Summary of Flood Impact Assessment

Development of Seniors Living and Aged Care facilities
24 Coronation Road, Congarinni North, NSW

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Prepared For: **Congarinni North Pty Ltd**
50 Hopetown Ave,
Vaucluse, NSW 2030

Meinhardt

Level 1, 34 Thomas Drive
Chevron Island, QLD 4217

P. 07 55286411
www.meinhardtgroup.com

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REV	DATE	AUTHOR	QA CHECK	REVIEWER
A	18-12-2020	U Weeks	S Fittock	
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1. Introduction

1.1 Meinhardt Urban Pty Ltd has been engaged to update the original Flood Impact Assessment previously prepared for 'Hamptons Property Services' in 2016, relating to the proposed seniors development at 24 Coronation Road, Congarinni North, New South Wales. This assessment of the subject site in relation to flood impact of surrounding land uses was requested by Nambucca Shire Council.

1.2 As part of their planning proposal application the developer of 24 Coronation Road, Macksville was required to assess the impacts the new development will have on flooding on surrounding properties, particularly Kings Point. Earthworks will be required to facilitate the development which may result in removal of existing flood storage. The Flood Impact Assessment was carried out to ascertain the effects of this development and incorporated the proposed land form changes for the development into the existing Nambucca Council Flood model. The model was then run for the 100 year ARI river dominated event to determine changes to flood behaviour.

1.3 The proposed levels within the development and the proposed levels for the access road that is proposed to connect with Coronation Road via a new right turn junction (and incorporating the raising of existing levels along Coronation Road in this vicinity) this is discussed in Traffix Report.

1.4 During April 2016 a representative of Nambucca Shire Council requested that this flood impact assessment should examine the offsite impacts of a 100yr ARI event and that subsequently should there be an impact identified to Kings Point or other properties, then additional modelling for a design and flood event that is equal to the level at which Joffre Street is flooded (the cut-off point to and from the site) would also need to be undertaken. Any further analysis work would then be dependent on the results of the initial model.

1.5 Reports that have been produced by Meinhardt in relation to this development include;

- Meinhardt 'Flood Emergency Warning Plan – Response and Evacuation' ref: 122896 dated November 2020
- Meinhardt 'Concept Design Report, ref: 122896-MIE-001-Concept Design Report' dated November 2020

The Meinhardt reports noted above referenced the contents of third party reports to allow recommendations and proposals to be offered. These third party reports included;

- TRAFFIX report 'Traffic Impact Assessment, Seniors Living 24 Coronation Road, Congarinni North'
- WMA 'Nambucca River and Warrell Creek Hydraulic Modelling Report' 2013. This report was produced in response to the Roads and Maritime Services producing a hydraulic model of the Nambucca River and Warrell Creek as part of the Pacific Highway upgrade. The WMA report sets out to assess the suitability of the RMS model for use in floodplain management planning and so further analysis and sensitivity testing was undertaken

1.6 WMA were commissioned to carry out the modelling work for this Flood Impact Assessment; they had previously produced the 'Nambucca River and Warrell Creek Hydraulic Modelling Report' 2013 noted above in Section 1.5.

2. Modelling Analysis

2.1 As part of these studies to produce the Flood Impact Assessment, a detailed two dimensional hydraulic model was developed using TUFLOW. TUFLOW is a finite difference numerical model which is capable of solving the depth averaged shallow water equations in both the one and two dimensional domains. The model consists of a combined one and two dimensional hydrodynamic model. A 2D 20m grid was used to define the overbank and the channel for the Nambucca River, Warrell Creek and its tributaries. One dimension network was used to define the main channel on the Upper Nambucca River, mid Warrell Creek, Tilly Willy Creek and the Macksville Town Drain.

The TUFLOW model limits were:

- Approximately 2km upstream Congarinni Road Bridge on Taylors Arm Road on Taylors Arm,
- Upstream to Bowraville on the Nambucca River,
- Upstream to near where Browns Crossing road bridges the railway on Warrell Creek, and
- Downstream - The Pacific Ocean.

2.2 The following information was utilised in order to model a representation of the development site in the hydraulic model:

- 12da surface of the development
- 12da surface of the access road
- Assumed dimensions for the modelled culverts under the access road at 2no. locations: culverts 0.9m height x 6m wide. Culverts assumed to be @1:100 and were also assumed to occur in the low points in the 20m grid and with inverts as per the grid.

2.3 Given that the site location is far enough upstream of the ocean that it is not affected by large ocean cases the following river dominated cases were run with a normal ocean level:

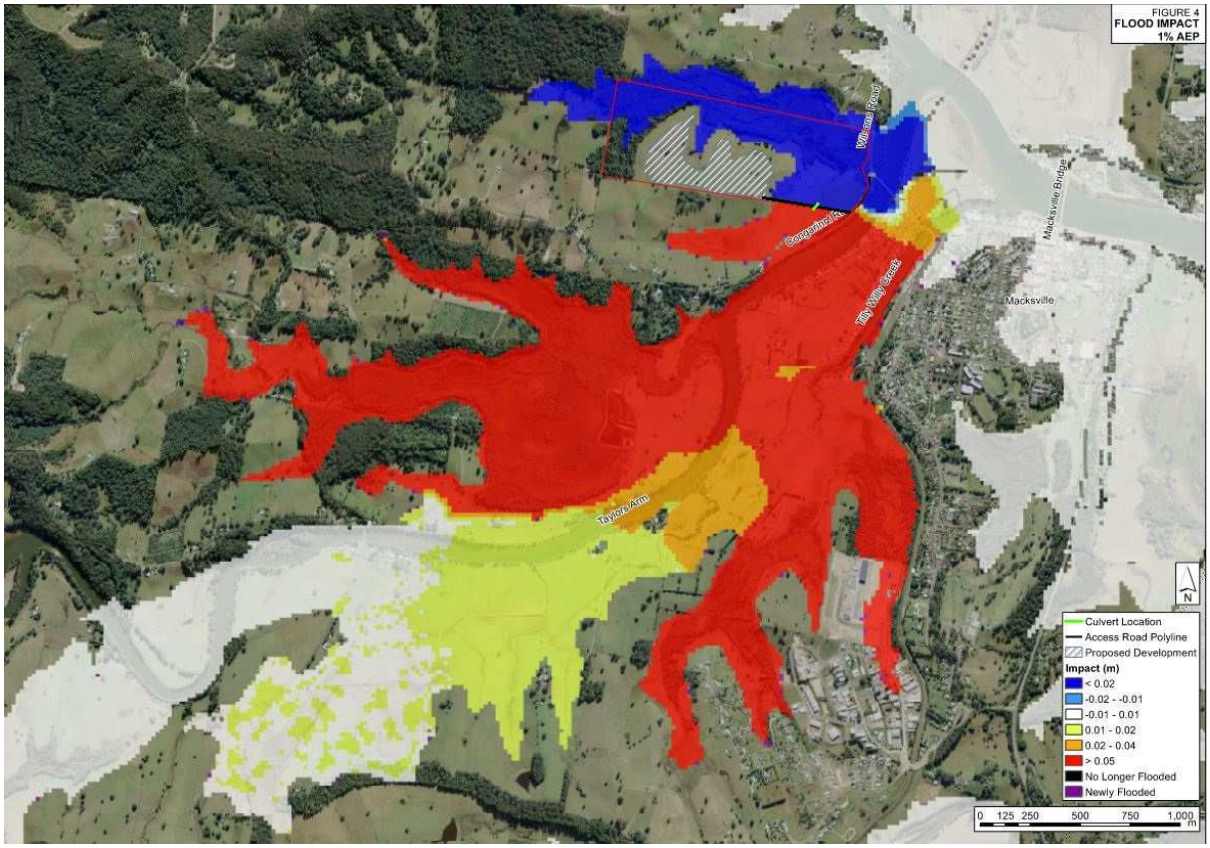
- 20 year ARI or 5 % AEP
- 50 year ARI or 2% AEP
- 100 year ARI or 1% AEP

Smaller events (5% and 2% AEP) were run due to their importance for evacuation of the area.

3. Summary of Modelling Analysis

3.1 The impacts of the development on flood levels was calculated by comparing the design scenario flood level minus the existing (current) scenario flood level. Positive values represented an increase in flood levels from the existing scenario.

3.2 The maximum impact in a 1% AEP event was 85 mm at the western culvert along the access road. Impacts in the order of 50 to 60 mm were widespread over Kings Point. This was caused by the access road blocking the flow path which previously conveyed 340m3/s during this event. The Figure below illustrates this for the 1% AEP event



3.3 From the results seen in the above Figure significant bridging would therefore be required to maintain the access road at its proposed current height.

3.4 The duration of impacts was assessed by extracting timeseries of results from the existing scenario and the development case. These are shown below for locations at the Access Road, Kings Point and at the Bridge over Tilly Willy Creek at Kings Point.

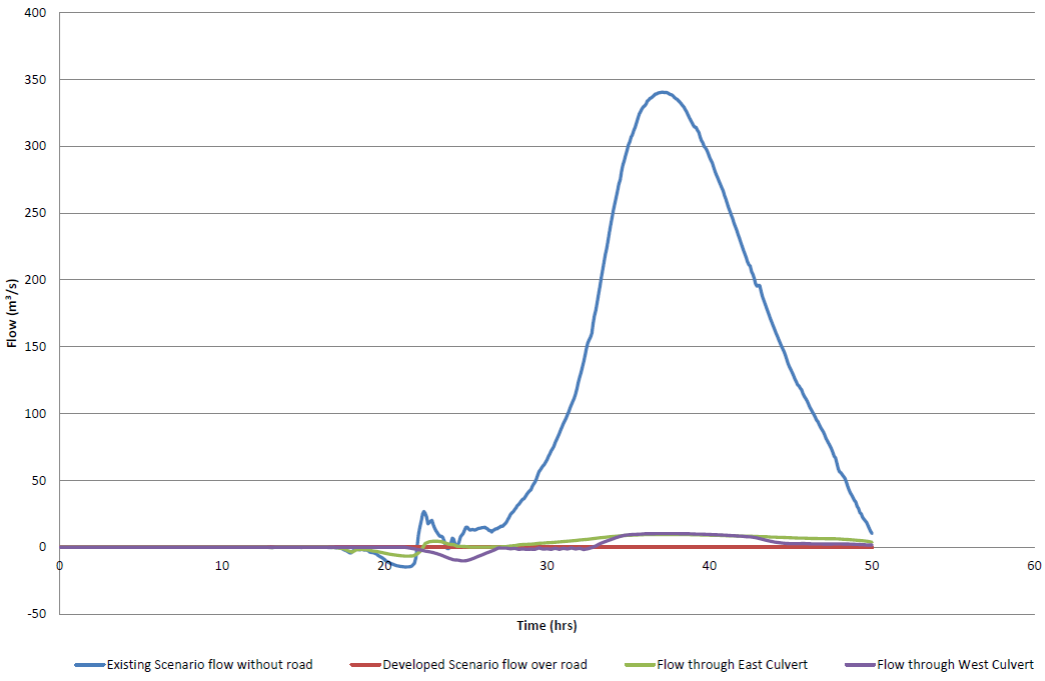


FIGURE 6
1% AEP
FLOW OVER ACCESS ROAD

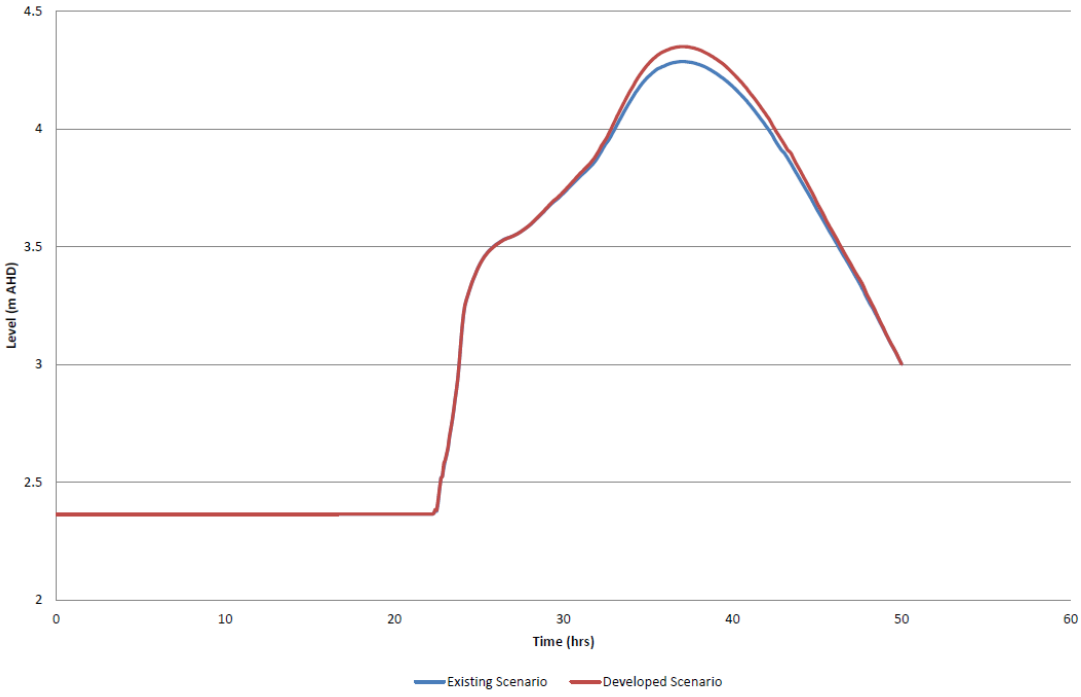


FIGURE 7
1% AEP
LEVEL AT KINGS POINT

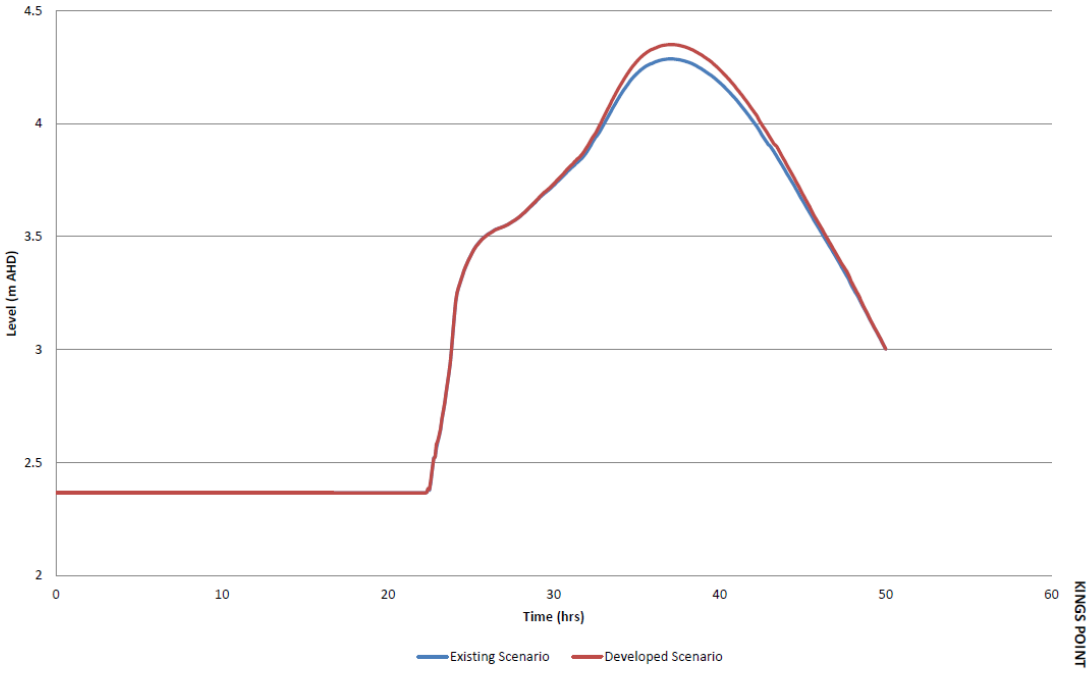
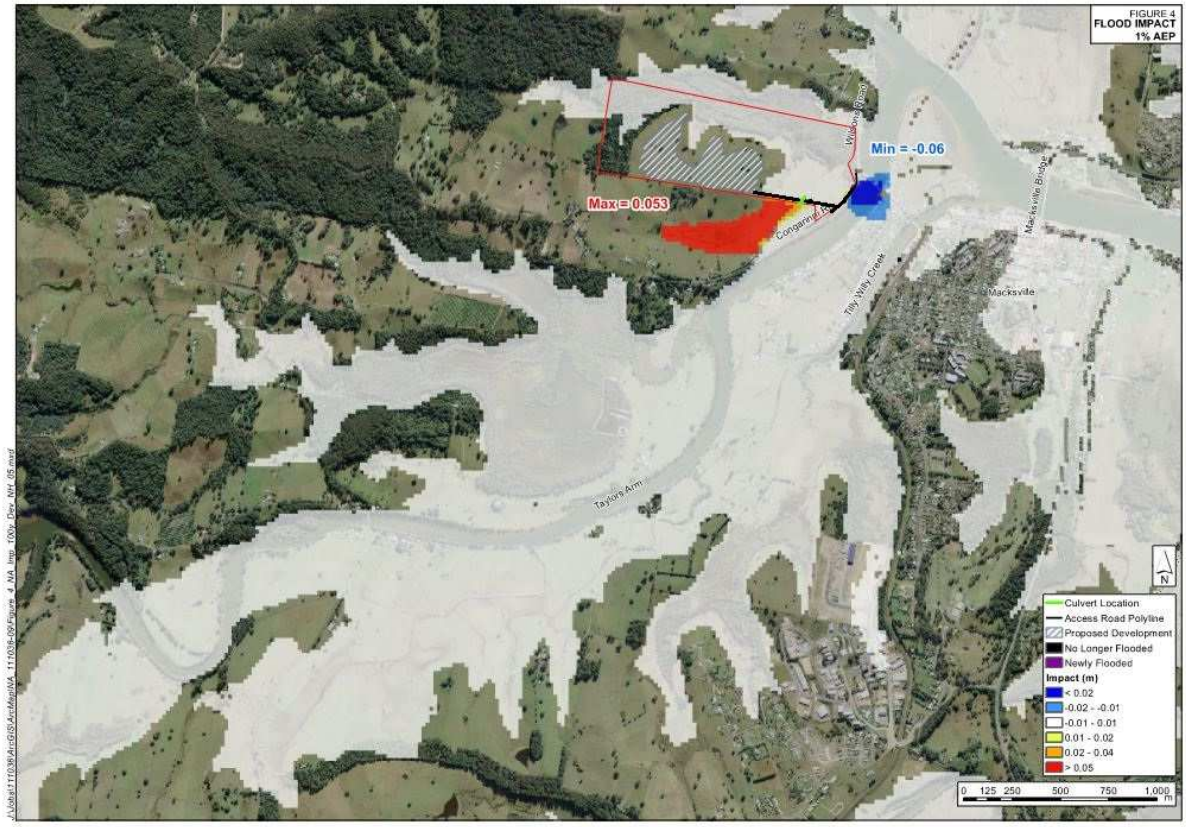


FIGURE 8
1% AEP
LEVEL AT BRIDGE OVER TILLY WILLY CREEK
KINGS POINT

3.5 A further option that was investigated was to consider how the flood waters would perform if the proposed access road levels were lowered from the original proposed levels of RL 4.2m down to RL 3.0m. The model was then run with the road lowered. This largely reduced the impact to the neighboring property to the south, but still created unacceptable flood waters in this area in a 1% event. See Figure below. Additionally this concept also involved reducing the finished levels of the access road which had previously been proposed at RL 4.2m. Subsequent discussions with Council have reinforced the concept that the access road should ideally be set at RL 4.2m at the junction with Coronation Road (which itself will need raising in this area from its current levels).



3.6 It is therefore proposed to keep the proposed access road design, from the raised Coronation Road into the site, as per the design levels already produced, ie the level of the finished surface of the access road will be RL 4.2m at the junction with Coronation Road (Coronation Road raised from its present levels in this area). This access road will then increase in height in a westerly direction towards the development site. This proposed level of RL 4.2m at the junction of Access Road/Coronation Road had been established previously based on existing 100year ARI event flood levels.

3.7 Due to the upstream inundation (ie to the south of the proposed access road; the flood waters generally moving in a northerly direction) due to the restriction that the 2no. culverts had produced with the road set at RL 4.2m, it is proposed to introduce culverts that will allow 340m3 to pass through. This will ensure that no effects to the current flood analysis will occur because no restriction will be created to create upstream inundation, and nor will downstream areas be affected due to concentrating flood flows through a restricted channel. These proposed culverts will consist of sufficient cross sectional area to allow 340m3 to pass through. Calculations have shown that 23no. culverts will be required, assuming each culvert has an opening of 2.10m height x 3.60m width. The IL of the culverts should be set at RL 0.25m and be introduced along the length of the access road (total length of openings and uprights would equate to a construction length of 86.04m). On plan the location of these culverts would be centred on the section of access road that the 'red' flood area sits adjacent to the road in the above Figure. Assuming that the culverts have a top depth of 0.265m above the opening, and if the finished road level is set at a minimum of RL 4.2m at Coronation Road, and rises towards the development, then the height available for the road construction will be a minimum of 1.5m approx. Modelling has shown that with the culvert IL set at RL 0.25m, then the top water level during the flows of 340m3/s would reach an RL 2.24m which is slightly below the underside of the top of the culvert ie the culverts would be fully utilized without causing a restriction to the flood flows.

5. Conclusion

5.1 The proposed seniors living and aged care facility at 24 Coronation Drive, Congarinni North NSW has been considered in respect of flooding issues and the potential impact on adjacent land uses.

5.2 Extensive modelling has been undertaken to determine the potential effects of the development, and any results should show that the development proposals should not have any adverse effects on surrounding land uses over and above the current situation. Therefore the proposals are to keep the proposed access road at the levels previously agreed with Council, and to provide sufficient pathways beneath the road to allow flood waters to pass (340m3/s in a 100yr ARI).

5.3 It is proposed to introduce a series of culverts beneath the road with sufficient cross-sectional area to allow flows of 340m3/s to pass unhindered. This situation will not adversely affect the current situation with respect to overland flood levels for the area both upstream and downstream of the subject site.

5.4 The proposed culverts would consist of a series of box culverts, nominally with opening sizes of 2.10m height x 3.60m length for a total length of 86.04m, with the IL of the box culverts set at 0.25m. The culverts should be set with a minimum fall of 1% in the direction of flow. This would ensure an available road construction depth from top of culvert to finished road level of at least 1.5m which is considered acceptable.