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Our Ref: DJL: L.N2335.015.docx

17 June 2013

Engenicom
161 King Street
Newcastle
NSW 2300

Attention: Mr. Brett Peterkin

Dear Brett

RE: HEXHAM TRAIN SUPPORT FACILITY - RESPONSE TO PPR FROM OEH

This letter provides a response to the issue raised by OEH concerning potential off-site flood impacts of the proposed on-site stockpiling of treated material.

A figure was provided to BMT WBM indicating the proposed locations of treatment and storage of acid sulphate soils. There are three areas located in the vicinity of the existing coal tailings and balloon loop, as indicated on Figure 1.

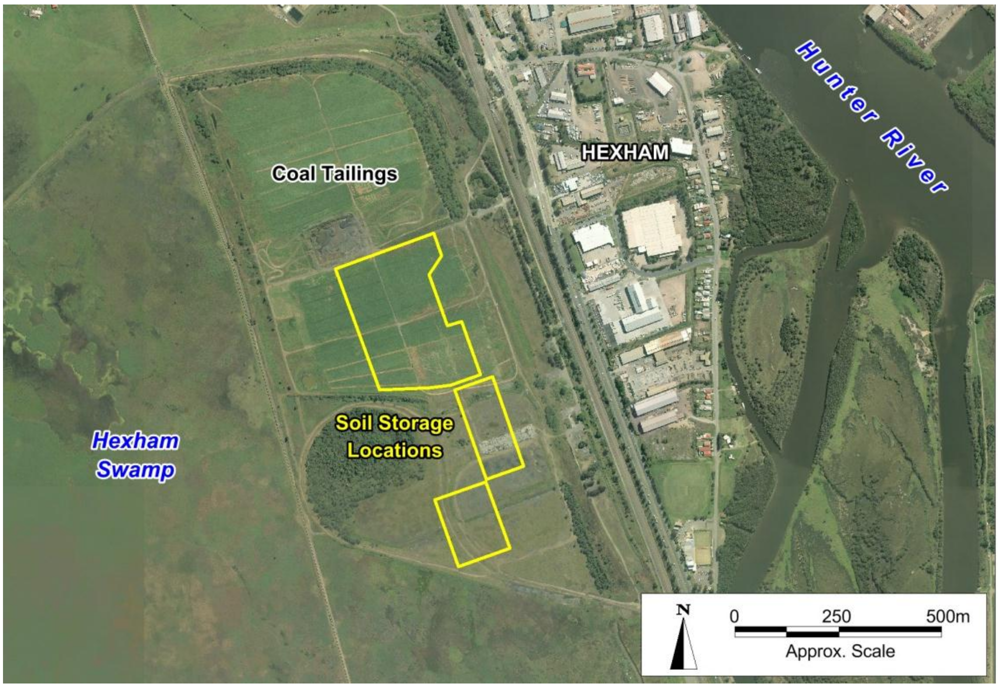

Figure 1 Location of Proposed Soil Storage Areas

The proposed storage locations are situated above the flood level of events up to the order of a 2% AEP magnitude. However, for larger events such as the 1% AEP the proposed storage locations may become inundated and potentially cause off-site flood impacts. An assessment of these potential flood impacts was therefore undertaken. The model representing the proposed works of the ARTC Hexham Relief Roads and the Aurizon Long Term Train Support Facility was used for the basis of this assessment.

Figure 2 shows the existing 1% AEP peak flood depths and corresponding flow velocity directions. In terms of the existing flow distribution, the locations of the proposed stockpiles provide for only limited obstruction to flow. The stockpile areas are typically located on or within the shadow zone of existing high ground. Accordingly it would be expected that the stockpiles would have limited impact on the broader flow behaviour. Nevertheless, the existing TUFLOW has been used to demonstrate this expected finding.

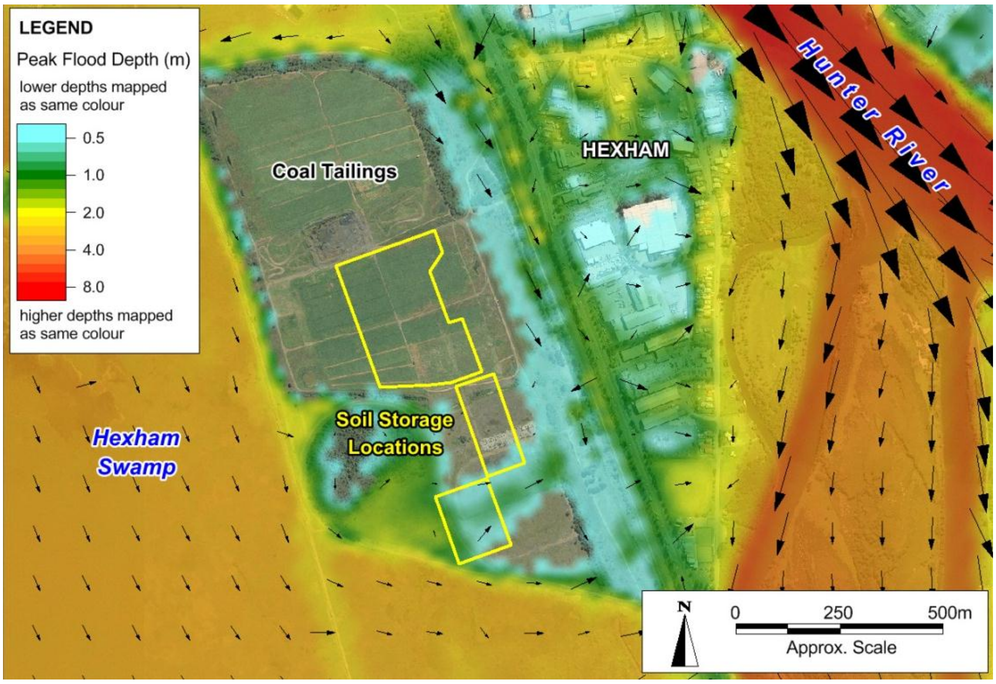

Figure 2 1% AEP Peak Flood Depths for Existing Conditions

The TUFLOW model was updated to incorporate the proposed storage locations, which were raised to an elevation above that of the 1% AEP flood level. The 1% AEP design flood event was then simulated to determine the impact on the flood behaviour. Figure 3 shows the impact on peak flood levels for the 1% AEP event. It can be seen that there is a localised reduction in peak flood levels on the “downstream” side of the soil storage locations. The off-site impacts are negligible. During the modelled 1% AEP design event flood waters flow from Hexham Swamp into the Hunter River between Hexham and Sandgate, overtopping the railway and Pacific Highway. The inclusion of on-site soil storage reduces this flow path width by around 100m, over a total flow path width of almost 3km, hence the negligible impacts on regional flooding.

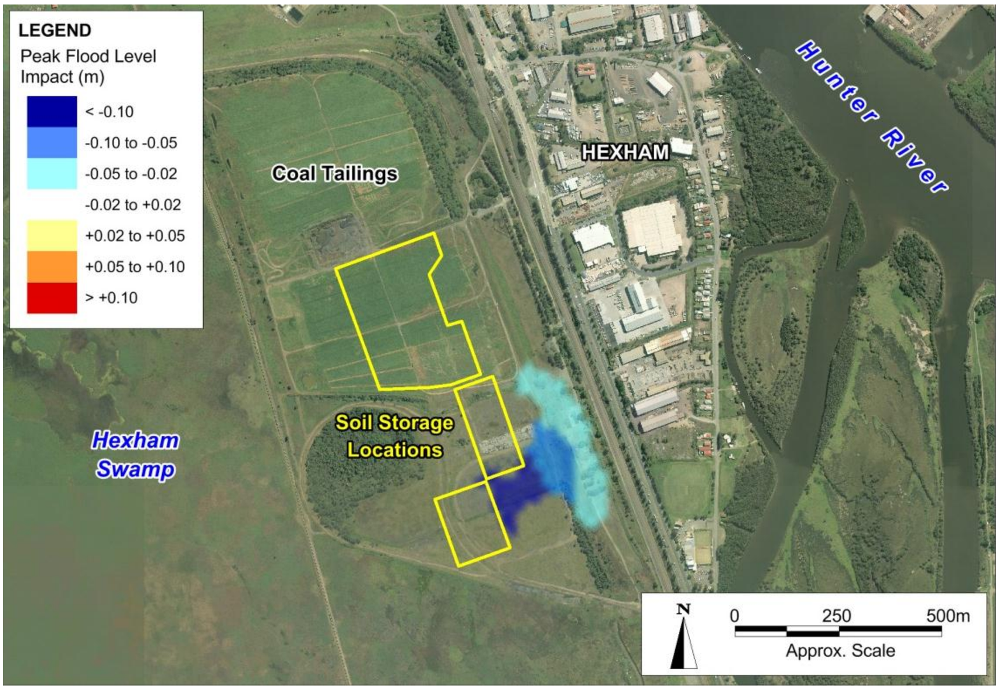

Figure 3 1% AEP Peak Flood Level Impacts

We trust that the additional information included in this letter adequately addresses the concerns of OEH. Further information or clarification regarding any aspect of the above can be obtained by contacting the undersigned.

Yours Faithfully
BMT WBM Pty Ltd

Darren Lyons
Manager, Water & Environment - Newcastle

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26 June 2013

Engenicom
161 King Street
Newcastle
NSW 2300

Attention: Mr. Brett Peterkin

Dear Brett

RE: HEXHAM RELIEF ROADS PIR - RESPONSE TO FLOOD IMPACT ASSESSMENT PEER REVIEW

This letter provides a response to the Peer Review request for additional information provided by Mr Grantley Smith of UNSW Water Research Laboratory (dated 12th June 2012) in relation to the Hexham Relief Roads PIR.

This letter response focuses on providing the additional information requested, specifically the items labelled a) to d). An individual response to each of these items is provided hereunder.

Item a) *Please provide longitudinal profiles in key locations comparing the crest levels of the flow controls as represented in the broad scale and fine scale models. The profiles should compare the 40m grid resolution profile with the 4m grid profile and the survey from the base digital elevation model developed using Lidar and photogrammetric data.*

A longitudinal profile along the existing rail control is provided in Figure 1 and relates to the alignment presented in Figure 2. Figure 2 also contains the modelled velocity-depth product from the existing case local model to present the spatial distribution of key flood flow paths. The source of the elevation profile is from the detailed photogrammetric dataset within the project corridor that was surveyed to assist with the design process. The profile presented has been extracted from the breaklines representing the top of rail. This surveyed profile has been incorporated as a 2d zshape into both the regional and local TUFLOW models and so the modelled profiles are consistent with that of the survey, albeit with a representative elevation point every 20m in the regional model and every 2m in the local model.

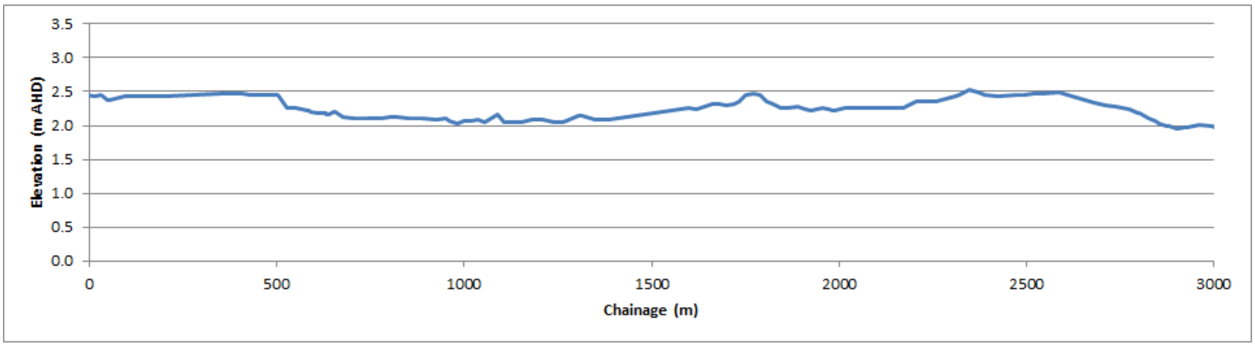

Figure 1 Longitudinal Profile of the Existing Rail Control

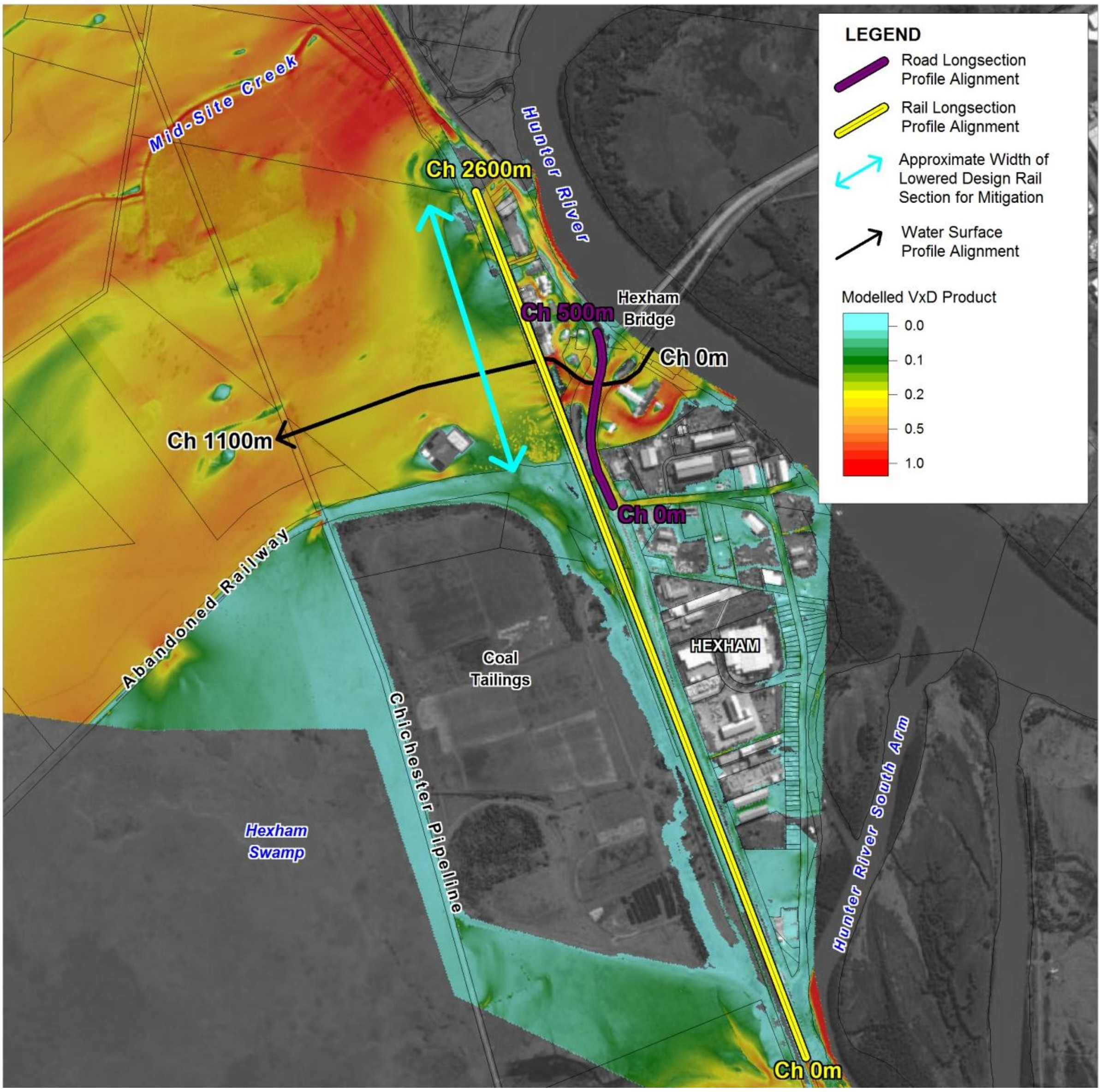

Figure 2 Location of Long Section Alignments and Modelled VxD Product

A longitudinal profile along the Maitland Road alignment (see Figure 3) has also been provided in Figure 3. It presents the surface elevations along the centreline of Maitland Road as represented by the digital elevation model derived from the detailed photogrammetric dataset and the LiDAR dataset. Modelled elevations have been extracted along the same alignment and are presented for comparison. The representation within the local model is similar to that of the survey data. The representation within the regional model is broadly similar to the survey data, but is noticeably different between chainages 100 and 300. This is the influence of the Pacific Highway flyover being picked up within the 40m grid resolution and is a major contributing factor to differences in modelled flows through the development site within the regional and local models.

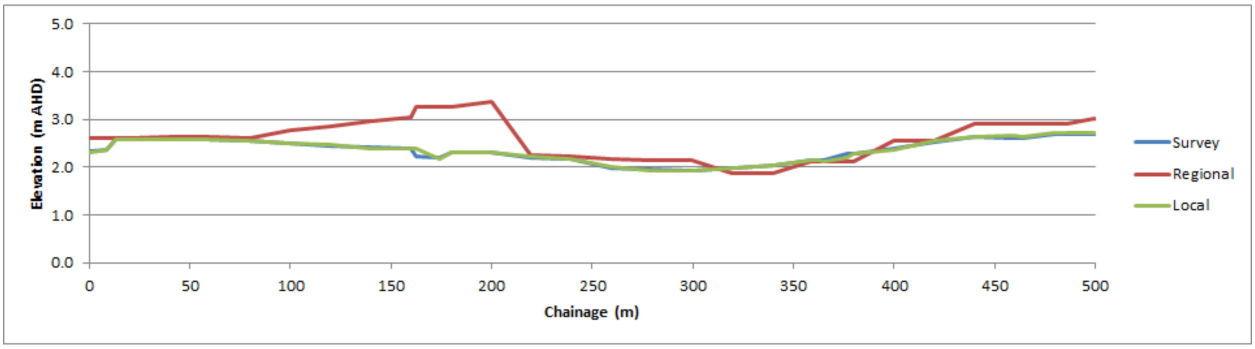

Figure 3 Longitudinal Profile of the Maitland Road

Item b) *A comparison of the water surface level gradients for the 2% AEP flood through the fine scale, 4m grid area compared to an equivalent alignment through the 40m grid model.*

A comparison of simulated water surface level gradients for the 2% AEP flood has been provided in Figure 4 for a transect from the Hunter River across the existing and proposed rail alignment through to Hexham Swamp (refer to Figure 2 for the transect alignment). The water surface profiles at the time of peak discharge through the development site are shown. Elevation surfaces for the existing case and design case have also been provided for context.

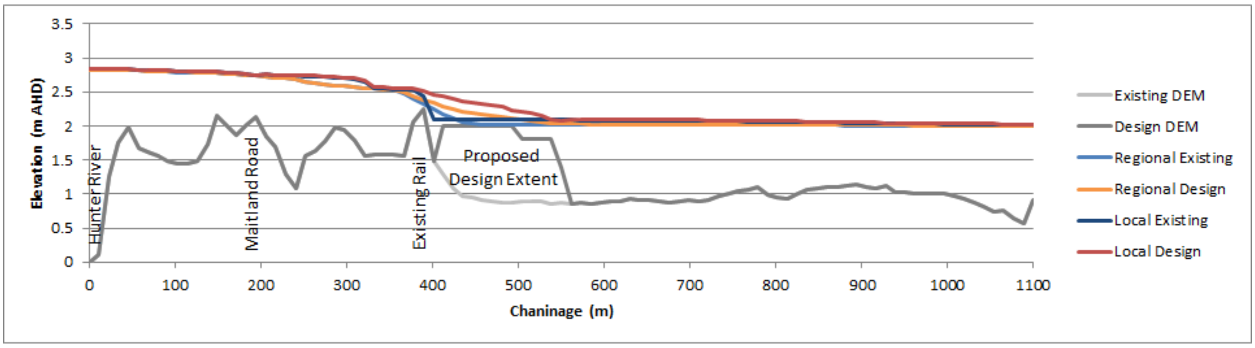

Figure 4 Water Surface Level Gradients through the Development Site for the 2% AEP Flood

The water surface level gradients are similar in the regional and local models, albeit with some additional local controls evident in the latter. The additional head loss across the proposed rail developments is also evident.

Item c) *A comparison of the model boundary flux distributions in the 4m grid model compared to the 40m grid model for the 2% AEP event for both existing and updated design cases.*

As discussed in the previous response, the flow across the New England Highway to the north of Hexham was extracted from the regional model and applied as a flow boundary to the local model. As such, the flow distribution is similar between the two models and is presented in Figure 5 for the 2% AEP flood. There is a negligible difference in the flow distribution between the existing and design cases.

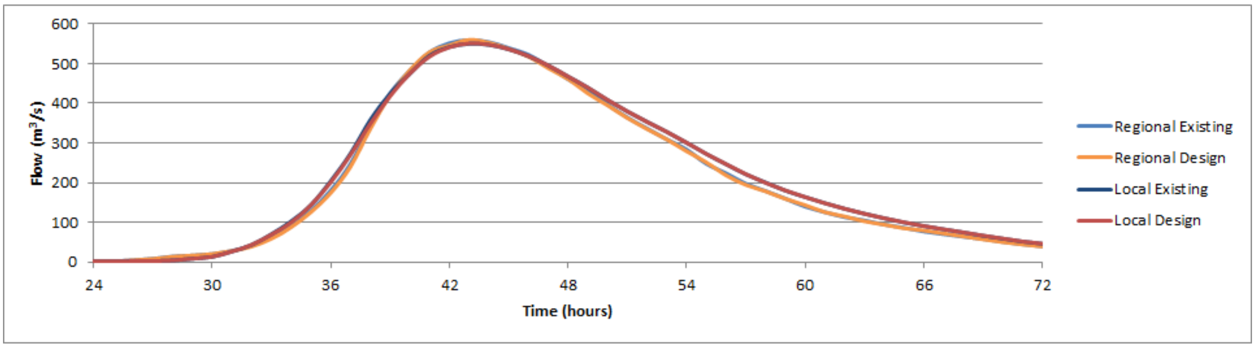

Figure 5 Flow Hydrographs at the New England Highway Model Boundary for the 2% AEP Flood

The flow across Maitland Road and over the existing rail alignment is significantly different between the regional and local models as the resolution of the model topography provides a much improved representation of conveyance through the site in the local model. This was the principal driver for the development of the local model noting the presence of a localised low point in the Hunter River right bank and complex flow path networks through the developed area of Hexham. The flow hydrographs over the existing rail alignment in Hexham for the 2% AEP flood are presented in Figure 6. It can also be seen that there is a slight reduction in conveyance across the railway for the design case, as more flow is instead pushed further north or south along the road and rail corridor. This is the principal source of the residual flood impacts presented in the study documentation.

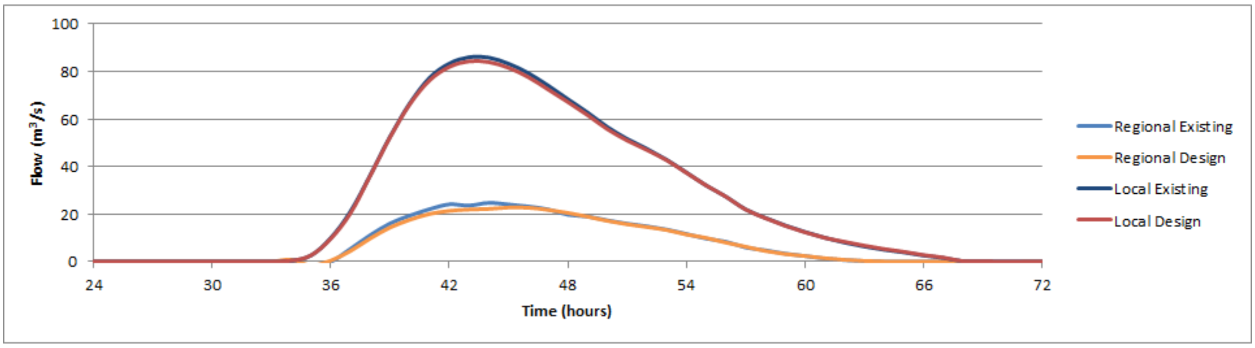

Figure 6 Flow Hydrographs over the Existing Rail Alignment for the 2% AEP Flood

The flow through Hexham Swamp near the downstream boundary of the local model is presented in Figure 7 along with the corresponding flow at a similar location in the regional model. It can be seen that the hydrographs in the local and regional models are a similar shape. The higher flows in the local detailed model compared to the regional model are directly attributable to the increased flow through the development site (as shown in Figure 6). In both the regional and local models there is negligible difference in flows between the existing and design cases.

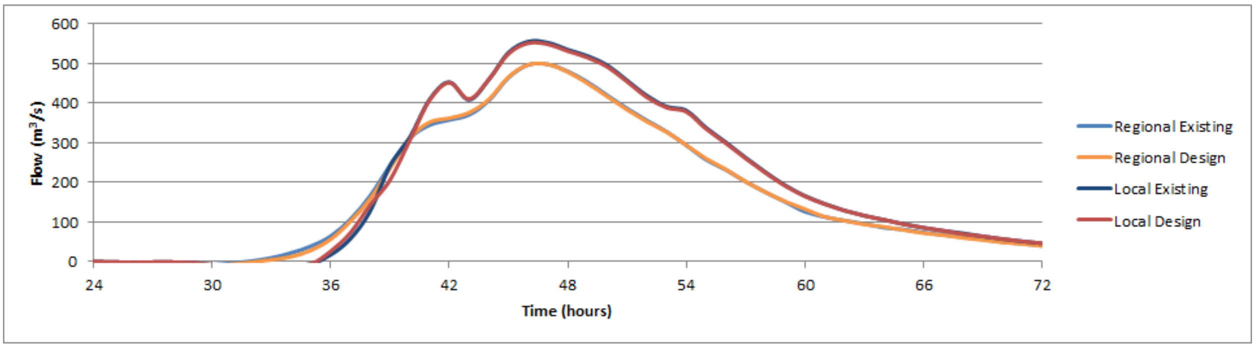

Figure 7 Flow Hydrographs at the Hexham Swamp Model Boundary for the 2% AEP Flood

Item d) *An updated longitudinal profile as per the item g) profile provided in the BMTWBM letter which includes:*

- *i. The existing rail profile;*
- *ii. The design rail profile;*
- *iii. The modelled water surface profile for the 2% AEP event along this alignment for both the existing and design cases*

A longitudinal profile along the existing rail alignment (indicated in Figure 2) is presented in Figure 8. The profile of the design rail alignment is also presented, together with the peak flood level profiles of the 2% AEP flood for both the existing and design cases (taken on the upstream face of the existing rail alignment). The profiles presented highlight three distinct flow paths through the development site. The main flow path is located between chainages 1800 and 2300, corresponding to the area of higher flow distribution in Figure 2. This area also corresponds to the main area of track lowering in the proposed design in order to accommodate the bulk of the existing flow.

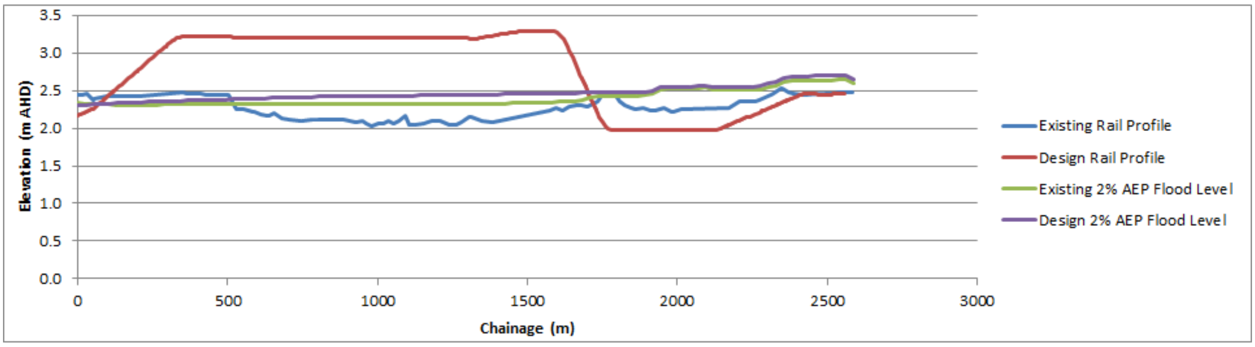

Figure 8 Longitudinal Profile along the Existing Rail Alignment and Design Profile with Corresponding 2% AEP Flood Level Profiles

Another significant flow path to the north of the Brancourts (former Oak Milk) site between chainages 2400 and 2600 is also maintained by the design rail profile given the design is at the same level as the existing rail.

The third flow path, located between chainages 500 and 1700, although significant in terms of the cross-sectional area of overtopping, is limited in conveyance capacity due to the presence of the existing coal tailings immediately downstream. This is also reflected in the flow distribution presented in Figure 2.

We trust that the additional information included in this letter adequately addresses the requests of the Peer Review. Further information or clarification regarding any aspect of the above can be obtained by contacting the undersigned.

Yours Faithfully
BMT WBM Pty Ltd

Darren Lyons
Manager, Water & Environment - Newcastle