

	RUDY VANDRIE ABN: 79 219675204 Aiming to “BALANCE Research & Development” in the provision of specialist Hydraulic advice. 4244 Taylors Arm Rd. Burrapine NSW 2447. Ph: +61-65642244 Email: rudy@balancernd.com.au
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For the Attention of:
HUNTINGDALE DEVELOPMENTS
PO Box 315
WOLLONGONG EAST
NSW 2520
phone 02 4228 1622 | fax 02 4226 3447 |
e ptaranto@bigpond.net.au

**RE: POST DEVELOPMENT Flood Level Assessment Wyalla Rd Jamberoo
(with Revised Roadway Levels)**

OVERVIEW:

An adjusted roadway level was received on 12/05/2012, including 4 spot levels. These were used to design an initial roadway. However in order to provide better driver conditions, and drainage conditions, roadway grades have been adjusted. The terrain adjustment included some minor filling of lots fronting the roadway and the inclusion of a roadway batter at approx. 1:3. The final adjusted terrain was used in the flood model to determine flood depth, velocity and hazard.

The results show that during a Q100 event the site is essentially flood free. During a PMF event portions of the site have minor inundation. However the inundation is non-hazardous having a VxD of less than 0.4. However the proponents have requested to investigate creating flood free lots up to the PMF event. As a result, the terrain was again adjusted and the model re-run. The flood surface now does not impact the proposed lots. The flood levels are locally impacted but the impact does not extend beyond the site.

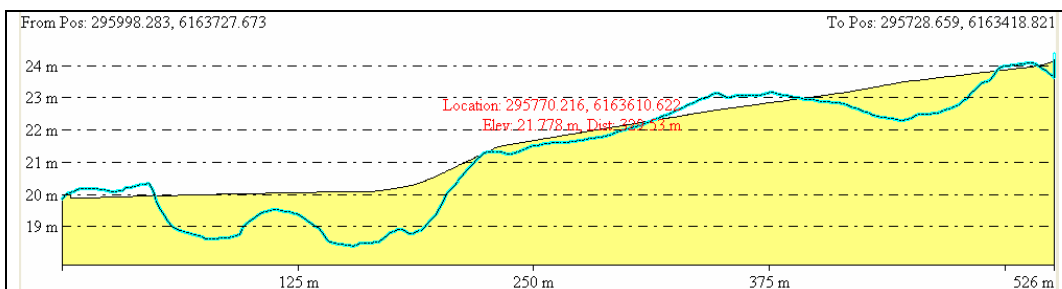


Figure 1. Roadway Centreline with existing terrain (blue) and proposed (yellow)

The adjusted proposal also provided an indication of roadway levels as four (4) spot levels along the roadway. These spot levels had to be adjusted considerably to produce a roadway that provided reasonable grades for not only traffic, but also drainage requirements. The adopted long section is shown as follows:

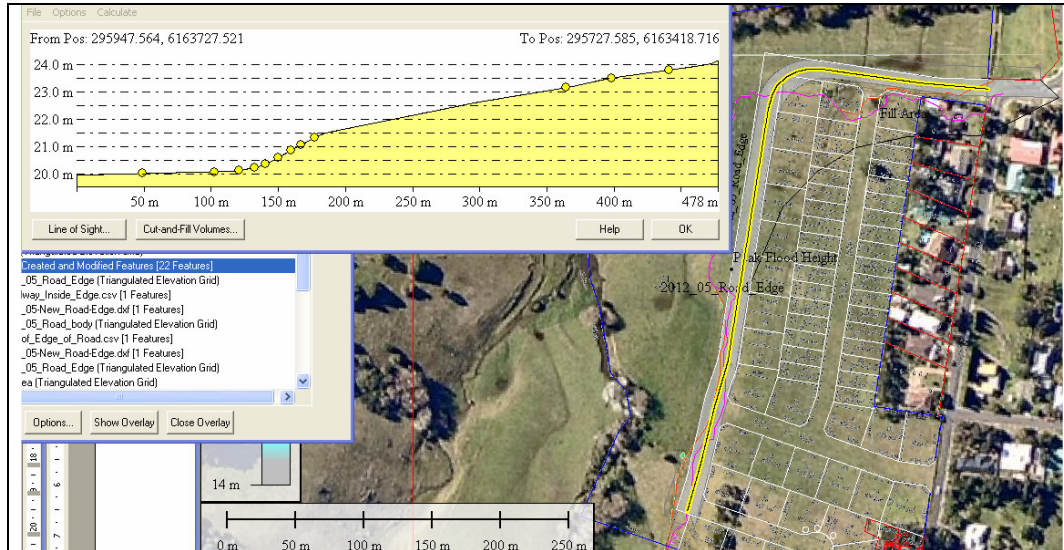


Figure 4. 12/05/1012 Roadway centreline adjusted to provide workable solution

The roadway formation was provided with a ~1:3 batter to merge with the surrounding natural ground. In addition localised low areas on the lots adjoining the roadway have been filled to provide an even grade to the roadway. The adopted final adjusted terrain appears as follows:

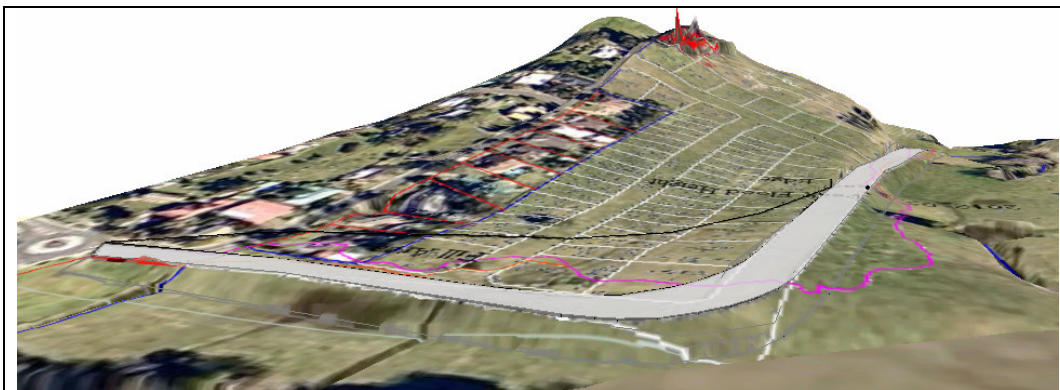


Figure 5. Adjusted terrain including roadway batter and minor filling of road frontage lots.

The adjusted terrain is now ready to be included in the flood model.

FLOOD ANALYSIS WITH PROPOSED ROADWAY:

The raised roadway and embankment batter ensure that the 1:100 year flood event does not impact the roadway or the development site.

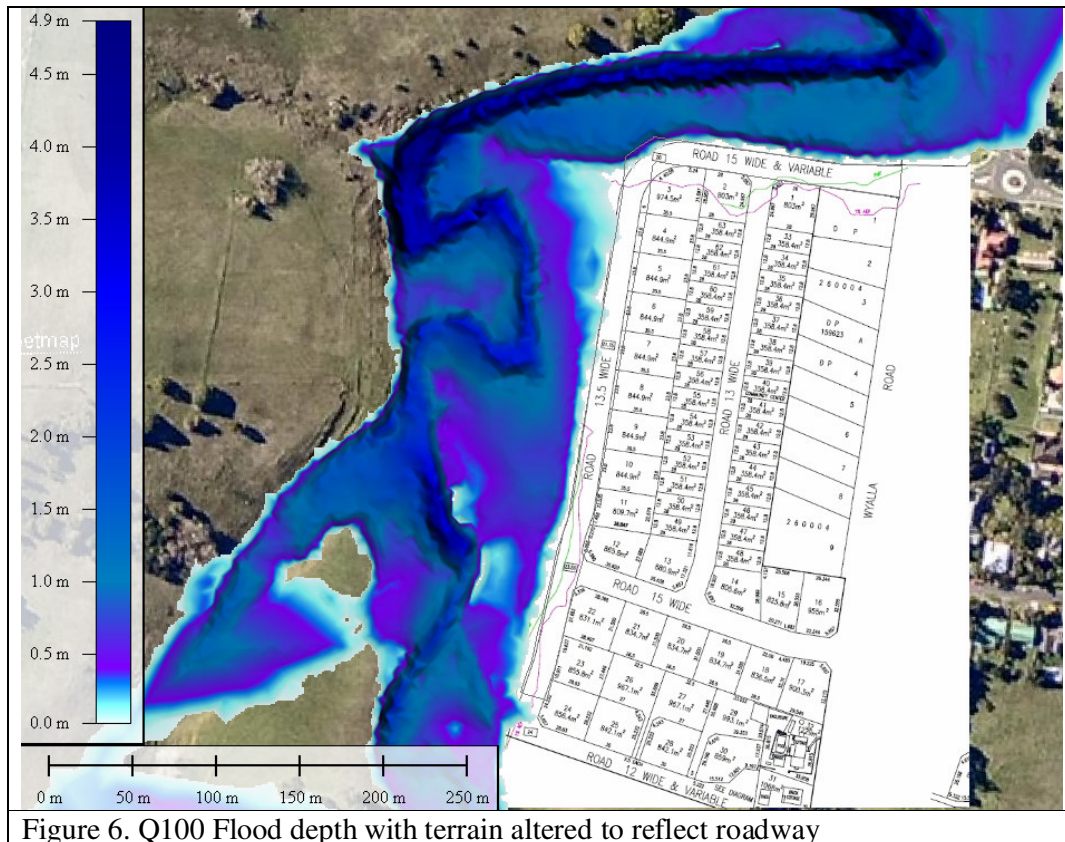


Figure 6. Q100 Flood depth with terrain altered to reflect roadway

The most informative plot to assess impact is in the review of momentum. Momentum is the product of Velocity times Depth ($V \times D$) which is also used as a measure of HAZARD. The plot shows that no hazardous conditions occur on or near the roadway.

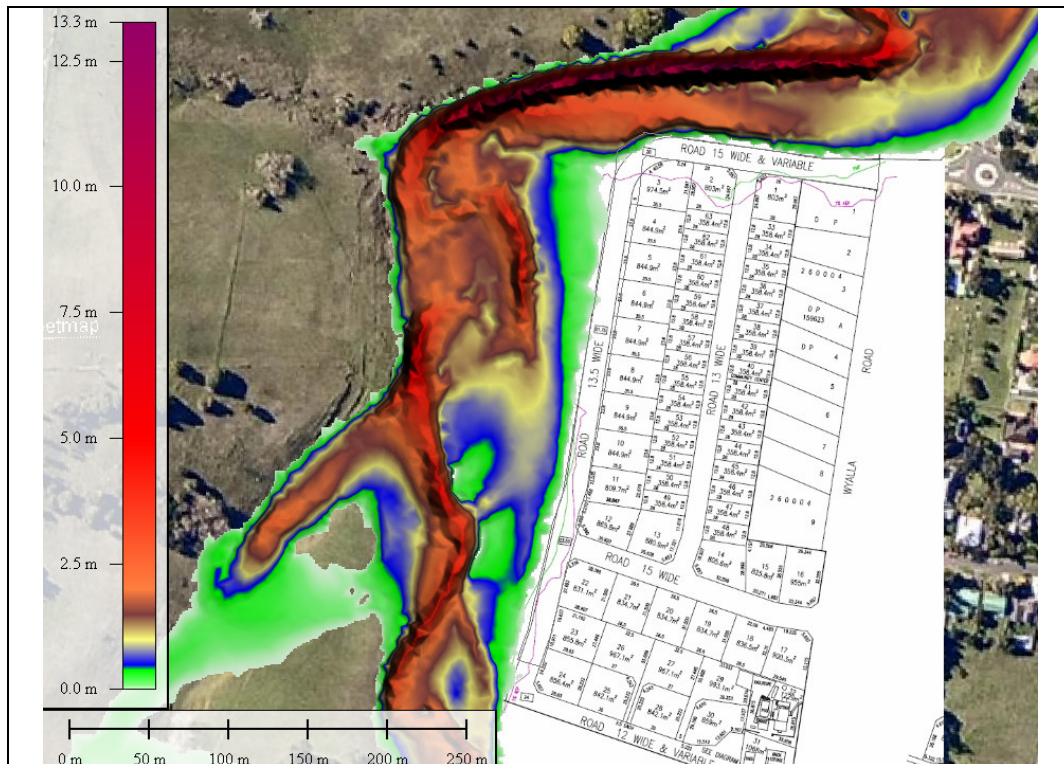


Figure 7. Q100 Flood Momentum with terrain altered to reflect roadway

The resulting flood stage (Flood levels) are as follows:

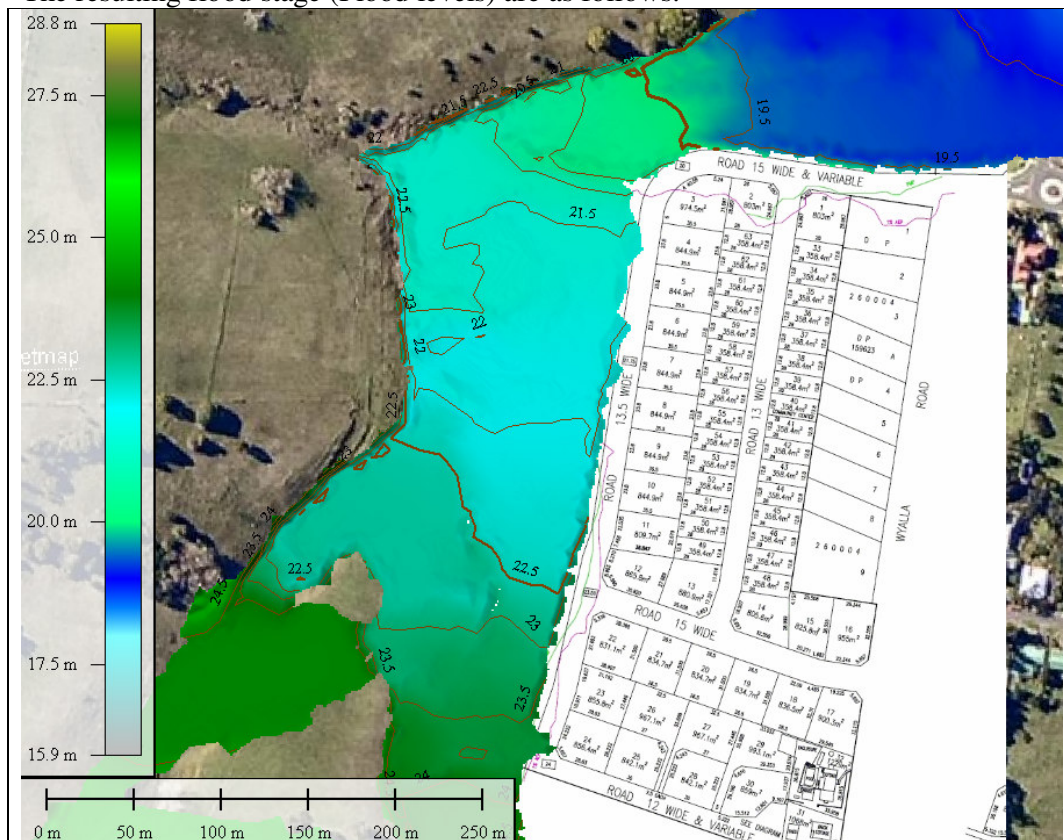
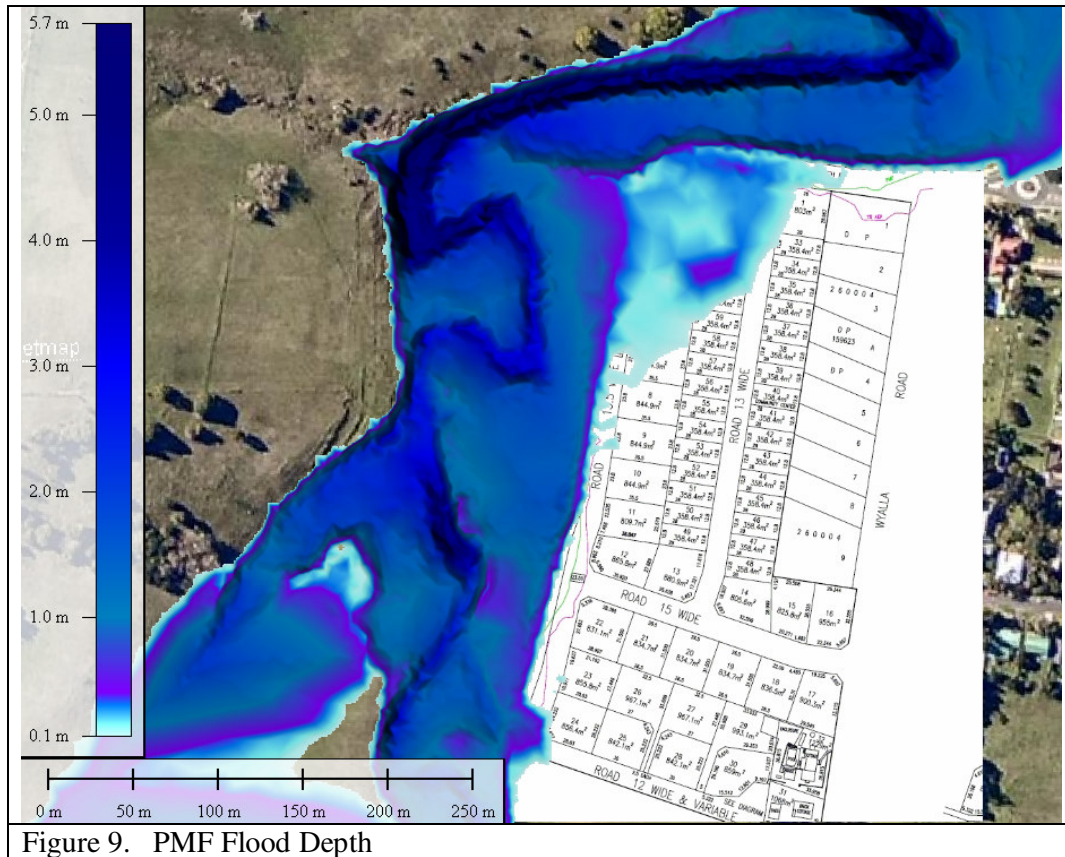


Figure 8. Resulting Q100 Flood Levels

The analysis of the PMF event has also been undertaken. The results show that the majority of the site is not impacted by the PMF. However there is some low level flooding in the north west corner generally less than 250mm with one small localised hollow showing depths of 400mm. This localised hollow will be filled as part of the sub division works. (Shown in purple).



Importantly the review of VxD (momentum) shows that the PMF flooding is non-hazardous having values below 0.4 (shown as green below).

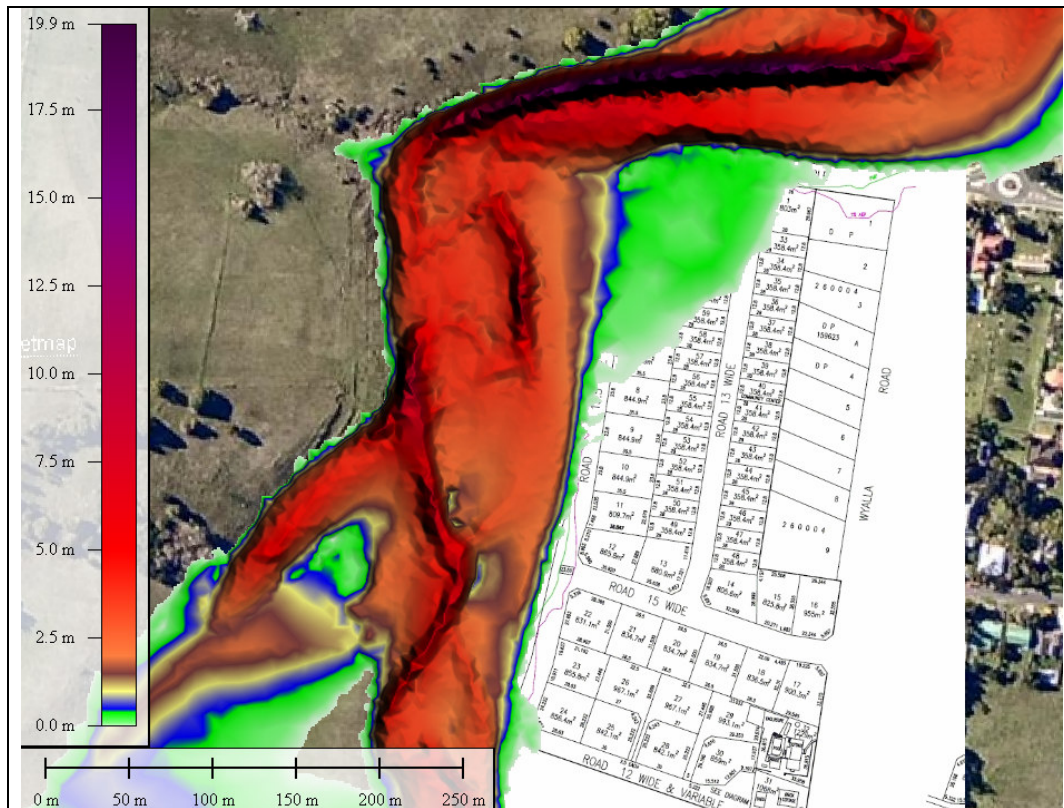


Figure 10. PMF Flood Hazard (VxD)

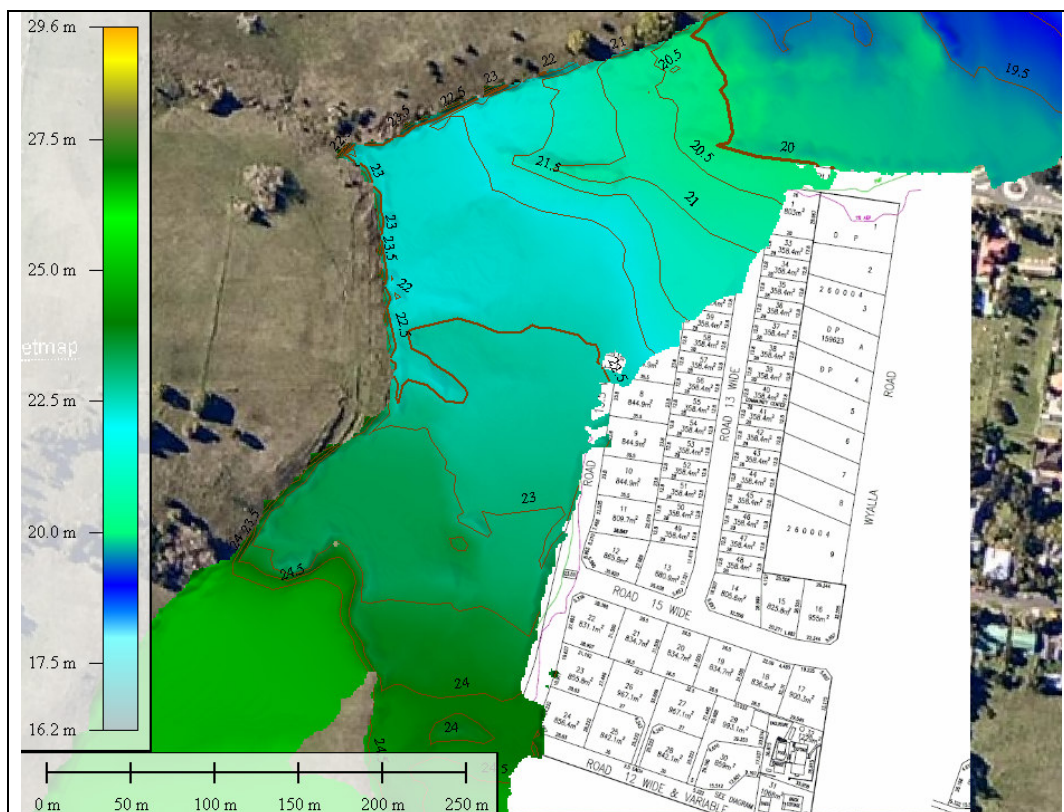
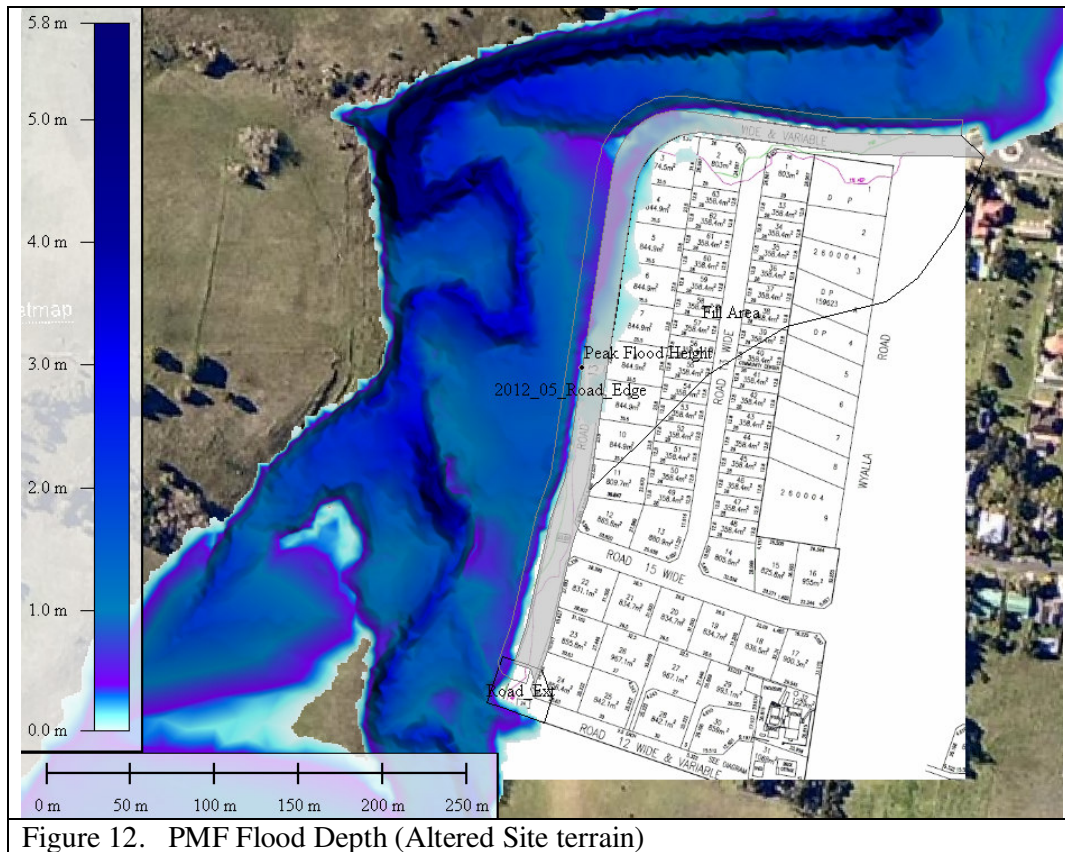


Figure 11. PMF Flood Levels

RAISING LOTS ABOVE THE PMF:

The proponents of the development have instructed that they would prefer to create allotments that are not impacted by the PMF event. Considering that generally the lots initially found to be inundated by the PMF have depths less than around 400mm (max.) altering the terrain (slightly) to provide flood free lots is plausible. The following images indicate the results of re-running the flood model with the PMF event with terrain altered to raise the lots.



Again the Momentum plot shows the associated level of HAZARD ($V \times D$).

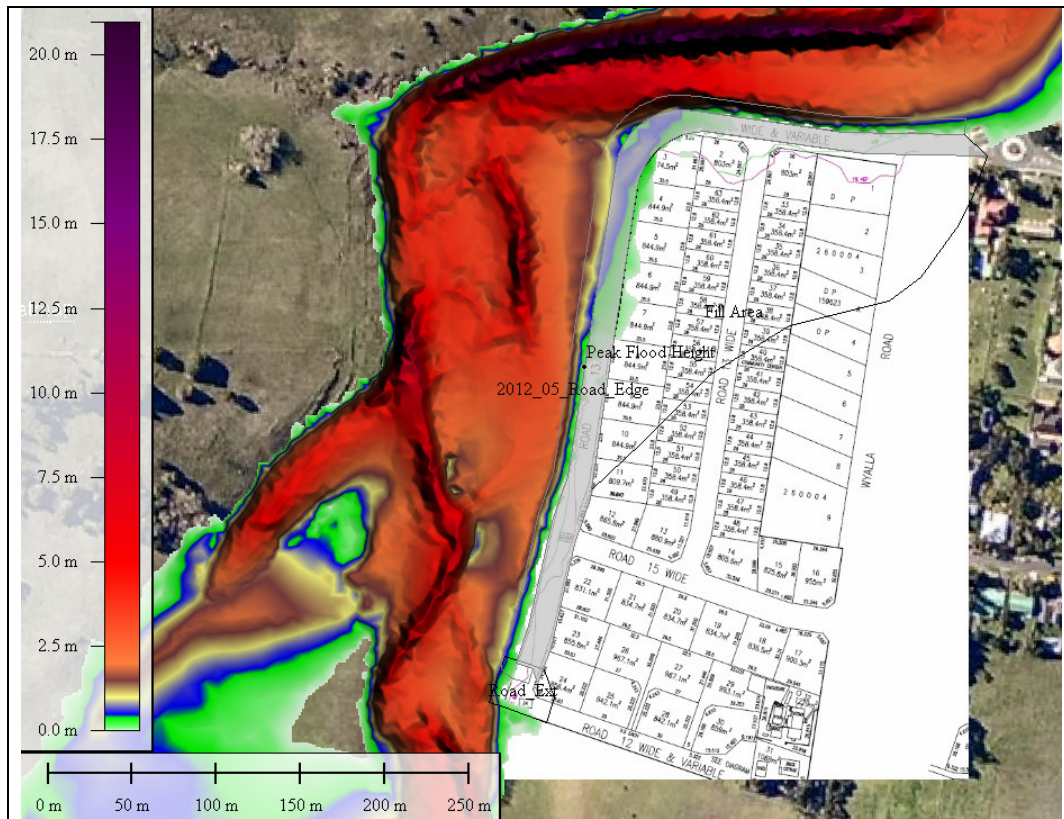


Figure 13. PMF Flood Hazard (VxD) { Altered site terrain}

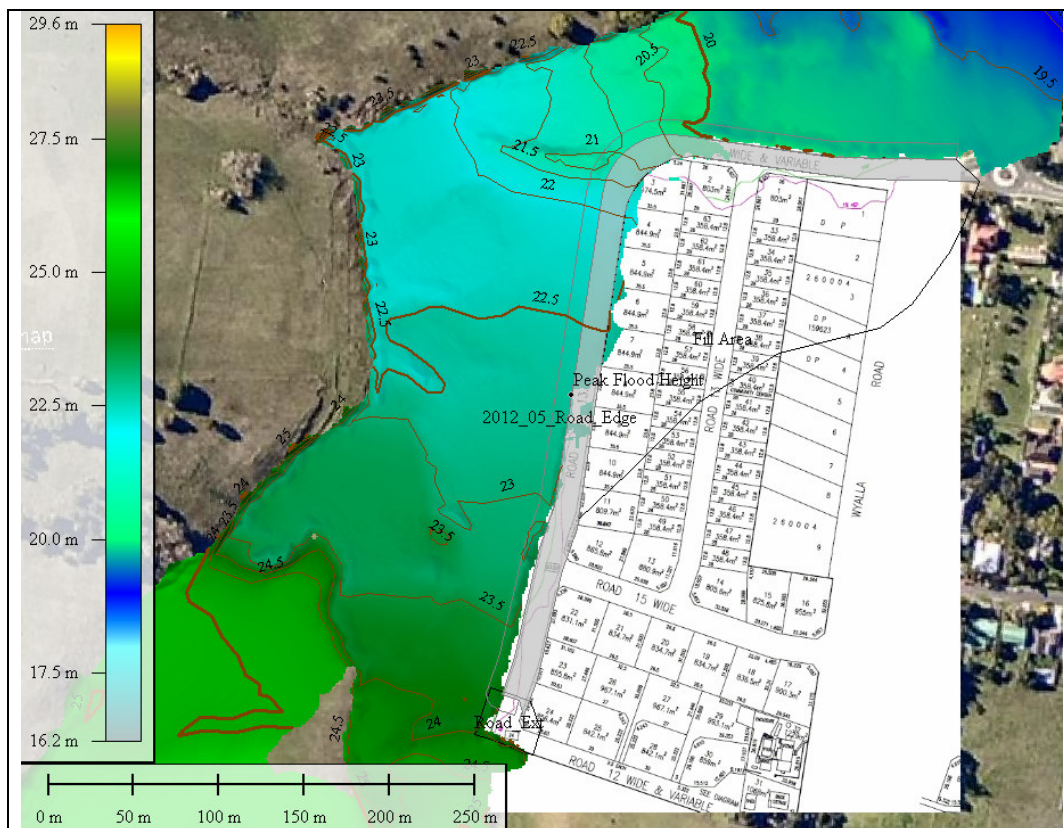


Figure 14. PMF Flood Levels with altered site terrain

CONCLUSIONS:

The post developed flood analysis shows that the proposed roadway is flood free in a 1:100 year event. The PMF analysis resulted in identifying an impact to lots that with some site terrain changes (filling) has been shown to be flood free for all events up to the PMF.

Comparing the pre and post developed PMF flood surface shows that the proposed development reduces the flood level between ~130-300m and has a localised increase between ~300-750m. The maximum decrease is around 400mm whilst the maximum localised increase is around 300mm tapering off to zero at around 750m.

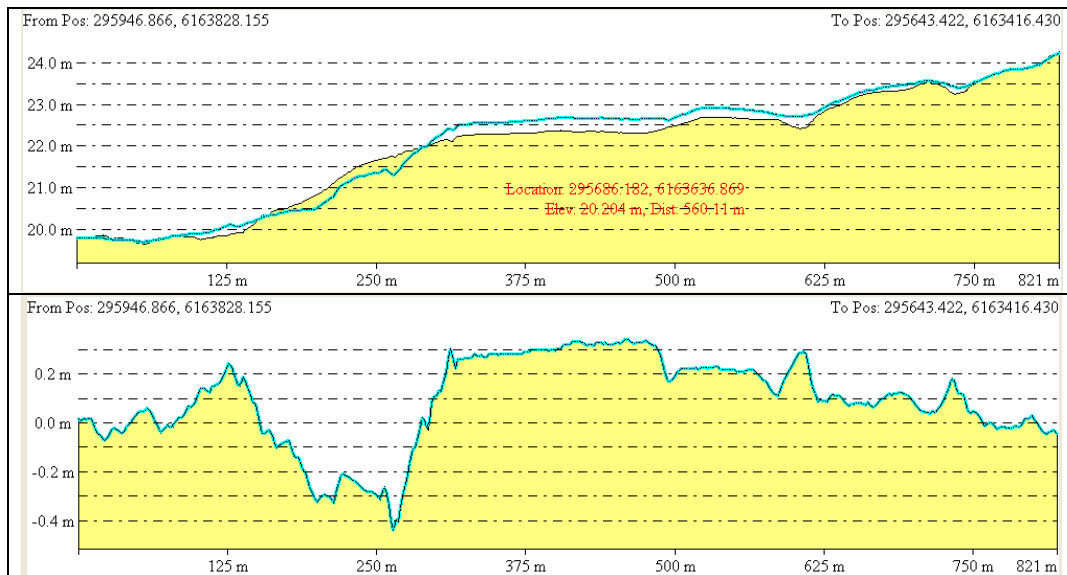
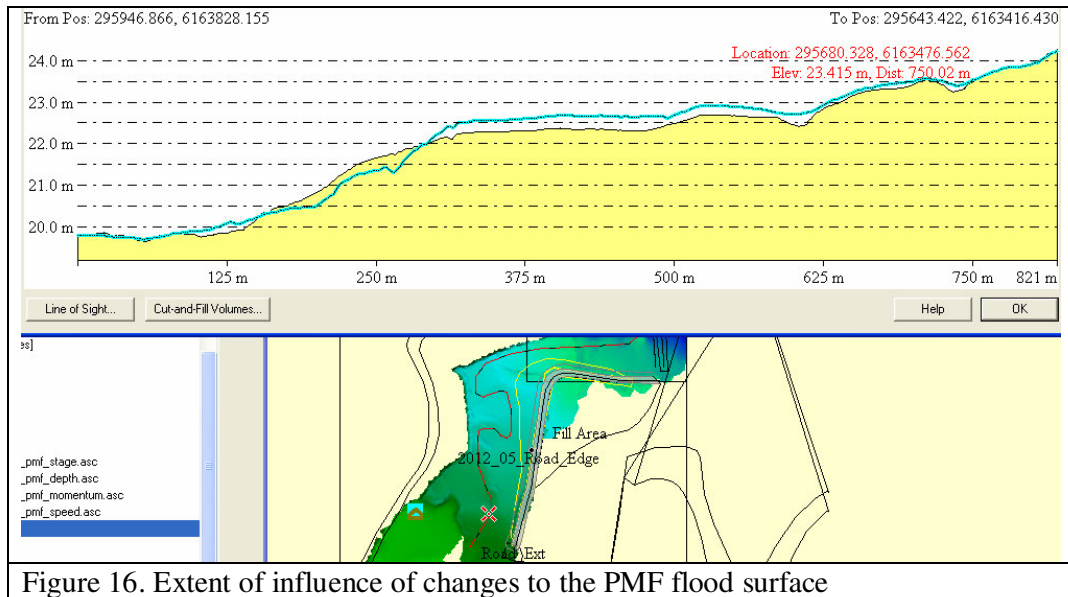


Figure 15. PMF Pre-Post developed flood profile(top) along stream centreline (& difference plot below)

Note that 750m along the stream centreline coincides with the red X on the following image, prior to the end of the proposed roadway and well within the site boundaries.

ADDENDUM to Wyalla Rd Jamberoo Flood Study – Post Development
By Rudy Van Drie Dated: 28/05/2012



It is clear that the proposed site can be developed in a manner that leaves the site flood free for all events including the PMF.

RECOMMENDATIONS:

It is recommended that the proposed roadway design levels be amended such that the levels adopted in this report be used to design the final roadway levels.

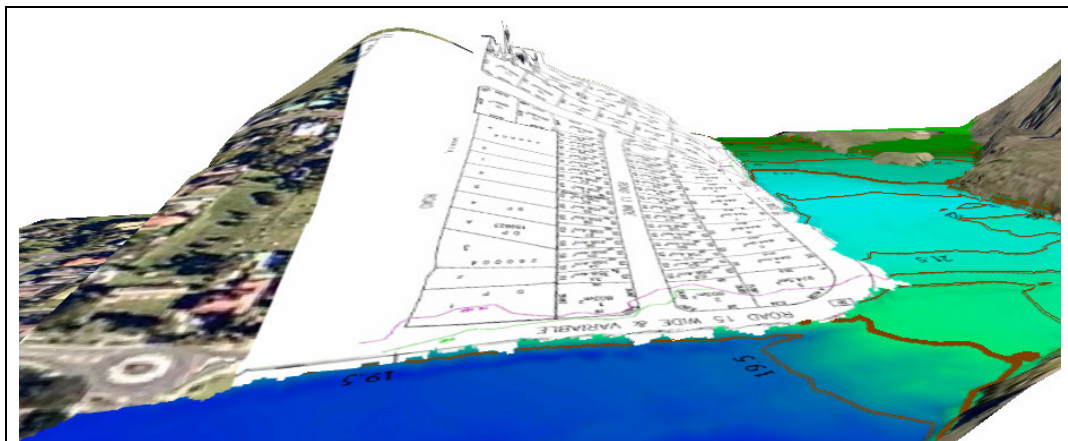


Figure 17. Developed Site under the influence of the 1:100 year event

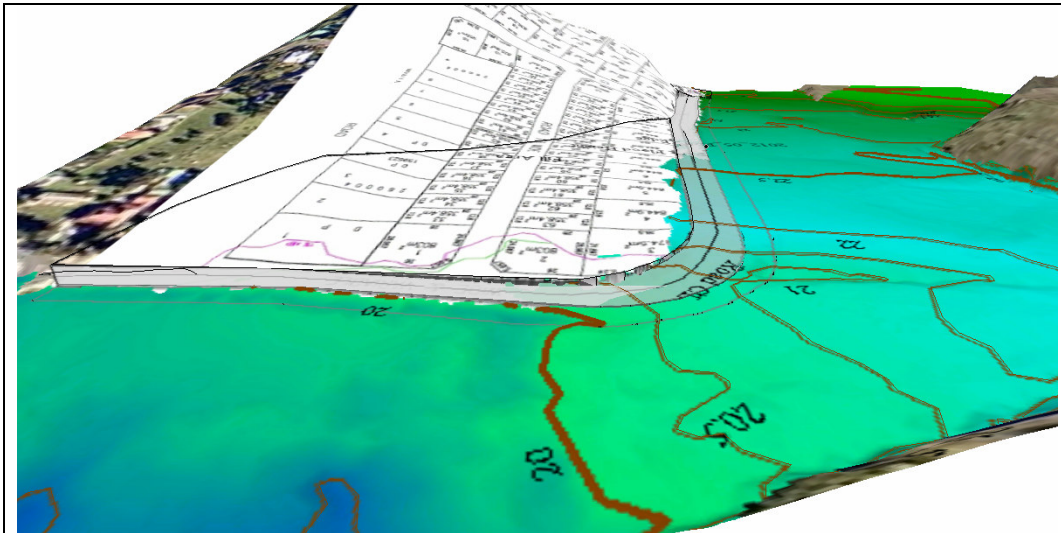


Figure 18. Developed Site under PMF conditions

If any one has any further questions regarding any thing stated in this report please do not hesitate to contact me.

Regards Rudy Van Drie



28/05/2012