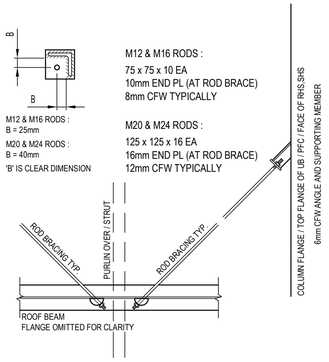


PROVIDE 6M12 BOLTS TOTAL AT ALL SPLICE LOCATIONS
NOTE : '2' BOLTS LOCATED IN BOTTOM FLANGE

TYPICAL PURLIN SPLICE DETAIL

SCALE 1:20

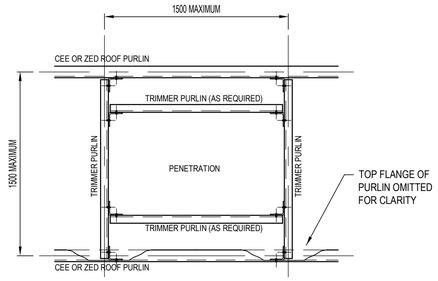


U.M.I WIND BRACING BRACKETS
ALLOW SUFFICIENT THREAD FOR TIGHTENING
NOTE: PLACE AS CLOSE AS POSSIBLE TO TOP OF
BEAM FLANGE & TO LINE OF PURLIN / STRUT OVER

ROOF/WALL DIAGONAL BRACING DETAILS

SCALE 1:20

NOTE:
- ALL RODS TO BE GRADE 4.6/S
- ALL WELDS TO BE E48xx
- ALL CROSS BRACING TO BE TENSIONED

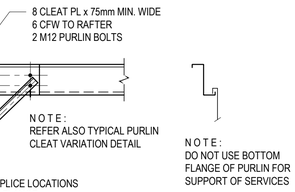


PROVIDE C100 19 TRIMMER PURLINS
TYPICALLY TO PERIMETER OF PENETRATION
PROVIDE 90 x 90 x 6 EA x 75 LONG AT
ALL JUNCTIONS USING 2M12 PURLIN BOLTS
IN 14 DIA. HOLES TYPICALLY

TYPICAL ROOF PENETRATION TRIMMER DETAIL

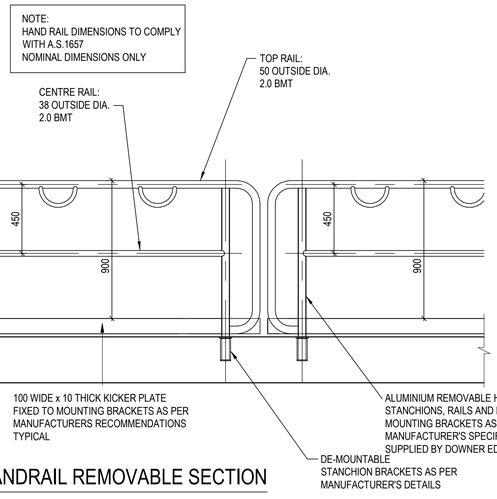
SCALE 1:20

(NOTE: TRIMMERS FOR LIGHT SUPPORT SIMILAR)



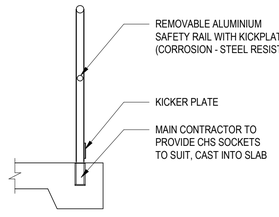
PROVIDE 6M12 BOLTS TOTAL AT ALL SPLICE LOCATIONS
NOTE : '2' BOLTS LOCATED IN BOTTOM FLANGE

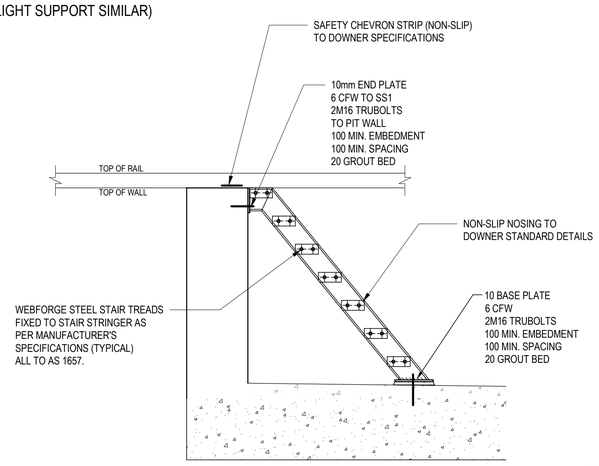
TYPICAL FLY BRACE DETAIL



TYPICAL HANDRAIL REMOVABLE SECTION

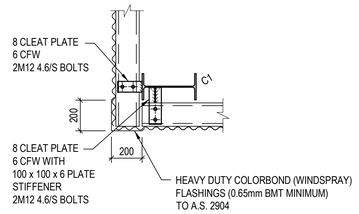
SCALE 1:20





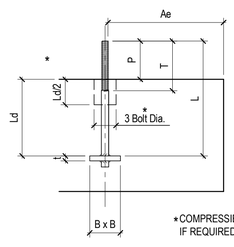
TYPICAL STAIR DETAILS

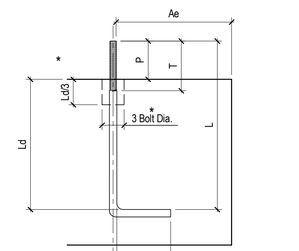
SCALE 1:20



CORNER PLAN DETAIL

SCALE 1:20





HOLDING DOWN BOLT DETAILS

SCALE 1:10

HOLDING DOWN BOLTS U.N.O
Material — Finish
Grade 4.6 AS 1111 — Galvanised AS/NZS 4680 For External Situations

NUTS AND WASHERS
Material — Finish
Grade 4.6 AS 1237 — Galvanised AS 1650 For External Situations

BASE PLATE
Material — Finish
Grade 250 AS3679 — Black

THREAD SIZE	LENGTH L	THREAD T	PROJ. P	EMBED. Ld	EDGE DIST. Ae	PLATE B	THICKNESS t	WELD (E48xx) tw
M30	440	170	140	300	450	125	20	8
M24	375	150	125	250	375	100	16	6
M20	325	150	125	200	300	75	12	6
M16	250	125	100	150	225	65	10	6

NOTES :
- FOR EMBEDMENT LENGTHS OR EDGE DISTANCES LESS THAN THESE VALUES, FULLY DEVELOPED REINFORCEMENT MUST BE PROVIDED TO INTERCEPT POTENTIAL CRACKING PLANES.
- CONCRETE UNREINFORCED, F'c = 25MPa MINIMUM
- TACK WELD 10mm BAR AROUND HOLDING DOWN BOLTS TO FORM A CAGE, TYPICALLY

HOLDING DOWN BOLT DETAILS

SCALE 1:10

HOLDING DOWN BOLTS U.N.O
Material — Finish
Grade 4.6 AS 1111 — Galvanised AS/NZS 4680 For External Situations

NUTS AND WASHERS
Material — Finish
Grade 4.6 AS 1237 — Galvanised AS 1650 For External Situations

BASE PLATE
Material — Finish
Grade 250 AS3679 — Black

THREAD SIZE	LENGTH L	COG H	THREAD T	PROJ. P	EMBED. Le	EDGE DIST. Ae
M30	650	200	170	140	510	450
M24	550	200	150	125	425	375
M20	450		150	150	125	325
M16	400		100	125	100	300

NOTES :
- FOR EMBEDMENT LENGTHS OR EDGE DISTANCES LESS THAN THESE VALUES, FULLY DEVELOPED REINFORCEMENT MUST BE PROVIDED TO INTERCEPT POTENTIAL CRACKING PLANES.
- CONCRETE UNREINFORCED, F'c = 25MPa MINIMUM
- TACK WELD 10mm BAR AROUND HOLDING DOWN BOLTS TO FORM A CAGE, TYPICALLY

Rev	Description	Date	By	App
P1	ISSUED FOR INFORMATION	11.08.23	TF	

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Project Name: MANILDRA RAIL MAINTENANCE BUILDING
BOLONG ROAD. BOMADERRY, NSW

Drawing Title: STEELWORK DETAILS
SHEET 2

FOR INFORMATION ONLY

Designed	JR	Project Director Approved	Date / North
Drawn	TF		
Scale	1:20	Project Ref.	Drawing No. / Rev
Date	11/08/23	131012	S0046 P1
Sheet	A1		

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A1

Symaga Silos

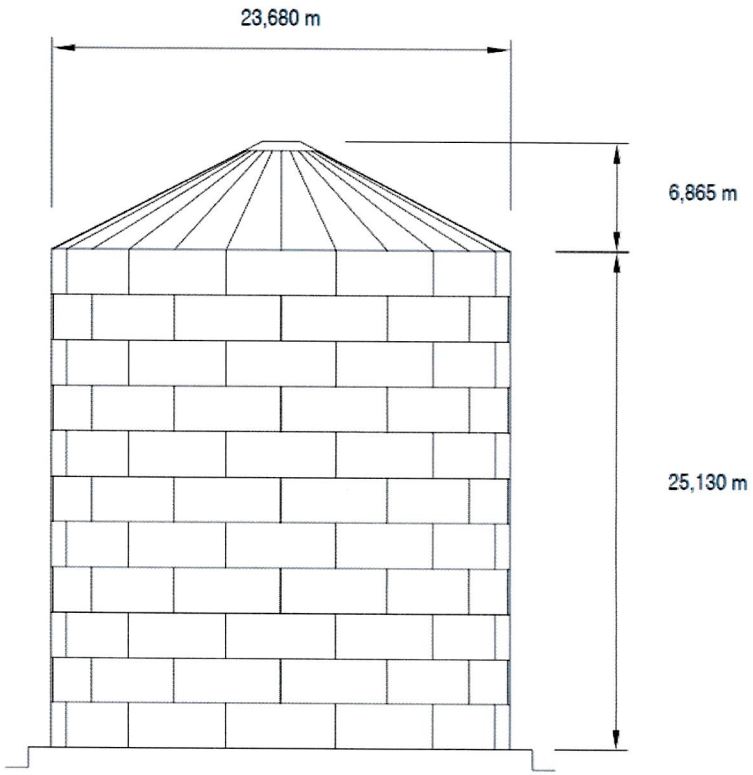
Specifictions:

Capacity for wheat:

8.682,9t

9.204t with copmactation

Flat bottom silos SBHX2368/21
Made in galvanized and corrugated steel sheets, with outside galvanized stiffeners and with the following dimensions:
Model: SBHX2368/21
Diameter (mm): 23683
Cylindrical height (mm): 23990
Total height (mm): 30529
Roof slope: 30º
Total volume (m3): 11577,3
Steel covering:
Roof sheets ZM310, body sheets and stiffeners Z600 - 600 g/m² (42 µm) according the norm UNE-EN-10346:2015
Bolts: quality 8.8 or 10.9 hot dip galvanized.
Silo includes a roof ladder, roof inspection door and a cylinder access door in the second ring, and bolting.
Product to be stored: HÜLSENFRÜCHTE UND ÖLSAAt
Density (Kg/m3): 780,00
Capacity (Tn): 9.030,29
Capacity with 6% due to compactation (Tn): 9.572,11



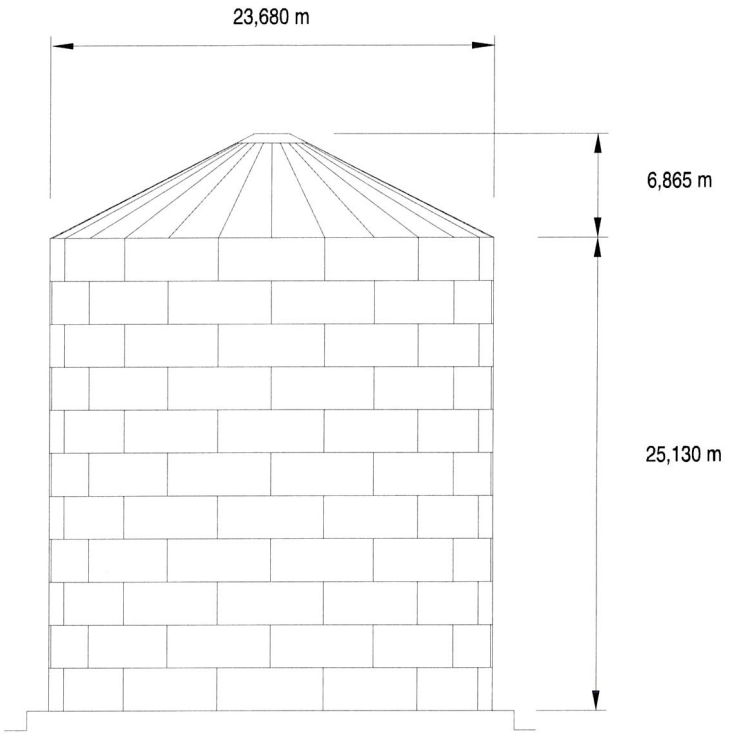
FOUNDATION LOADS

Silo: 23,68/22

(Unfactored Loads)

BUHLER AG

PRO-SYM-004800

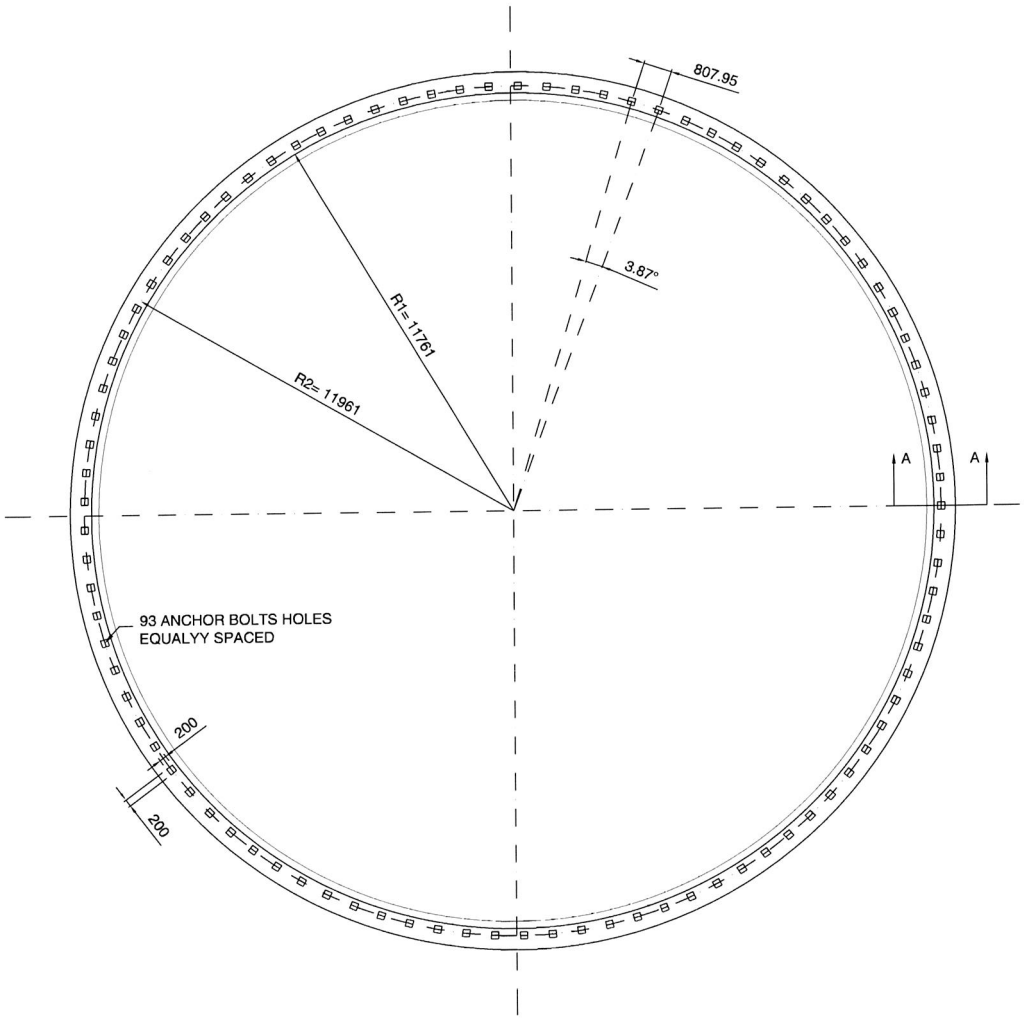


Notice: Loads according our Standard
Please, check with local Code

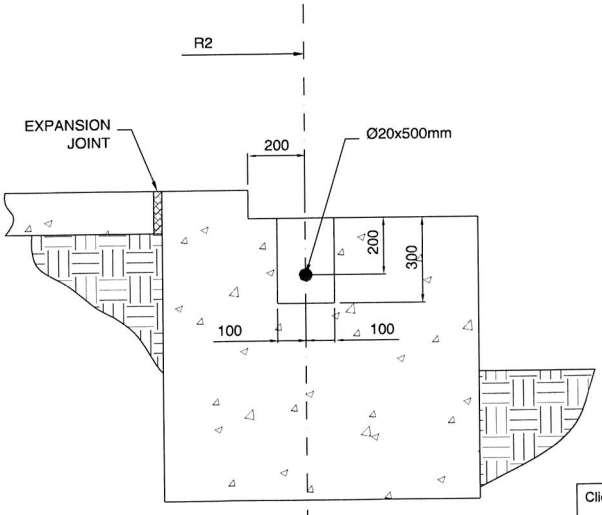
Code:	ANSI/ASAE EP433
Density:	0,834 Tn/m3
Date:	09/12/2021

SYMAGA SILOS

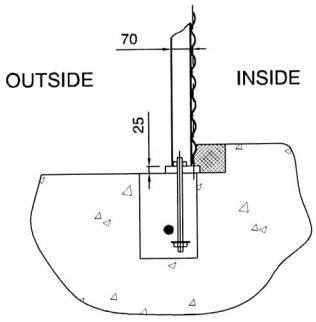
Load Type / Hypothesis	Seismic Cs	Snow	Wind	Total Load
Surface Load at the Bottom of the Silo due to grain.	-	-	-	**14,78 Tn/m²**
Vertical Load per Stiffener due to own weight(silo and conveying system).	-	-	-	**1,06 Tn**
Vertical Load per Stiffener due to grain.	-	-	-	**37,22 Tn**
Vertical Load per Stiffener due to snow weight.	-	200 kg/m2	-	**0,82 Tn**
Vertical Load per Stiffener due to wind.	-	-	176 kg/m2	**2,48 Tn**
Vertical Load per Stiffener due to seismic.	0,056	-	-	**13,88 Tn**
Horizontal Load per Stiffener only due to wind.	-	-	176 kg/m2	**1,02 Tn**
Horizontal Load per Stiffener only due to seismic.	0,056	-	-	**6,06 Tn**
Bending Moment due to wind load	-	-	176 kg/m2	**1365,13 Tn.m**
Bending Moment due to seismic load	0,056	-	-	**7858,18 Tn.m**
Number of Stiffeners evenly distributed around Silo circunference				**93**



DETAILS E: 1/25



SECTION A-A



ANCHOR DETAIL

Cliente/customer: Customer			Oferta/Order Nº: -----		
Ref. /project: Reference					
Plano/drawing: FOUNDATION SILO Ø2368					
Dibujado/drawer: R.LP	07/09/2017	Rev:	Escala/scale:	Tamaño/Paper size:	
Aprob. /confirmed: D.T.	07/09/2017	0	1/200	A4	
Categoria/Issued: FOUNDATION					
Nombre/Drawing:					
Observ. /Notes: 3 STIFFENERS/BODYSHEET					

SYMAGA SILOS

C/Azcona 37, Madrid C.P. 28028 Phone: +34 917264304 www.symaga.com
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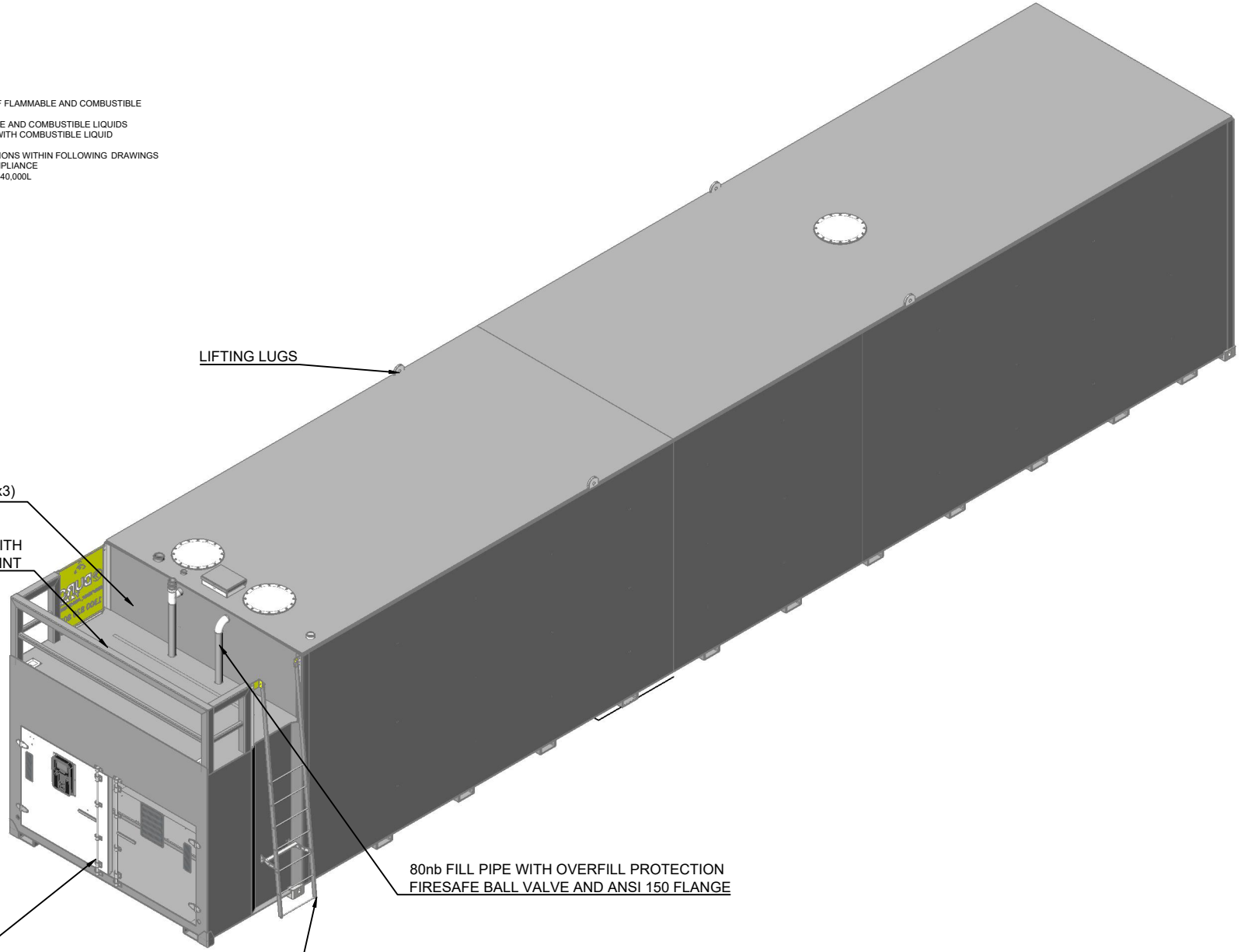
ENGINEERING SPECIFICATIONS:

1. MATERIAL SPECIFICATION
   - FLAT: GRADE 300+ AS/NZS 3679.1
   - PLATE/ SHEET: GRADE 250 AS 3678
   - PFC: GRADE 300+ AS/NZS 3679.1
   - R/BAR: GRADE 300+ AS/NZS 3679.1
   - ALL FLANGES ANSI 150
   - ALL VALVES FIRE SAFE CARBON STEEL
2. DESIGN COMPLIANCE
   - ADG CODE 7th EDITION
   - AS1940-2017: STORAGE AND HANDLING OF FLAMMABLE AND COMBUSTIBLE LIQUIDS
   - AS1692-2006: STEEL TANK FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS
   - FUEL TANK IS DEFINED AS CATEGORY 3, WITH COMBUSTIBLE LIQUID
   - BUNDED 'DOUBLE SKIN' DESIGN
   - DIMENSIONAL AND MATERIAL SPECIFICATIONS WITHIN FOLLOWING DRAWINGS SET NEED TO BE MAINTAINED AND TO MEET COMPLIANCE
   - THE DESIGNED SAFE FILL LEVEL (SFL) IS 140,000L
   - FUEL TANK ASSEMBLY WEIGHT
     - EMPTY: 23,000kg
     - FILLED: 139,200kg



REV	DATE	DETAILS	BY/APPD

REVISION HISTORY

GENERAL NOTES
- ALL DIMENSIONS ARE IN MILLIMETERS (mm) U.N.O
- GENERAL TOLERANCE U.N.O
  - X ± 0.5
  - X.X ± 0.1
  - X.XX ± 0.05
  - Angular ±0.25°
- REMOVE ALL SHARP EDGES AND BURRS
- PAINTING MANUFACTURER IN ACCORDANCE
- MATERIAL GR250

2 West St, Lake Cargelligo NSW 2672
Phone: 1300 829 802
Email: sales@durotank.com.au
Web: www.durotank.com.au

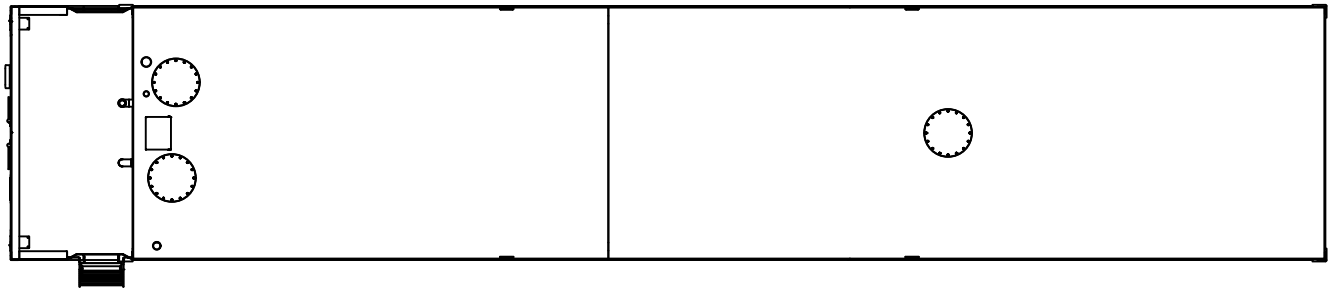
DURO TANK®
'BUILT TOUGH, PROVEN TOUGH'

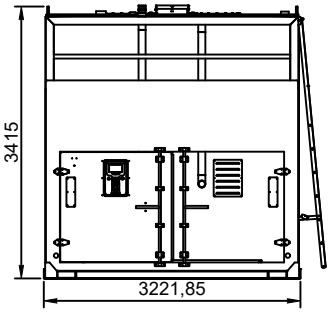
THIRD ANGLE PROJECTION AS1100
1.6
STANDARD FINISH SURFACE

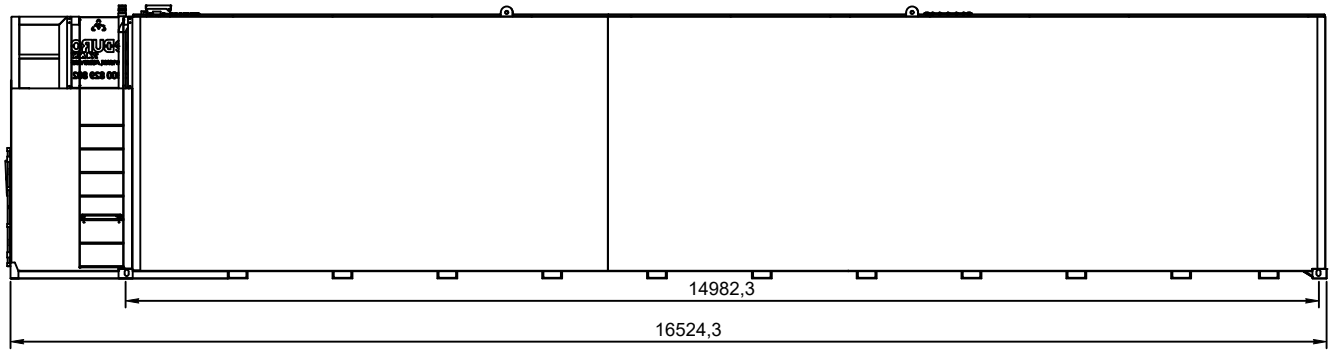
DRN: MWH
DATE: 01.05.2023
CHK:

TITLE: OVERVIEW

SHEET: A3
DWG NO: ST140
DO NOT SCALE U.N.O







REV	DATE	DETAILS	BY/APPD

REVISION HISTORY

GENERAL NOTES
- ALL DIMENSIONS ARE IN MILLIMETERS (mm) U.N.O
- GENERAL TOLERANCE U.N.O

X	± 0.5
X.X	± 0.1
X.XX	± 0.05
Angular	±0.25°

- REMOVE ALL SHARP EDGES AND BURRS
- PAINTING MANUFACTURER IN ACCORDANCE
- MATERIAL GR250

2 West St, Lake Cargelligo NSW 2672
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THIRD ANGLE PROJECTION AS1100
1.6
STANDARD FINISH SURFACE

DRN: MWH
DATE: 01.05.2023
CHK:

TITLE
LAYOUTS

SHEET A3

DWG NO: ########

DO NOT SCALE U.N.O



Inclusion of August 2024 Australian Rainfall & Runoff Version 4.2 Climate Change

Appendix C

APPENDIX C: Inclusion of August 2024 Australian Rainfall & Runoff Version 4.2 Climate Change

C1 Introduction ARR Version 4.1

The hydrologic and hydraulic modelling in this report was taken from the November 2022 Lower Shoalhaven River Flood Study which was adopted by Shoalhaven City Council for application of design flood levels on the lower Shoalhaven River floodplain. The 2022 Flood Study adopted the 2019 ARR Version 4.1 (Reference 4) approach for design flood modelling which was the best practice approach at the time and undertook a climate change analysis with the summary text provided below.

The study also assessed the potential impacts of both Climate Change induced rainfall increases and sea level rise using current recommended ARR2019 values based on global climate modelling. Increased rainfall due to climate change has the biggest impact in the Shoalhaven River upstream of Nowra Bridge due to the increased flows and the incised valley. The increased flow dominates changes in expected flood levels to approximately Terara, with sea level rise having impacts in the Shoalhaven River downstream of Terara and in the Crookhaven River/Crookhaven Creek floodplain. Only minor increases in flood level are observed in the Broughton Creek floodplain.

For the 1% AEP, with rainfall increases of 16.3% due to Climate Change, associated increased flows may result in increases in flood levels in the Shoalhaven River upstream of Nowra by up to almost 1.4m at Grassy Gully and 1.1m at Gradys Caravan Park reducing to 200mm at Nowra Bridge. Increases in the lower floodplain areas are generally less than 150mm for all scenarios up to 7.6% rainfall increase with increases typically 150 – 250 mm for the 16.3% (2090 RCP 8.5) rainfall increase.

In combination with Sea Level Rise a further increase in water levels may be expected around low-lying foreshore areas and up to 400mm total water level increases near the Shoalhaven and Crookhaven River entrances.

C2 August 2024 Engineers Australia ARR Version 4.2

In August 2024 Engineers Australia released ARR Version 4.2. The most significant change was inclusion of an updated anthropomorphic climate change approach. This provided a methodology to include climate change increases in design rainfall intensities to those adopted in the 2022 Flood Study, as stated below.

There is unequivocal evidence that greenhouse gas emissions have caused global warming. The Intergovernmental Panel on Climate Change's sixth assessment report concluded that global surface temperatures have significantly increased above pre-industrial levels, with significant further warming expected (IPCC, 2023). This warming is causing an increase in many drivers of flood risk, including an intensification of extreme rainfall events and the elevation of average and extreme sea levels (IPCC, 2023).

Traditionally, design flood estimation has assumed that historical observations are representative of current and future conditions. This is no longer the case. Records on historical flooding or flood drivers (such as extreme rainfall or sea level) can no longer be assumed to provide a direct analogue of current or future flood risk. To account for significant observed and projected changes to the drivers of flooding, it is necessary to account for the non-stationarity of flooding in the assessment of current and future flood risks.

Key differences from the ARR 2019 Climate Change Considerations chapter (Version 4.1) include the following.

- Recognition that global temperatures have increased over the historical period used to derive design rainfall information.
- A recommendation to adjust 2016 Intensity-Frequency-Duration curves to present (i.e. current climate) conditions.
- Provision of information to support a range of approaches to decision-making.
- Provision of guidance across the range of AEP considered in ARR up to and including the PMP.
- Provision of uncertainty estimates.
- Consideration of additional factors that influence design flood estimates; that is, changes in rainfall losses, temporal patterns, and sea level rise.

C3 Description of August 2024 ARR Climate Change Approach

The latest Intergovernmental Panel on Climate Change (IPCC) temperature projections are based on Shared Socioeconomic Pathways (SSPs) that cover a broad range of potential future development options referred to as very low (SSP1-1.9), low (SSP1-2.6), medium (SSP2-4.5), high (SSP3-7.0) and very high (SSP5-8.5) emissions pathways. SSPs are the current 'what if' scenarios used to explore the consequences of greenhouse gases accumulating in the atmosphere. Each SSP outlines ways the world might change in the future, including different types of energy generation, rates of population growth, economic development and land uses. These lead to different levels of greenhouse gas emissions over time.

The SSP "names" consist of the following two parts. The "SSP Family" code based on one of the five global socio-economic narratives, and the extra energy reaching the earth by the year 2100. This is summarised Diagram C1 with the projected temperature increases for each SSP shown on Diagram C2.

Diagram C1: Representation of SSPs

	SSP1-1.9 "SUSTAINABILITY"	SSP1-2.6 "SUSTAINABILITY"	SSP2-4.5 "MIDDLE OF THE ROAD"	SSP3-7.0 "REGIONAL RIVALRY"	SSP5-8.5 "FOSSIL-FUELLED DEVELOPMENT"
RCP equivalent	No equivalent RCP	RCP2.6	RCP4.5	No equivalent RCP	RCP8.5
THE WAY THE WORLD MIGHT CHANGE IN THE FUTURE					
Emissions reduction	Very high and immediate	High and immediate	Moderate from 2040s	None (minor slowing)	None (accelerating)
Energy sources	Renewables	Renewables and biofuels	Renewables and fossil fuels	Fossil fuels	Increased fossil fuels
Carbon dioxide removal	New technology	New technology	None	None	None
Global socio-economic trends	Gradual move towards sustainability and environmental respect; increasing action towards Sustainable Development Goals (SDGs)	Gradual move towards sustainability and environmental respect; increasing action towards SDGs	Similar to the past; unevenly distributed; slow progress towards SDGs	Slow and increasingly unequal	Rapid growth at the expense of the environment; resource intensive lifestyles and industries; high investment in health and education; dependence on technological solutions
WHAT THE FUTURE CLIMATE MAY LOOK LIKE UNDER EACH SSP					
Global warming by 2100	1.0-1.8°C	1.3-2.4°C	2.1-3.5°C	2.8-4.6°C	3.3-5.7°C
Resulting global warming levels*	Due to past emissions all SSPs reach 1.5°C in the 2030s and then diverge				
	Overshoots 1.5C slightly around 2050 then returns and stabilises near 1.5C by 2100	Reaches 2°C around 2050s and stabilises	Reach 2°C around 2050s 2.7°C by 2100	Reach 2°C around 2050s 3°C around 2070s 4°C possible by 2100	Reach 2°C around 2050s 3°C around 2060s 4°C by around 2080s

Diagram C2: Projected temperature increases associated with the 6th IPCC Report socioeconomic pathways relative to 1961-1990 and their associated uncertainty

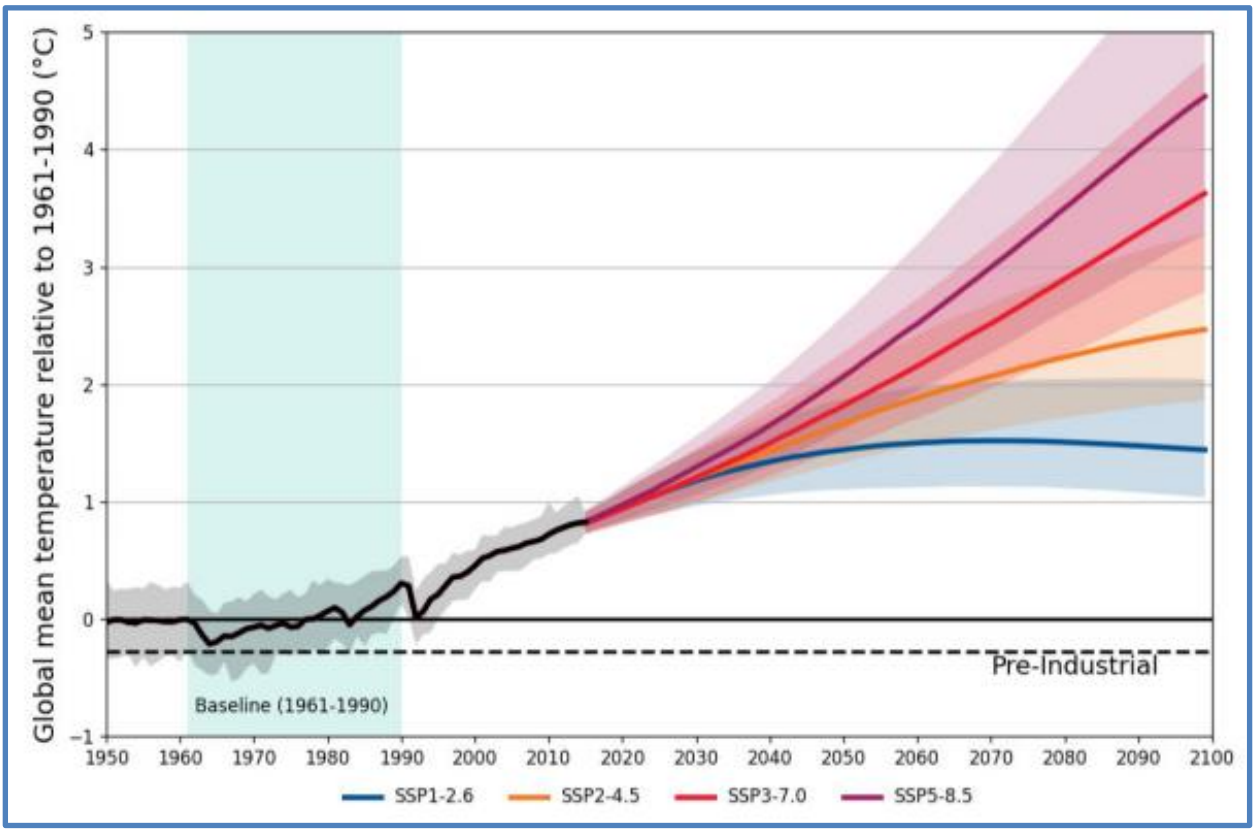
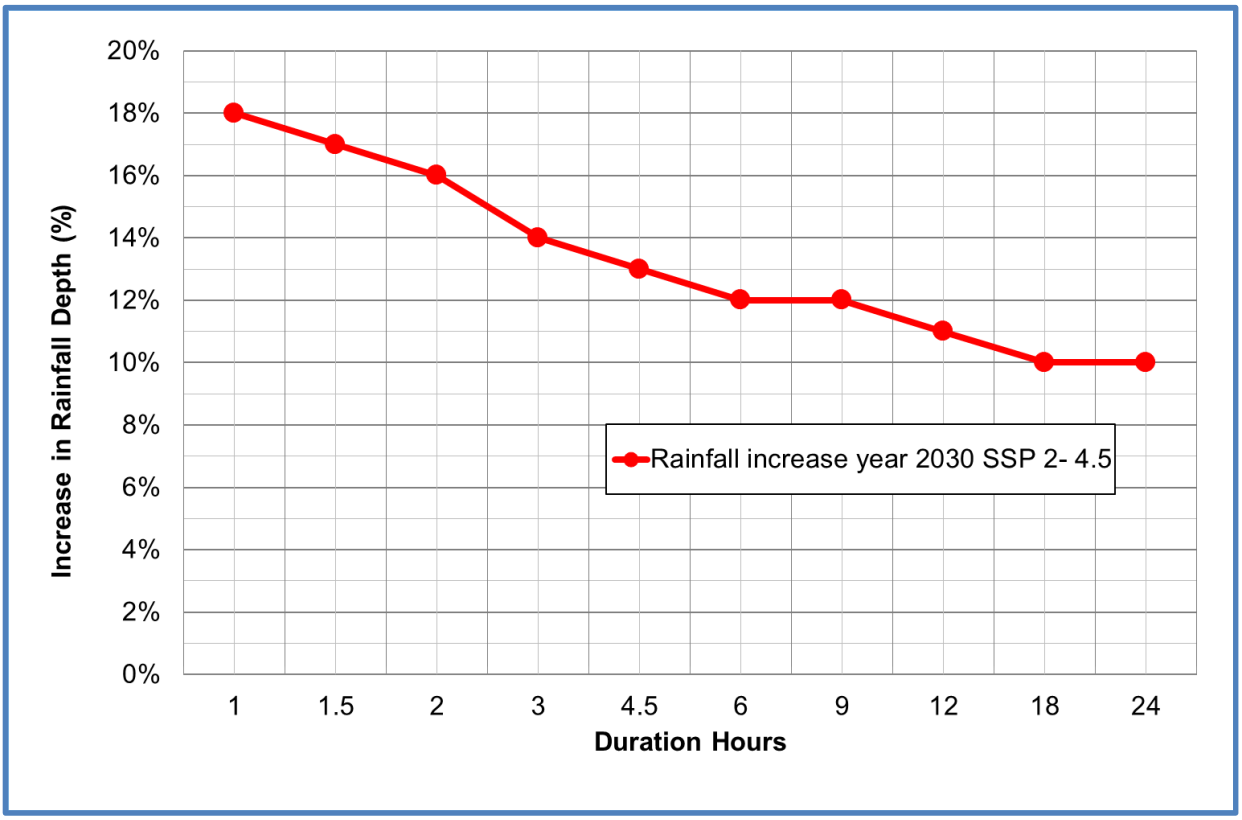


Diagram C3 indicates the percentage increase in rainfall depth from the data in ARR 2019 to the Year 2030 data provided in ARR Version 4.2. Thus, for the durations of event producing flooding in the study area (say > 12 hours) the increase due to upgrading to the Year 2030 is around 10%.

Diagram C3: Change in Rainfall Depth for ARR 2019 IFD data Updated to the Year 2030 (SSP 2-4.5)



C4 Methodology for Inclusion of August 2024 ARR Climate Change Approach in this Report

Shoalhaven City Council advised that the August 2024 ARR Climate Change approach should be adopted as part of this Flood Compliance Report and this required updating the 2022 Flood Study hydrologic modelling. Initially in early 2025, Council provided a WBNM hydrologic model that was developed by Rhelm Consulting to apply in the upcoming Lower Shoalhaven River Flood Risk Management Study (due in 2026). The WBNM approach was determined to not be practical as it would require extensive work to develop the critical storm durations and to justify that the WBNM results are compatible with the 2022 Flood Study results.

Council advised that WMAwater could use either the WBNM approach or the XPRafts hydrologic model approach which was adopted in the 2022 Flood Study. Council then provided a copy of the XPRafts hydrologic model together with input data. For various software reasons WMAwater could not directly use the supplied XPRafts model / input data and therefore developed their own approach using the data provided. It should be noted that XPRafts has been discontinued and thus there are no software updates to address changes in methodology (such as climate change).

The same critical duration storms and associated rainfall data (loss rates) adopted in the 2022 Flood Study were adopted in the current analysis and these are shown in Diagram C4.

Diagram C4: Critical Duration Storms Adopted in the 2022 Flood Study (Reference 1)

Table 9-1 Design events and durations

AEP	Critical Durations Simulated
50%	6hr, 18hr
20%	90min, 6hr, 18hr
10%	90min, 3hr, 18hr
5%	90min, 3hr, 18hr
2%	12hr, 18hr
1%	12hr, 18hr
0.2%	2hr, 6hr, 36hr
PMF	24hr, 72hr

C5 Results

To be confident that the WMAwater modelling approach produced the same (or very similar) results to 2022 Flood Study results, Figures C1 (5% AEP), C2 (1% AEP) and C3 (PMF) provide a comparison between the two approaches. These show that the differences between the two sets of results for the three design events are within +0.05m & -0.05m and thus the WMAwater XPRafts hydrologic modelling approach can be adopted.

Figures C4 (5% AEP), C5 (1% AEP) and C6 (PMF) indicate the increase in peak flood level due to adoption of the 2030 SSP3 planning horizon including a 0.1m sea level rise with no change to the topography (i.e. these results reflect solely the impact of climate change). Within the floodplain areas downstream of Nowra in the 5% AEP there are increases of greater than 0.4m, up to 0.3m in the 1% AEP and up to 0.4m in the PMF.

Figures C7 (5% AEP), C8 (1% AEP) and C9 (PMF) indicate the increase in peak flood level due to adoption of the 2100 SSP3 planning horizon including a 0.9m sea level rise with no change to the topography (i.e. these results reflect solely the impact of climate change). Within the floodplain areas downstream of Nowra there are increases greater than 0.4m in all three design events.

Figure C10 shows the difference in incremental effect (1% AEP event) of the Mod26 works from the November 2025 Existing conditions if climate change (Year 2030 SSP3 including a 0.1m sea level rise) is adopted for the Existing and Mod26 conditions. Figure C10 indicates that the incremental effect of the Mod26 works for the 1% AEP event is similar whether climate change (Year 2030 SSP3 including a 0.1m sea level rise) is included or not in the Existing and Design conditions.

Figure C11 and C12 indicate the design flood depths and contours for the 1% AEP event, post Mod26 works, for the Year 2030 and Year 2100, SSP3 respectively.

FIGURE C1
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
CHANGE IN PEAK FLOOD LEVEL
2022 FLOOD STUDY V WMAWATER XPRAFTS
5% AEP EVENT

N

Study Area

Impact (m)

- < -0.4
- -0.4 to -0.3
- -0.3 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- No Longer Flooded
- Newly Flooded

0 0.5 1 2 3 4 Kilometres

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FIGURE C2
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
CHANGE IN PEAK FLOOD LEVEL
2022 FLOOD STUDY V WMAWATER XPRAFTS
1% AEP EVENT

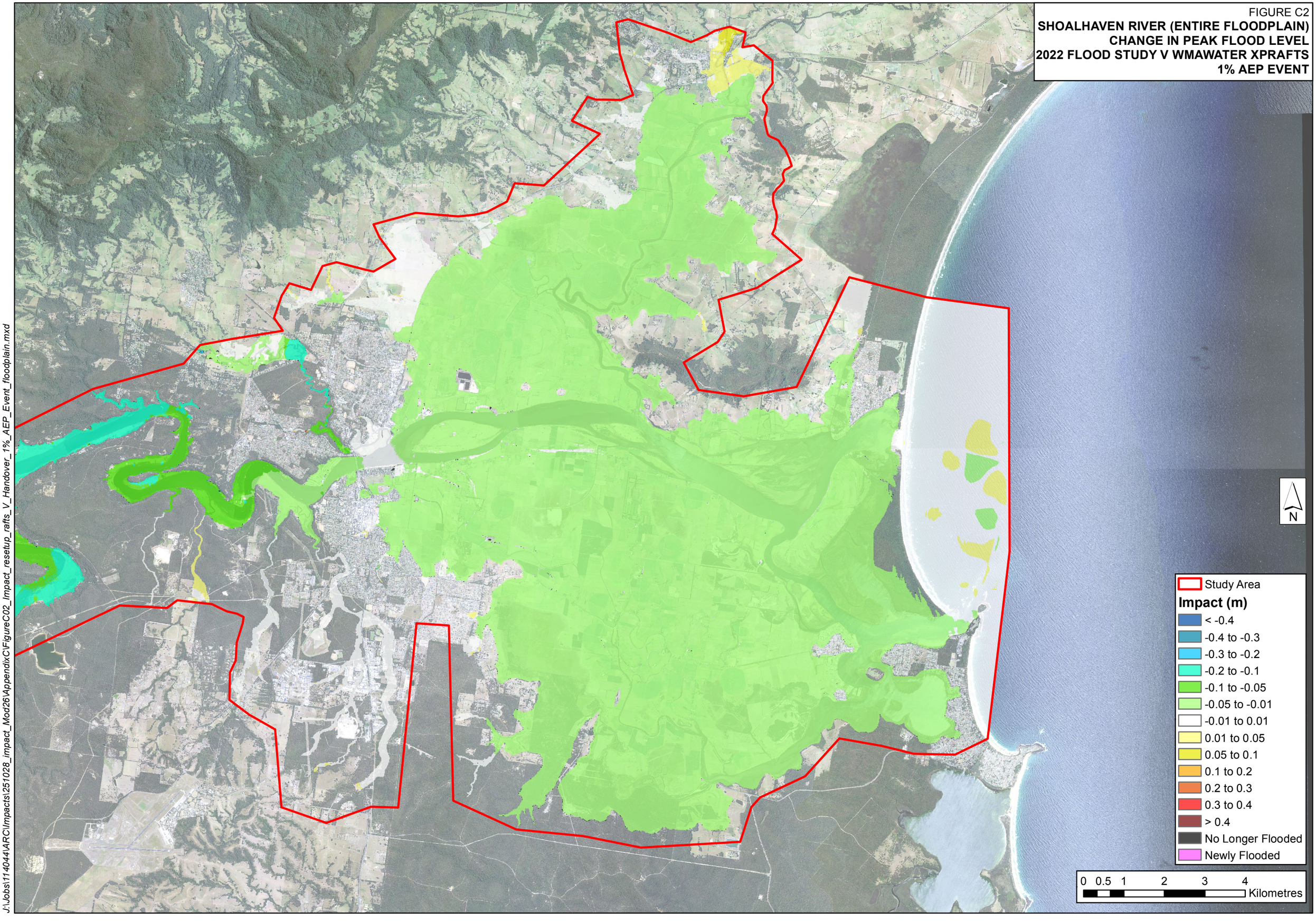

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FIGURE C3
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
CHANGE IN PEAK FLOOD LEVEL
2022 FLOOD STUDY V WMAWATER XPRAFTS
PMF EVENT

N

Study Area

Impact (m)

- < -0.4
- -0.4 to -0.3
- -0.3 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- No Longer Flooded
- Newly Flooded

0 0.5 1 2 3 4 Kilometres

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FIGURE C4
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
INCREASE IN PEAK FLOOD LEVELS
YEAR 2030, SSP3
5% AEP EVENT

N

Study Area

Impact (m)

- < -0.4
- -0.4 to -0.3
- -0.3 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- No Longer Flooded
- Newly Flooded

0 0.5 1 2 3 4 Kilometres

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FIGURE C5
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
INCREASE IN PEAK FLOOD LEVELS
YEAR 2030, SSP3
1% AEP EVENT

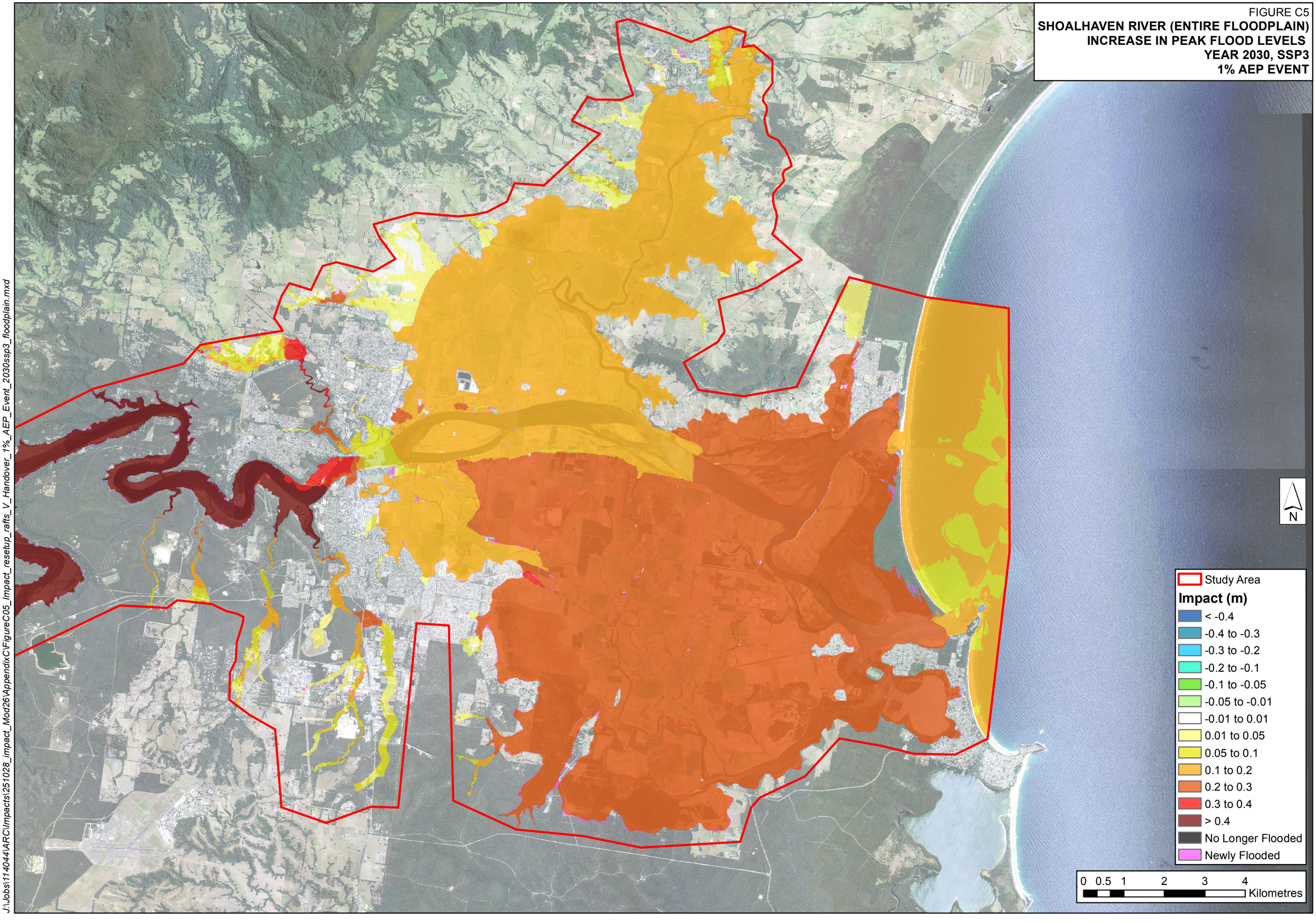

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FIGURE C6
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
INCREASE IN PEAK FLOOD LEVELS
YEAR 2030, SSP3
PMF EVENT

N

Study Area

Impact (m)

- < -0.4
- -0.4 to -0.3
- -0.3 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- No Longer Flooded
- Newly Flooded

0 0.5 1 2 3 4 Kilometres

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FIGURE C7
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
INCREASE IN PEAK FLOOD LEVELS
YEAR 2100, SSP3
5% AEP EVENT

N

Study Area

Impact (m)

- < -0.4
- -0.4 to -0.3
- -0.3 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- No Longer Flooded
- Newly Flooded

0 0.5 1 2 3 4 Kilometres

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FIGURE C8

SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
INCREASE IN PEAK FLOOD LEVELS
YEAR 2100, SSP3
1% AEP EVENT

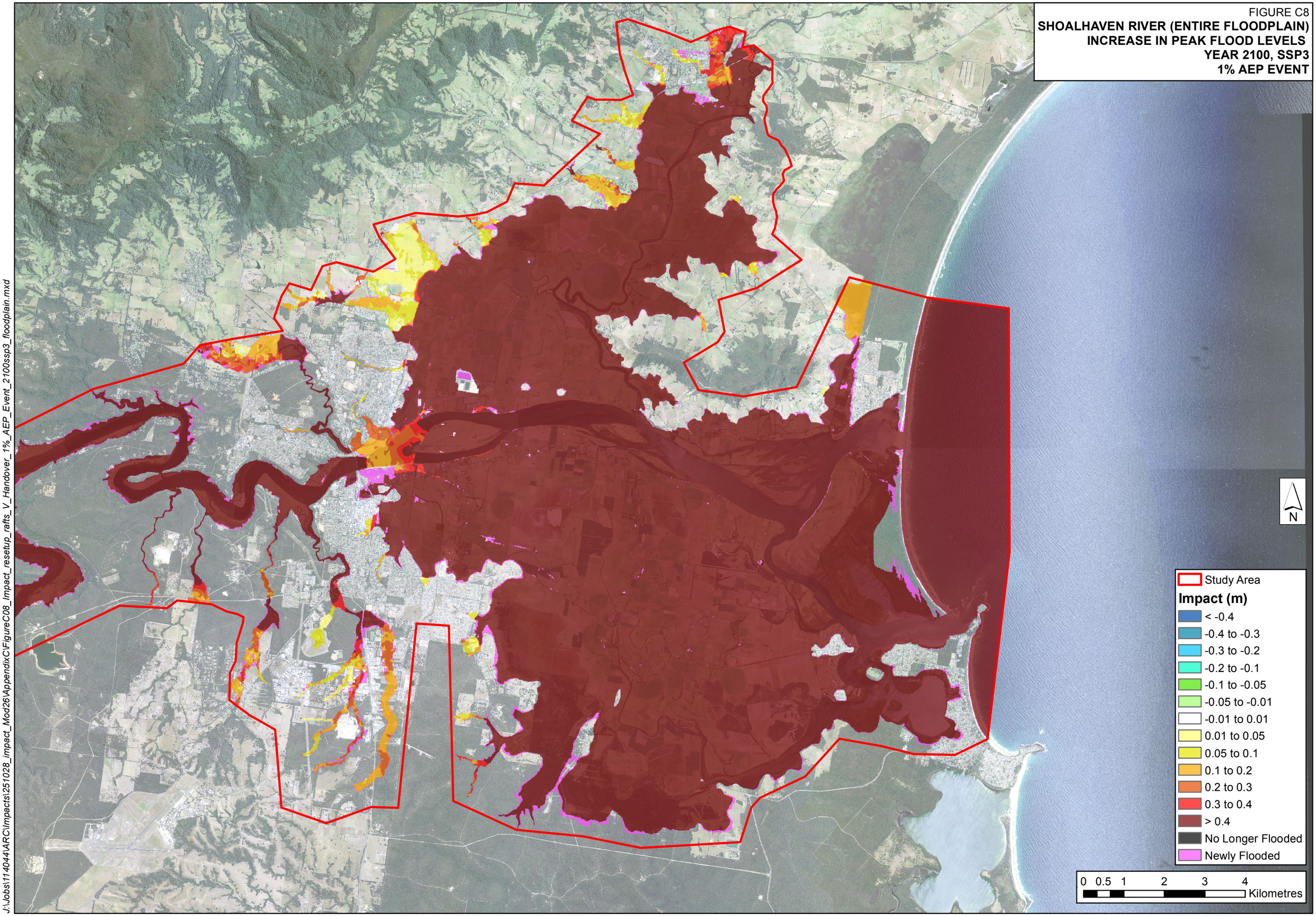

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FIGURE C9
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
INCREASE IN PEAK FLOOD LEVELS
YEAR 2100, SSP3
PMF EVENT

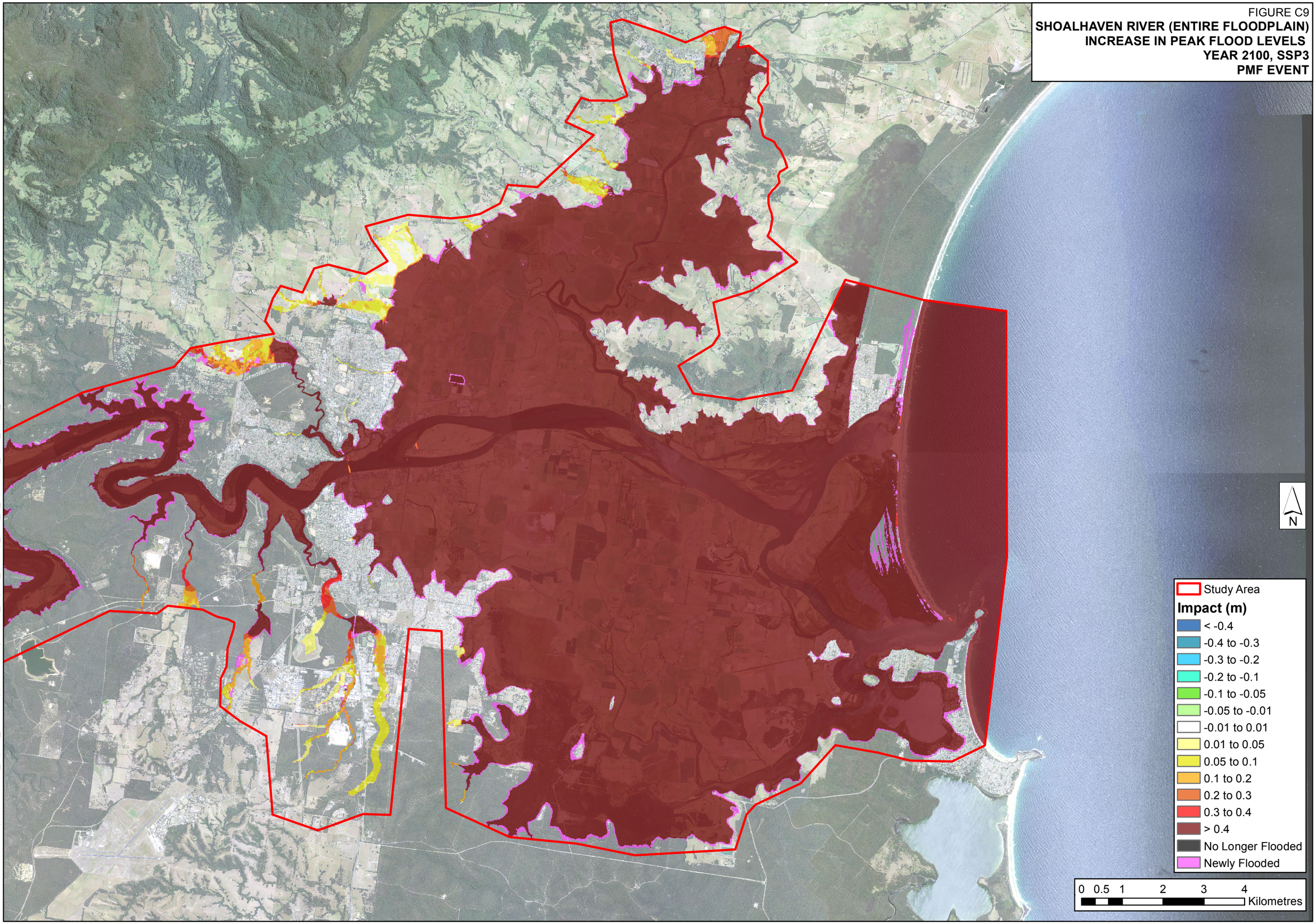

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FIGURE C10
SHOALHAVEN RIVER (ENTIRE FLOODPLAIN)
CHANGE IN PEAK FLOOD LEVELS
YEAR 2030, SSP3
1% AEP EVENT

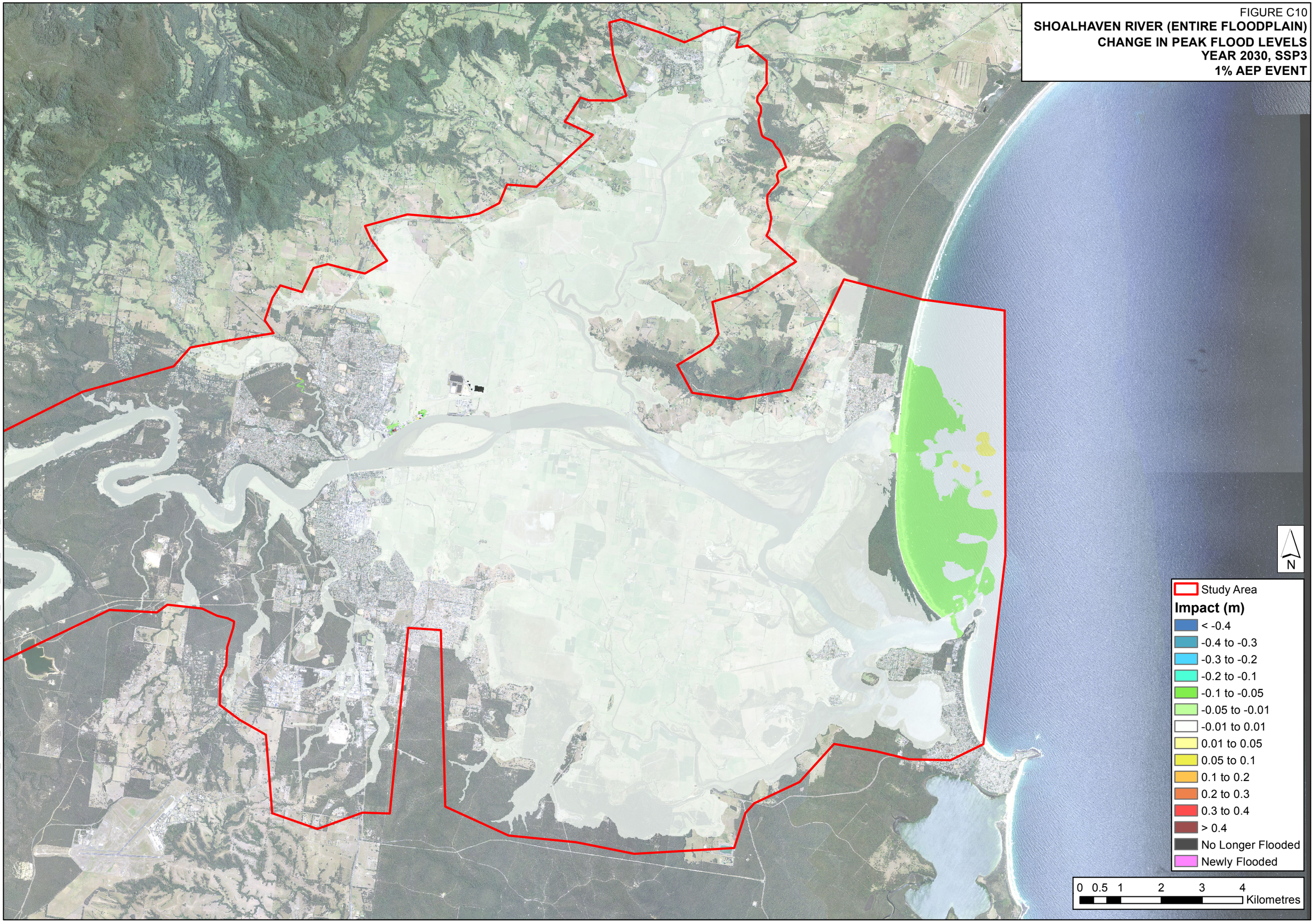

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FIGURE C11
SHOALHAVEN RIVER (LOCAL AREA)
DESIGN FLOOD DEPTHS AND CONTOURS
MOD26, YEAR 2030, SSP3
1% AEP EVENT

Major Contour (0.5m interval)
Minor Contour (0.1m interval)

Peak Flood Depth (m)
- 0 - 0.15
- 0.15 - 0.3
- 0.3 - 0.5
- 0.5 - 1
- 1 - 2
- > 2

N

0 0.125 0.25 0.5 0.75 1
Kilometres

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FIGURE C12
SHOALHAVEN RIVER (LOCAL AREA)
DESIGN FLOOD DEPTHS AND CONTOURS
MOD26, YEAR 2100, SSP3
1% AEP EVENT

Major Contour (0.5m interval)
Minor Contour (0.1m interval)

Peak Flood Depth (m)

- 0 - 0.15
- 0.15 - 0.3
- 0.3 - 0.5
- 0.5 - 1
- 1 - 2
- > 2

N

0 0.125 0.25 0.5 0.75 1
Kilometres

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Flood Certificate for 32 Bolong Rd, BOMADERRY – LOT 34 DP 1222627

Appendix D

Shoalhaven City Council

Bridge Rd, Nowra NSW 2541 | 02 4429 3111
Deering St, Ulladulla NSW 2539 | 02 4429 8999

Address all correspondence to
The General Manager, PO Box 42, Nowra NSW 2541 Australia
council@shoalhaven.nsw.gov.au | DX5323 Nowra | Fax 02 4422 1816

shoalhaven.nsw.gov.au

COUNCIL REFERENCE: 28112E (D23/322278)
DATE: 10 Aug 2023

Thank you for your recent inquiry in relation to flood data held by Shoalhaven City Council.

Please find below some general information on flooding, as well as the requested property specific Flood Certificate.

GENERAL FLOOD INFORMATION

Shoalhaven City Council in conjunction with the NSW State Emergency Service has produced site specific flood brochures for Shoalhaven Heads, Nowra / Bomaderry / Terara, Greenwell Point / Orient Point, St Georges Basin, and Sussex Inlet.

These site-specific FloodSafe brochures, as well as general FloodSafe brochures, can be accessed at the below link:

https://www.ses.nsw.gov.au/local-region-information/isr/flood-storm-and-tsunami-guides/

General Flood Information, such as “What to do before, during & after a flood”, prepared by Emergency Management Australia is also available online at the below link:

http://www.bom.gov.au/water/floods/document/What_todo_floods.pdf

FLOOD PLANNING LEVELS FOR THE LOWER SHOALHAVEN RIVER FLOODPLAIN

In the Ordinary Council meeting held on 23 January 2023, the *Lower Shoalhaven River Flood Study (2022)* and the amended *Flood Planning Levels for the Lower Shoalhaven River Floodplain Policy (2023)* was adopted. The Flood Planning Levels in this Flood Certificate have been determined in accordance with this Policy, available online at the below link:

https://doc.shoalhaven.nsw.gov.au/displaydoc.aspx?record=POL23/7

FLOOD CERTIFICATE

According to the *Lower Shoalhaven River Floodplain Risk Management Plan – Climate Change Assessment (2011) and Lower Shoalhaven River Flood Study (2022)* this property, 32 Bolong Rd, BOMADERRY – LOT 34 DP 1222627, Land ID – 119700, comprises Flood Prone Land. This property is located below the Flood Planning Level and is affected by the 1% AEP flood event**.**

FLOOD INFORMATION

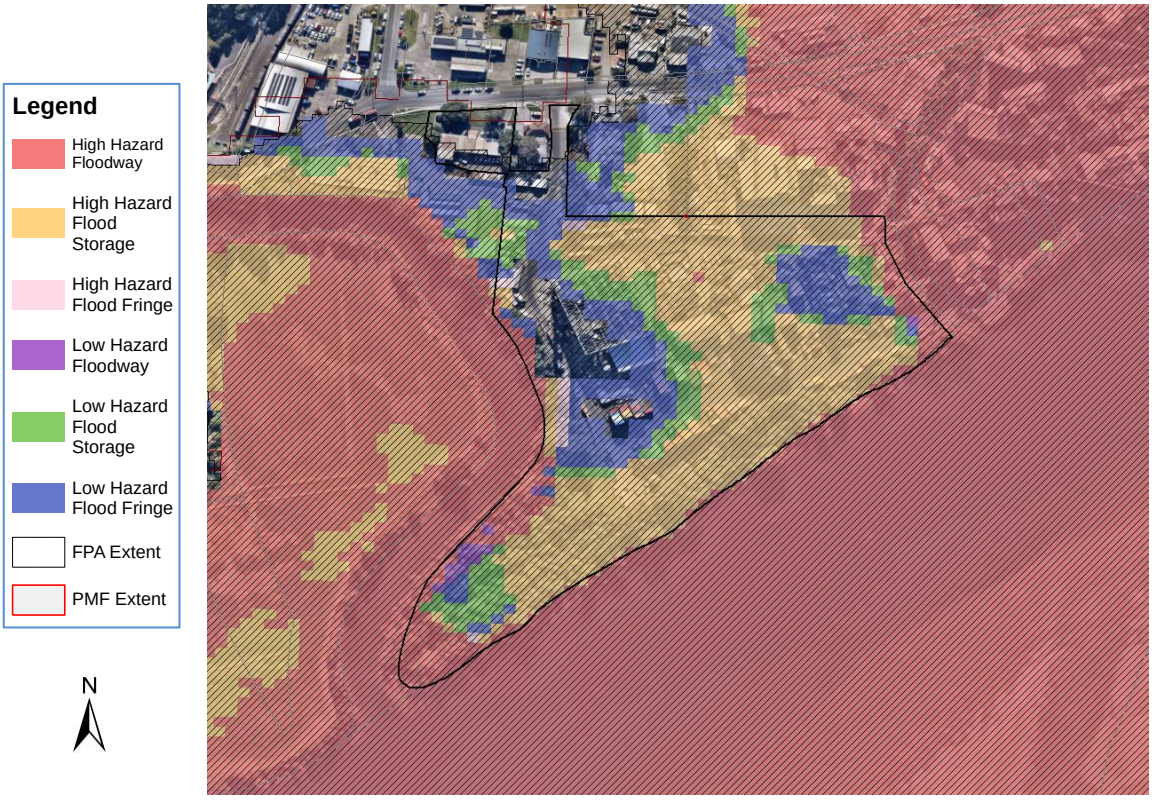
Year	Existing	Projected 2050	Projected 2100
Flood Planning Level (m AHD)	Not Applicable	6.3**	6.3**
Hazard and Hydraulic Category*	High Hazard Floodway	High Hazard Floodway	High Hazard Floodway
Probable Max Flood Level (m AHD)	7.0	7.0	7.1
0.2% AEP Flood Level (m AHD)	5.7	5.7	5.7
1% AEP Flood Level (m AHD)	5.4	5.4	5.5
2% AEP Flood Level (m AHD)	5.2	5.2	5.2
5% AEP Flood Level (m AHD)	5.0	5.0	5.0
10% AEP Flood Level (m AHD)	4.5	4.5	4.5
Velocity (0.2% AEP flood event) (m/s)	1.6	1.5	1.5
Velocity (1% AEP flood event) (m/s)	1.5	1.5	1.5

* Refer to Standard Considerations in this Flood Certificate for further details.

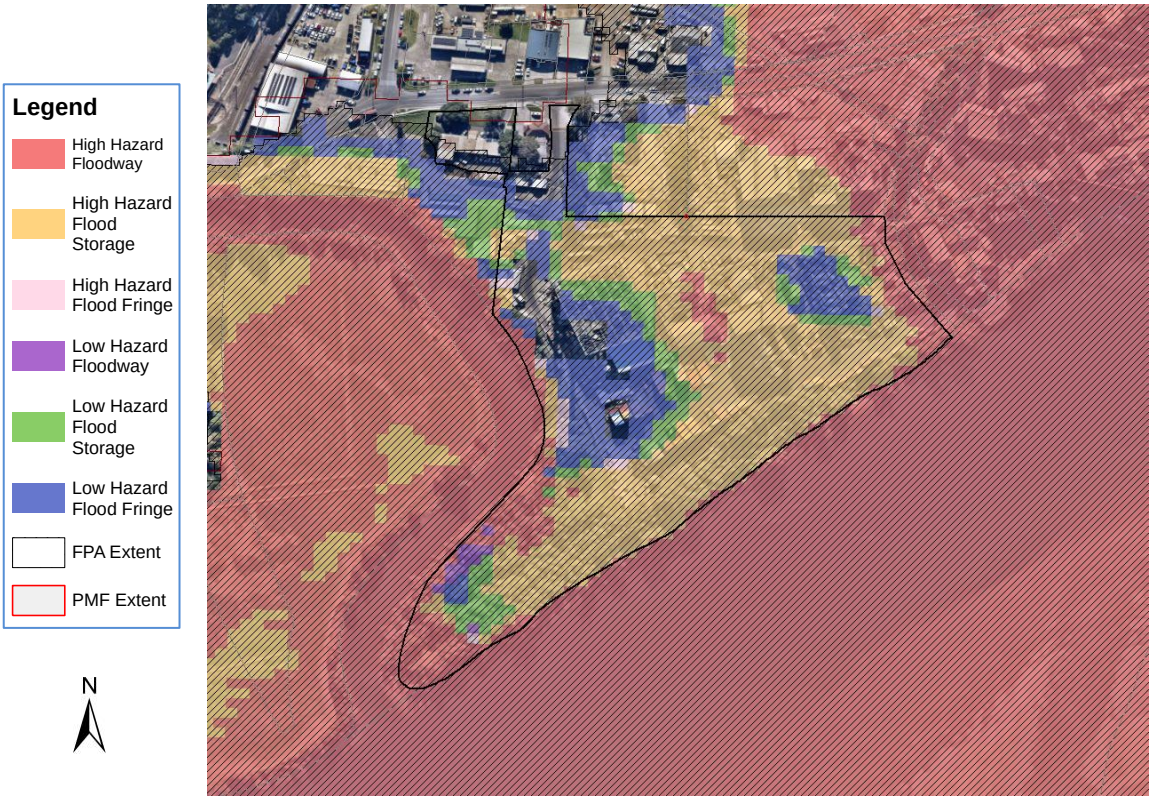
** Flood Planning Levels obtained from the *Lower Shoalhaven River Floodplain Risk Management Plan – Climate Change Assessment (2011)* in accordance with the *Flood Planning Level for the Lower Shoalhaven River Floodplain Policy (2023)*. The hazard and hydraulic category, flood levels and flood velocities have been obtained from the *Lower Shoalhaven River Flood Study (2022).*

SITE SPECIFIC CONSIDERATIONS

1. Current NSW Government legislation requires climate change to be considered as part of this Floodplain Risk Management Study and Plan. Climate change related information evolves with time and it is expected that existing flood behaviour and levels may change in the future.
2. All applications for buildings, and the like, must take into account the projected 2050 flood information. All subdivision and other long-term planning must take into account the projected 2100 flood information.
3. Other hazard and hydraulic categories may affect the property. For more specific information regarding the different hazard and hydraulic categorisations affecting this property please refer to Map 1 and Map 2 below or contact Council on 1300 293 111.



Map 1: Hazard and Hydraulic Categories for the Projected 2050 Scenario



Map 2: Hazard and Hydraulic Categories for the Projected 2100 Scenario

STANDARD CONSIDERATIONS

Properties below the Flood Planning Level:

Council considers the land in question to be below the Flood Planning Level and therefore subject to flood related development controls. The conditions as set out below will reduce flood risk in flood events up to the Flood Planning Level, however the property may still be subject to flooding at higher levels during rare flood events.

Development controls apply to flood affected properties.

Development conditions will vary depending on flood hazard, hydraulic category as well as the type of development that is proposed. Please refer to the following documents for information on Council's flood related development controls and the NSW State Government's Flood Prone Land Policy. For properties that comprise multiple hazard and hydraulic categories, the development conditions will apply for the highest category that exists within the development footprint.

- Shoalhaven Development Control Plan – Chapter 9: Development on Flood Prone Land http://dcp2014.shoalhaven.nsw.gov.au/main-category/whole-document
- Flood Risk Management Manual 2023: Flood Risk Management Manual | NSW Environment and Heritage

DISCLAIMER

Your enquiry relating to the likelihood of the land specified in the application being flooded has been referred to the Council's Floodplain Engineer.

In responding to your application, the Council seeks to bring to your attention the fact that pursuant to s.733 of the Local Government Act a council does not incur liability in respect of the giving of any advice furnished in good faith by the Council relating to the likelihood of any land being flooded or the nature or extent of any such flooding.

The Council does not have a legal obligation to provide advice to you and to the extent that this reply is giving advice, the Council provides that advice in good faith with the intention of preserving, so far as is legally possible, the Council's immunity from liability pursuant to s.733 of the Local Government Act.

While all reasonable care has been taken to ensure the accuracy of the information given in this reply, its purpose is to provide a general indication of flood risk in the area. Flood lines shown on Council maps indicate the approximate extent of flooding only in relation to the abovementioned land.

The information provided may contain errors or omissions and the accuracy may not suit the purposes of all users. A site survey and further investigation are strongly recommended before commencement of any project based on this data.

The information given is the most current information at the time of the request. It is to be noted, however, that flood information is constantly reviewed and updated and as such, the information contained in this regard is current only on the day of issue.

Before acting upon the information provided in this reply, the Council urges you to obtain separate and independent advice as Council, in giving this information, does not intend it to be relied upon in such a fashion as to impose liability upon the Council.

Should you not be prepared to accept the information contained in this reply upon that basis then you should immediately notify Council.

GLOSSARY

AEP (Annual Exceedance Probability) means the chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage – for example a 1% AEP flood event has a 1% chance of occurring in any one calendar year.

AHD (Australian Height Datum) is a common national surface level datum corresponding approximately to mean sea level.

Flood Fringe is the part of the floodplain remaining after the floodway and flood storage areas have been defined.

Flood Planning Area is any land identified as being flood affected in the 1% AEP flood event plus freeboard.

Flood Planning Level (FPL) is the 1% AEP flood level plus freeboard. The FPL is used for planning purposes, as determined in Floodplain Risk Management Studies and incorporated in Floodplain Risk Management Plans.

Flood Prone Land means any land susceptible to flooding up to the Probable Maximum Flood event (that is, land within the floodplain) as identified in an adopted Council Flood Study or Floodplain Risk Management Study and Plan.

Flood Storage areas are those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood.

Flood Study is a technical investigation of flood behaviour. It defines the nature of flood risk by establishing the extent, level and velocity of floodwaters. The study also provides information on the distribution of flood flows across various sections of the flood plain for the full range of flood events up to and including the PMF.

Floodplain Risk Management Plan is a plan developed in accordance with the principles and guidelines contained in the NSW Government Floodplain Management Manual. Usually includes both written and diagrammatic information describing how particular areas of flood prone land are to be used and managed to achieve defined objectives.

Floodplain Risk Management Study is a study that identifies and compares various risk management options. This includes an assessment of their social, economic, ecological and cultural impacts, together with opportunities to maintain and enhance river and floodplain environments.

Floodway means 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.

Freeboard is currently 0.5m for riverine flooding for all catchments in the Shoalhaven LGA. Freeboard is a factor of safety used to set the FPL (i.e. FPL = 1% AEP flood level plus freeboard (0.5m)). Freeboard takes into account uncertainties in flood modelling and climate change predictions, local factors that cannot be included in the flood model or wave action caused by wind, boats or vehicles driving through flood waters.

Hazard Category represents the risk or danger to personal safety, evacuation movements and buildings and structures within the Flood Planning Area during the 1% AEP flood. There are only two possible hazard categories – high or low.

Hydraulic Category describes the function of a specific part of the Flood Planning Area in conveying flood waters during a 1% AEP flood. There are three possible hydraulic categories – floodway, flood storage or flood fringe.

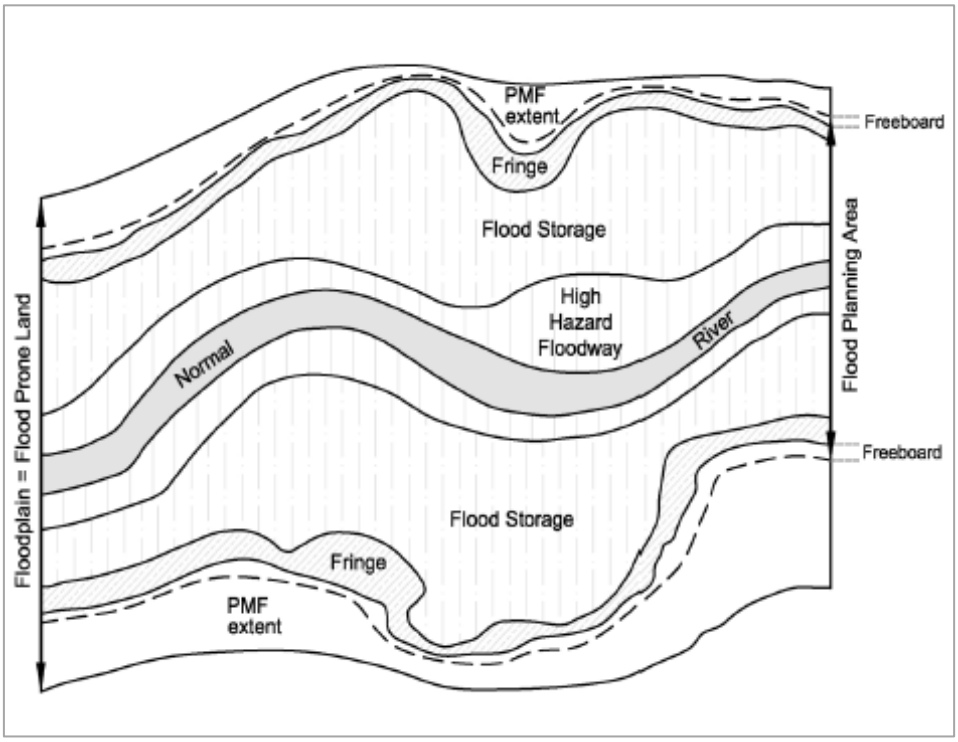


Figure: Floodplain Aerial View

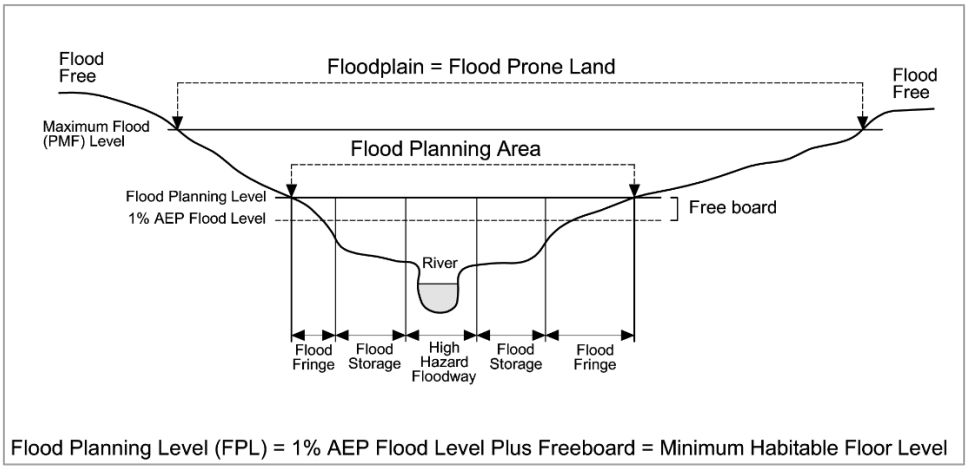


Figure: Cross Section through Floodplain

Probable Maximum Flood (PMF) is the largest flood that could conceivably occur at a particular location, usually estimated from Probable Maximum Precipitation. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain.

Provisional is used for hazard categories that have been determined in a Flood Study. Hazard categories are provisional until the Floodplain Risk Management Study and Plan has been completed and adopted by Council, as this document considers additions risks, not considered during the Flood Study.