RE: Ohinewai - stop bank breach scenario

Friday, 21 August 2020 11:06 am

Subject	**RE: Ohinewai - stop bank breach scenario**
From	Ajay Desai
To	Rick Liefting; mpennington@tonkintaylor.co.nz; Ghassan Basheer
Cc	Stuart Penfold; John Olliver
Sent	Thursday, 20 August 2020 5:48 pm

Hi Ghassan,

Thanks for the meeting this morning. Here is a summary of our discussion that we intend to summarise in a piece of rebuttal evidence to inform the decision making panel (and to provide clarity to the wider audience, primarily the WDC and WRC planners).

1. Results from the additional modelling for the stop bank breach scenario and way forward to share results/models/model bathymetry for pre and post development scenarios
    a. All the final models and results for the following scenarios are saved on OneDrive link provided below as separate icmt files (and in GIS format) for review and feedback –
    i. Effects assessment scenarios (pre and post development for rainfall events agreed with Mark Pennington)
    ii. Sensitivity assessment
    iii. Stop bank breach scenario
    iv. No storage within Business park area
    v. The changes are as explained in the email dated 29th of June 2020 and summarised here - We have refined the models in InfoWorks ICM as suggested in earlier emails which works coherently which are using for designing. As you can see in the table below, these refinements are significant improvements in the model resolution and captures all of the overland flow paths and key features like roads and rail lines, etc.

Modelling details	***Flood Assessment Modelling***	***Pre Hearing Modelling (Round 2)***
Software	*Mike by DHI (v2017)*	*InfoWorks ICM 9.5.2*
Mesh resolution within Sleepyhead Estate site	*Maximum element size: 25m²*	*Maximum element size: 5m² Minimum element size: 2m²*
Mesh resolution outside Sleepyhead Estate site in neighbouring properties (all areas contributing in vicinity of the site draining to Tahuna and Balemi drains)	*Maximum element size: 100m²*	*Maximum element size: 10m² Minimum element size: 5m²*
Rest of the catchment	*Maximum element size: 100m²*	*Maximum element size: 100m² Minimum element size: 25m²*

OneDrive link – https://woodandpartner-my.sharepoint.com/:f:/g/personal/ajay_desai_woods_co_nz/Ehny3A6opnNAuEnFghbZ0FcBOaa25Z8b3Cf8NlW15PyujA?e=uCWEZ8

2. Draft plan provisions

    a. Agreed that the maximum flood level within Lake Waikare and the APL site would be 8.0mRL
    b. We propose to set out minimum floor levels in the plan provisions to account for the potential for flood risk to the development. This has been guided by NZS4404:2010 as you have suggested. Note that we have used the terminology of finished floor levels (rather than building platform) as that is consistent with clause 4.3.5.2 and provides for clarity at building consent stage/ planning check. The rules provide for the freeboard above the flood level as set out in the NZS.

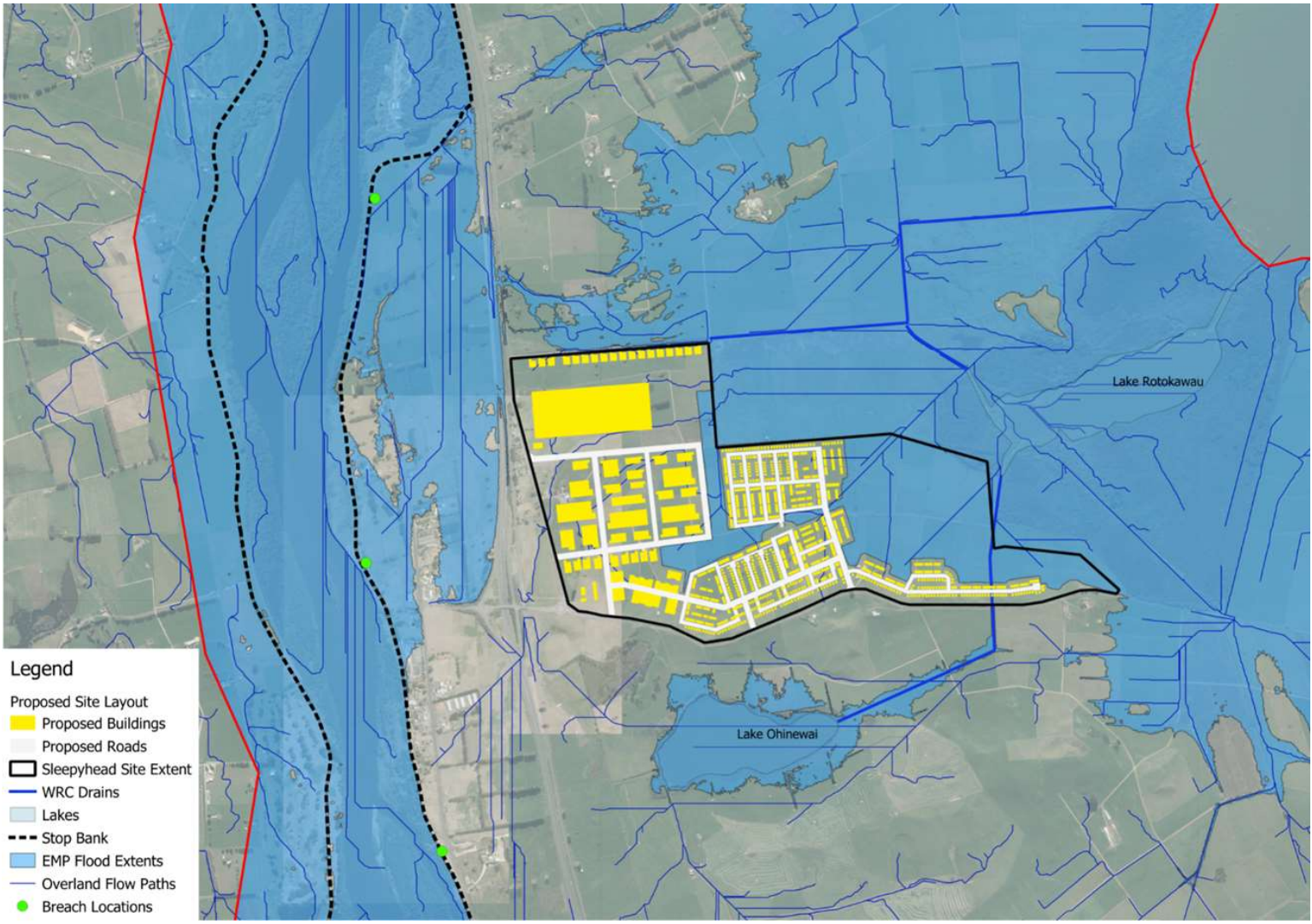
Proposed rules would be as follows (subject to updating references):

i. ***Residential zone - 16.6.4 RD2: Any residential units (including attached garages) are to have a minimum finished floor level of 8.5mRL***
ii. ***Residential zone - 16.6.4 RD3: Any non-habitable residential buildings and detached garages are to have a minimum finished floor level of 8.2mRL***
iii. ***Business Zone - 17.6.4 RD1: Any commercial/industrial units are to have a minimum finished floor level of 8.3mRL***
iv. ***Industrial Zone – 20.6.3 RD 1: Any commercial/industrial units are to have a minimum finished floor level of 8.3mRL***

    c. Results from the stop bank breach modelling (as shown below) confirm that the breach flows are mostly contained within the area to the west of State Highway 1 and the North Island Main Trunk railway. Flows overtop the State Highway 1 ONLY at one location and follow the overland flow paths towards the northern site boundary and traverse eastwards to Lake Rotokawau and lake Waikare. There are no flows entering the site with the proposed terrain designed within the factory site (which are in excess of 9.5mRL) to match/connect the North Island Main Trunk railway existing levels and are already locked in under Stage 1 already. There is no other interaction of the site with breach flows, hence the site south of the factory site is completely safe from stop bank breach flows.

To account for a minimum of earthworks across the site and to ensure the development is protected by any stop bank breach, we propose the following rules.

i. ***16.6.4 RD2: All lots must have building platforms that are above 8.00mRL (ground level)***
ii. ***Replicated in the Business and Industrial zone***



Please let us know if you and Rick are happy with these to be closed out. We're happy to discuss the planning aspects with Ian Mayhew if that would help.

Regards,
Ajay

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Health & Safety Quality Environment

Ajay Desai
Senior Technical Specialist - 3 Waters
M.E., B.Tech, MEngNZ, MCIWEM, GMICE
022 637 9729
ajay.desai@woods.co.nz
woods.co.nz

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Ajay Desai
Senior Technical Specialist - 3 Waters
M.E., B.Tech, MEngNZ, MCIWEM, GMICE
022 637 9729
ajay.desai@woods.co.nz
woods.co.nz

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From: Ajay Desai <ajay.desai@woods.co.nz>
Sent: Tuesday, 18 August 2020 11:29 am
To: Rick Liefting <Rick.Liefting@waikatoregion.govt.nz>; Mark Pennington <MPennington@tonkintaylor.co.nz>; Ghassan Basheer <Ghassan.Basheer@waikatoregion.govt.nz>
Cc: Stuart Penfold <spenfold@bbo.co.nz>; Pranil Wadan <pranil.wadan@woods.co.nz>
Subject: RE: Ohinewai - stop bank breach scenario

Hi Rick,

Thank for the phone conversation this morning. As discussed, we have received Ghassan's evidence and would like to arrange a meeting sometime early this week to discuss the following with the aim to closeout prior to end of this week –

1. Confirm if WRC is happy with a minimum ground level of 8.0mRL (or 8.05m) and finished floor levels of 8.3m for commercial and 8.5m for residential
2. Results from the additional modelling for the stop bank breach scenario and way forward to share results/models (noting that the InfoWorks icmt file is ~130GB)

Let me know what time suits and I can set this meeting via MS Teams or any other platform (Zoom, Team Viewer, etc).

Kind Regards,
Ajay

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Health & Safety Quality Environment

Ajay Desai
Senior Technical Specialist - 3 Waters
M.E., B.Tech, MEngNZ, MCIWEM, GMICE

022 637 9729
ajay.desai@woods.co.nz
woods.co.nz

From: Rick Liefting <Rick.Liefting@waikatoregion.govt.nz>
Sent: Friday, 3 July 2020 12:03 pm
To: Ajay Desai <ajay.desai@woods.co.nz>; Mark Pennington <MPennington@tonkintaylor.co.nz>; Ghassan Basheer <Ghassan.Basheer@waikatoregion.govt.nz>; Ian Mayhew <ianm@4sight.co.nz>
Cc: John Olliver <jolliver@bbo.co.nz>; Stuart Penfold <spenfold@bbo.co.nz>; Pranil Wadan <pranil.wadan@woods.co.nz>; Ben Pain <ben.pain@woods.co.nz>
Subject: RE: Ohinewai - stop bank breach scenario

Thanks Ajay!

Rick Liefting | TEAM LEADER | Regional Flood Coordinator | Regional Resilience, Integrated Catchment Management

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P: +6478590580
M: +6421443310
F: facebook.com/waikatoregion
Private Bag 3038, Waikato Mail Centre, Hamilton, 3240

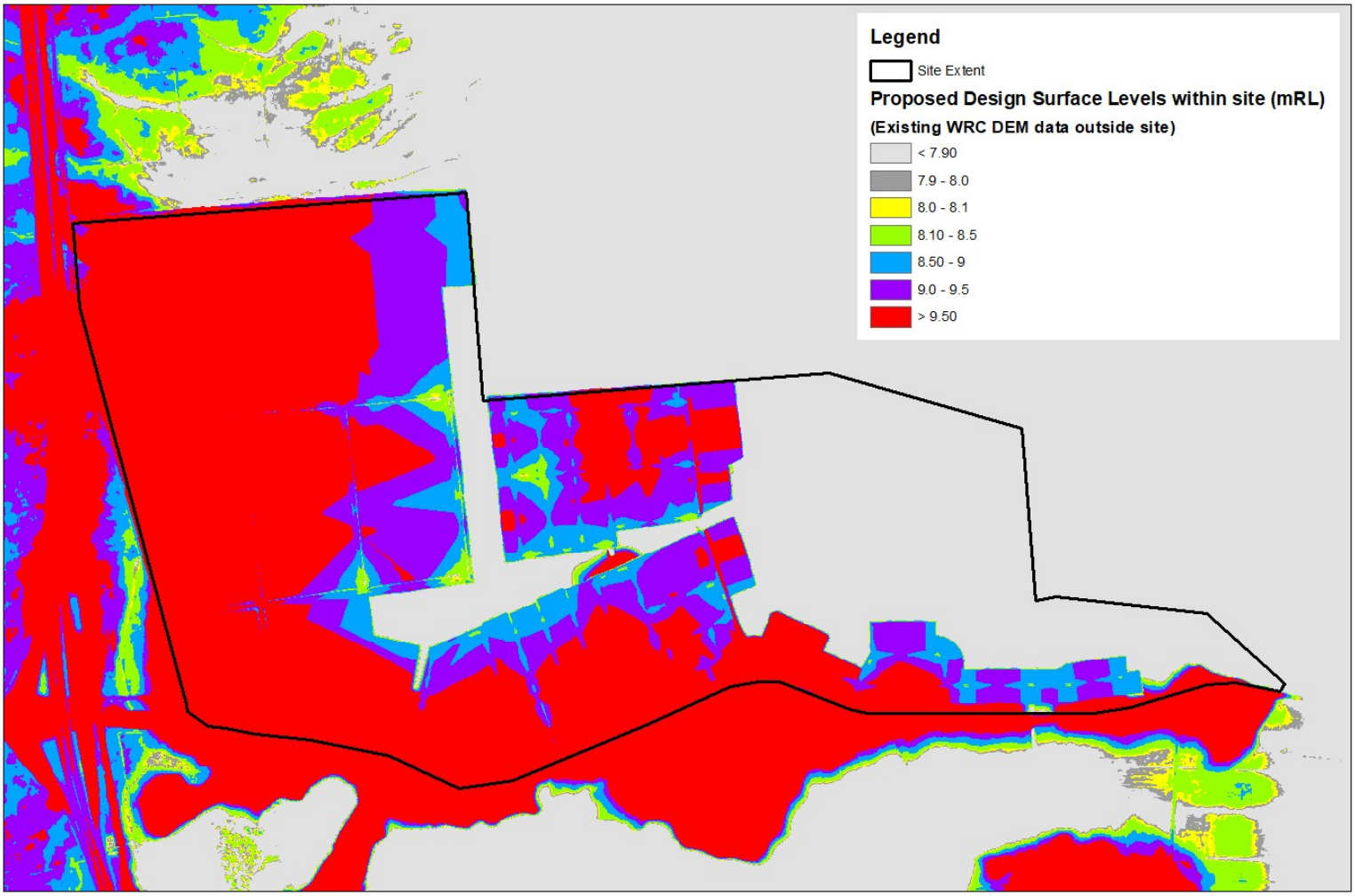
From: Ajay Desai <ajay.desai@woods.co.nz>
Sent: Thursday, 2 July 2020 6:24 PM
To: Mark Pennington <MPennington@tonkintaylor.co.nz>; Rick Liefting <Rick.Liefting@waikatoregion.govt.nz>; Ghassan Basheer <Ghassan.Basheer@waikatoregion.govt.nz>; Ian Mayhew <ianm@4sight.co.nz>
Cc: John Olliver <jolliver@bbo.co.nz>; Stuart Penfold <spenfold@bbo.co.nz>; Pranil Wadan <pranil.wadan@woods.co.nz>; Ben Pain <ben.pain@woods.co.nz>
Subject: RE: Ohinewai - stop bank breach scenario

Hi All,

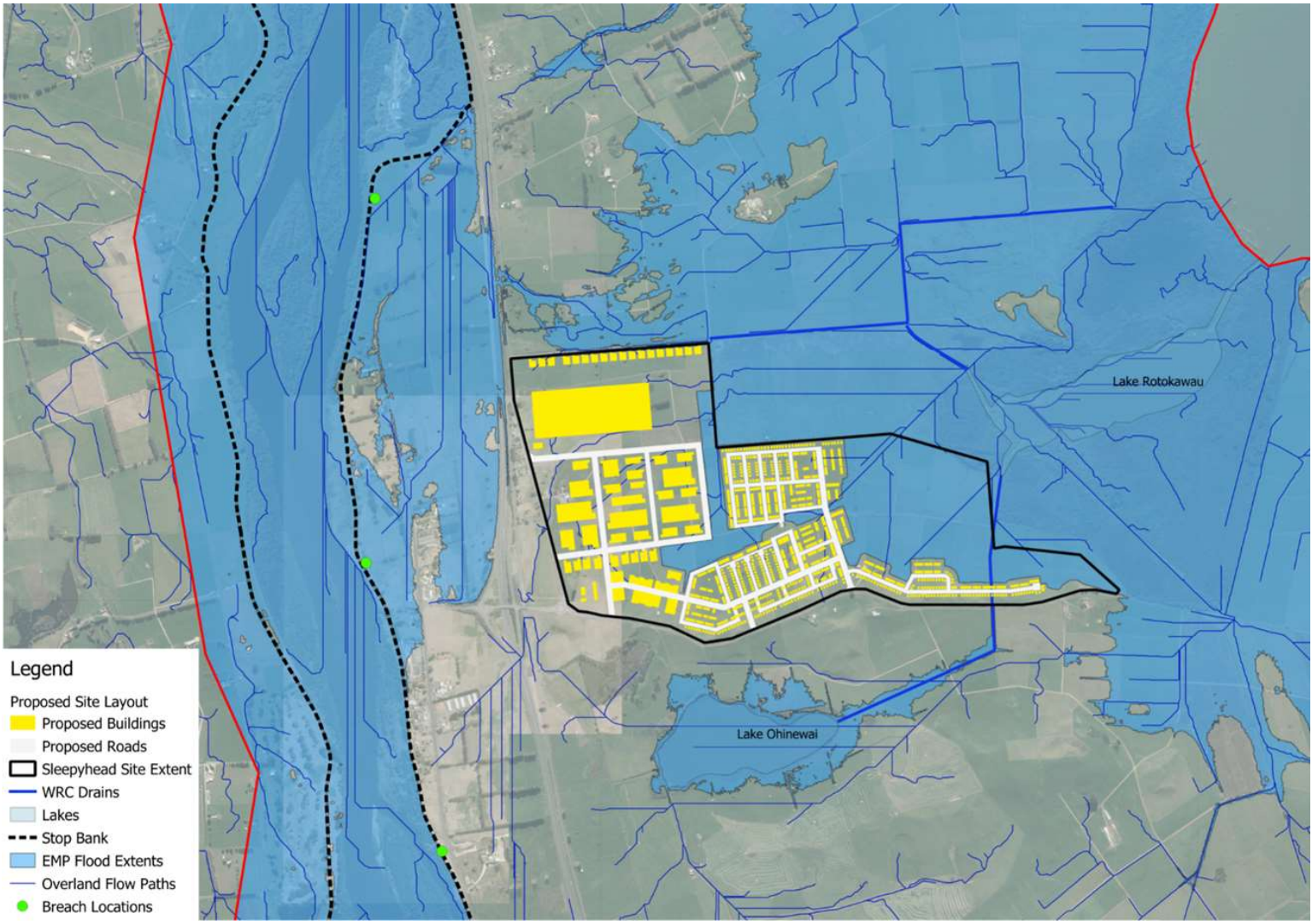
I have been forwarded this email by Stuart to provide some further information/ clarity in terms of proposed design levels used for the Stop bank breach scenario modelling.

To understand the terrain levels within the site better, I have created this thematic map below showing proposed ground levels within the site (and WRC DEM data outside of the site extent).

The general principle behind the design topography is to have the lowest terrain set along the Central park area and grade up gradually towards the Lumsden and Tahuna Roads to match existing grounds along the western and southern boundaries respectively. The levels along the northern boundary (factory site) are governed by the North Island Main Trunk railway levels and sit above 9.5mRL for connection and the factory site gradually slopes down towards the Central park area.



Results from the stop bank breach modelling (as shown below) confirm that the breach flows are mostly contained within the area to the west of State Highway 1 and the North Island Main Trunk railway. Flows overtop the State Highway 1 ONLY at one location and follow the overland flow paths towards the northern site boundary and traverse eastwards to Lake Rotokawau and lake Waikare. There are no flows entering the site with the proposed terrain designed to match/connect the North Island Main Trunk railway existing levels which are already locked in for the factory site under Stage 1 already. There is no other interaction of the site with breach flows, hence the site south of the factory site is completely safe from stop bank breach flows.



To support above said, I have set a model scenario for the stop bank assessment with the following –

- Factory site as per proposed design
- Area outside of site as per WRC DEM (same as used previously)
- Remainder of the site at 8.05mRL (50mm above 8.0mRL which is the tailwater level applied for Lake Waikare)
- No other changes from the EMP modelling previously undertaken

The model results would be available tomorrow afternoon/evening and I can share the findings which I believe would be same as above. Please feel free to contact us if you have any further questions.

Kind Regards,

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Ajay Desai
Senior Technical Specialist - 3 Waters
M.E., B.Tech, MEngNZ, MCIWEM, GMICE
022 637 9729
ajay.desai@woods.co.nz
woods.co.nz

From: Ian Mayhew <ianm@4sight.co.nz>
Sent: Thursday, 2 July 2020 1:42 pm
To: Stuart Penfold <spenfold@bbo.co.nz>
Subject: FW: Ohinewai - stop bank breach scenario

As discussed

Ngā mihi

Ian Mayhew
Principal Planning and Policy Consultant

Mobile: 021 544 577

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PO Box 911 310, Victoria St West, Auckland 1142

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From: Mark Pennington <MPennington@tonkintaylor.co.nz>
Sent: Wednesday, 1 July 2020 4:01 PM
To: Ian Mayhew <ianm@4sight.co.nz>
Cc: Miffy.Foley@waikatoregion.govt.nz; Rick Liefting <Rick.Liefting@waikatoregion.govt.nz>; Ghassan Basheer <Ghassan.Basheer@waikatoregion.govt.nz>
Subject: RE: Ohinewai - stop bank breach scenario

Hi Ian

I was able to open the file in Ajay's email, and have attached a screenshot from this. This represents what Woods claims is the "post-development" land level. You can see the Sleepyhead site shown as "smooth" looking ground with roads slightly cut in.

What I have shown is that, in white (no colour), are areas below elevation of 8.0mRL. So within the Sleepyhead site, there are parts of the site that are located right at the bottom of a few drains that have elevation below 8.0mRL. Almost all of the site is shown at elevation in the green colour band, which starts at over 8.5mRL – more like 9.0mRL and upwards. This is the landform that I understand was used for the hazard assessment – and this has been confirmed by Ajay.

There are a few dark blue "blobs" over the site with elevation between 8.0 and 8.5mRL.

In my view it's fairly clear that, over almost all of the site, the ground elevation used in the hazard assessment has had elevation 9.0mRL or higher.

Hope this helps. I can contour the elevation image if this helps…

Mark

From: Ian Mayhew <ianm@4sight.co.nz>
Sent: Wednesday, 1 July 2020 12:42 PM
To: Mark Pennington <MPennington@tonkintaylor.co.nz>
Cc: Miffy.Foley@waikatoregion.govt.nz; Rick Liefting <Rick.Liefting@waikatoregion.govt.nz>; Ghassan Basheer <Ghassan.Basheer@waikatoregion.govt.nz>
Subject: FW: Ohinewai - stop bank breach scenario

Hi Mark or others

Are you able to shed any light on the below (I can't open the link) and the attached in respect of the ground levels used in the modelling. Stuart's email (attached) seems a bit open to interpretation (a minimum of 8.0m – but of course this might be in a drain/flow path).

I am really trying to get to the bottom of what was modelled – particularly did they use a ground level of 8 or 8.5 for the built parts of the development or something else as per Rick's original question.

Ngā mihi

Ian Mayhew
Principal Planning and Policy Consultant

Mobile: 021 544 577

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PO Box 911 310, Victoria St West, Auckland 1142

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From: Ajay Desai <ajay.desai@woods.co.nz>
Sent: Monday, 29 June 2020 6:10 PM
To: Rick Liefting <Rick.Liefting@waikatoregion.govt.nz>; Stuart Penfold <spenfold@bbo.co.nz>; Ian Mayhew <ianm@4sight.co.nz>
Cc: John Olliver <jolliver@bbo.co.nz>; Ghassan Basheer <Ghassan.Basheer@waikatoregion.govt.nz>; Mark Pennington <MPennington@tonkintaylor.co.nz>
Subject: RE: Ohinewai - stop bank breach scenario

Hi Rick,

The model uses the same DEM inputs that was used in the previous model - WRC DEM outside of the site and the same design surface within the site. I have shared this on OneDrive here if you like to review –
https://woodandpartner-my.sharepoint.com/:u:/g/personal/ajay_desai_woods_co_nz/EZhkjlCK8HZAuHg2Zbb8iZYBlpibogvfvDM2EvjR0NPgYA?e=0K1UaW

We have refined the models in InfoWorks ICM as suggested in earlier emails which works coherently which are using for designing. As you can see in the table below, these refinements are significant improvements in the model resolution and captures all of the overland flow paths and key features like roads and rail lines, etc.

Modelling details	**Flood Assessment Modelling**	**Pre Hearing Modelling (Round 2)**
Software	Mike by DHI (v2017)	InfoWorks ICM 9.5.2
Mesh resolution within Sleepyhead Estate site	Maximum element size: 25m^2	Maximum element size: 5m^2 Minimum element size: 2m^2
Mesh resolution outside Sleepyhead Estate site in neighbouring properties (all areas contributing in vicinity of the site draining to Tahuna and Balemi drains)	Maximum element size: 100m^2	Maximum element size: 10m^2 Minimum element size: 5m^2
Rest of the catchment	Maximum element size: 100m^2	Maximum element size: 100m^2 Minimum element size: 25m^2

Hope this helps. Let us know if you need anything else.

King Regards,

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Ajay Desai
Senior Technical Specialist - 3 Waters
M.E., B.Tech, MEngNZ, MCIWEM, GMICE
022 637 9729
ajay.desai@woods.co.nz
woods.co.nz

From: Rick Liefting <Rick.Liefting@waikatoregion.govt.nz>
Sent: Monday, 29 June 2020 4:54 pm
To: Stuart Penfold <spenfold@bbo.co.nz>; Ian Mayhew <ianm@4sight.co.nz>
Cc: Ajay Desai <ajay.desai@woods.co.nz>; John Olliver <jolliver@bbo.co.nz>; Ghassan Basheer <Ghassan.Basheer@waikatoregion.govt.nz>; Mark Pennington <MPennington@tonkintaylor.co.nz>
Subject: RE: Ohinewai - stop bank breach scenario

Hi Stuart, Ajay

Quick question, what ground level was used for the development area in your latest modelling?

Kind regards
Rick

Rick Liefting | TEAM LEADER | Regional Flood Coordinator | Regional Resilience, Integrated Catchment Management

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P: +6478590580
M: +6421443310
F: facebook.com/waikatoregion
Private Bag 3038, Waikato Mail Centre, Hamilton, 3240

From: Stuart Penfold <spenfold@bbo.co.nz>
Sent: Monday, 29 June 2020 4:00 PM
To: Ian Mayhew <ianm@4sight.co.nz>; Rick Liefting <Rick.Liefting@waikatoregion.govt.nz>
Cc: Ajay Desai <ajay.desai@woods.co.nz>; John Olliver <jolliver@bbo.co.nz>
Subject: RE: Ohinewai - stop bank breach scenario

Hi Ian, Rick.

I have sought additional information from Ajay on the additional stop bank breach modelling that was undertaken in May 2020.
This will be included in evidence, however it would be beneficial if we can note that specific planning provisions are not required (in the planning JWS).
Summary below.

- The Waikato River runs along the north of Ohinewai South Road (to the west of the Waikato Expressway, less than 1km from the site) and the river flows are contained by the Wool Scourers to Fosters Landing Stop Bank (the stop bank).
- As part of the modelling exercise Woods undertook a stop bank breach scenario to determine the risk to the site from an uncontained Waikato River. While considered unlikely, we received feedback from WRC that considered that the potential risk to property and life is significant enough in such an event that that assessment was required.
- This assessment involved running a steady state analysis for 24hrs with the maximum water level of 10.2mRL and 8.0mRL applied along the River and Lake Waikare respectively with a 30m wall collapse (as agreed with WRC) simultaneously at 3 locations to understand risk with overland flow paths directed towards the proposed development.
- The initial stop bank breach scenario model undertaken (reported in Woods Flood Assessment Report Nov. 2019) showed flooding along State Highway 1, the North Island Main Trunk railway and properties along Ohinewai North Road and Ohinewai South roads leading towards the proposed development. A portion of the industrial land (Sleepyhead Factory site) was also subject to flooding because the overland flow from the breach.
- Subsequent detailed modelling analysis was undertaken (April 2020) with refinements in and around the site to capture the topographical features like roads, rail lines, depressions and overland flow paths with higher resolution representation of 2D domain in the model.
- Model results confirms that the stop bank breach flows are generally contained to the west of State Highway 1 and flows crossing the State Highway 1 do not enter the development including factory site and instead flow along the northern boundary eastwards towards Lake Waikare. This is indicated in the Figure provided below.
- The model results showed flooding along State Highway 1, the North Island Main Trunk railway and all properties along Ohinewai North Road and Ohinewai South roads leading towards the Lake Rotokawau.
- There were 3 locations identified for possible breach based on water level differences and overland flow paths discharging towards Lake Rotokawau and Lake Waikare. Effect of each breach location is as follows and shown in Figures 1 below:
    - Breach Location 1 (Ohinewai North Road): Breach flows from this location traverse eastwards along the northern boundary of the site without entering the site. There is no flooding within the proposed site.
    - Breach Location 2 (Ohinewai Landing Road): Breach flows are contained within the area to the west of State Highway 1 and do not affect the proposed site
    - Breach Location 3 (Ohinewai South Road): Breach flows are directed along the flow path towards Lake Ohinewai and do not affect the proposed site

- Based on the modelling results completed in November 2019, it was proposed that an evacuation plan would be drafted at detailed design of the factory to ensure that employees are provided safe evacuation and access for emergency services is assured in the unlikely event of a breach event.
- However, based on the most recent detailed analysis as described above (May 2020) it is considered that there is no flood risk to developed parts of the site from such an event and there is no requirement for an evacuation plan. As part of other regulations or requirements for plant operations, such a plan may be required, however in terms of plan provisions for the OSP, it is considered there is no reason to include such a requirement.

Happy to chat further on this as required.
Many thanks
Stuart

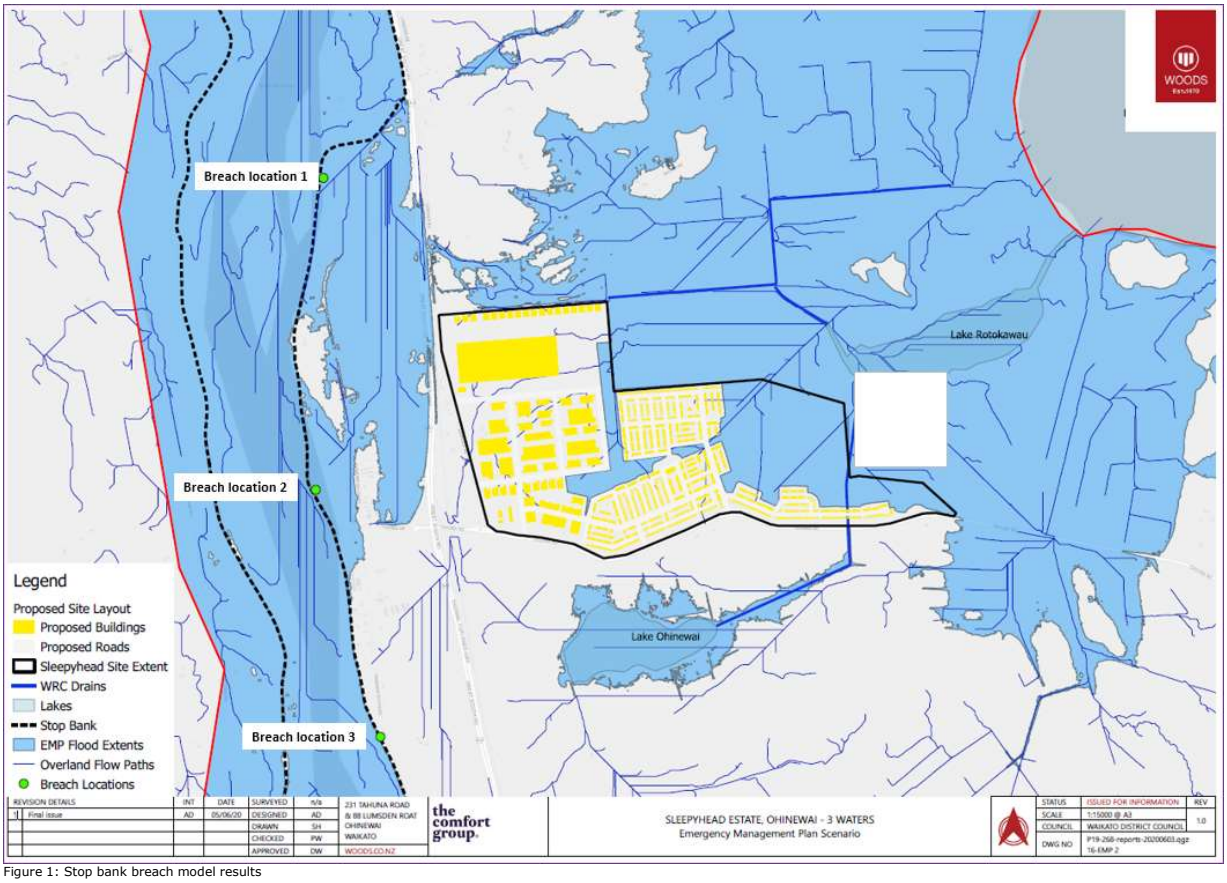

Figure 1: Stop bank breach model results

From: Ian Mayhew <ianm@4sight.co.nz>
Sent: Monday, 29 June 2020 8:38 am
To: Stuart Penfold <spenfold@bbo.co.nz>
Cc: Ajay Desai <ajay.desai@woods.co.nz>; John Olliver <jolliver@bbo.co.nz>; Rick Liefting <Rick.Liefting@waikatoregion.govt.nz>
Subject: RE: Ohinewai - stop bank breach scenario

Yes, we should be able to do that. Rick and I liaised on this late last week, so I will confirm the position with him and advise.

Ngā mihi

Ian Mayhew
Principal Planning and Policy Consultant

Mobile: 021 544 577

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201 Victoria Street West, Auckland Central 1010
PO Box 911 310, Victoria St West, Auckland 1142

4Sight.Consulting LinkedIn

From: Stuart Penfold <spenfold@bbo.co.nz>
Sent: Sunday, 28 June 2020 11:10 AM
To: Ian Mayhew <ianm@4sight.co.nz>
Cc: Ajay Desai <ajay.desai@woods.co.nz>; John Olliver <jolliver@bbo.co.nz>; Rick Liefting <Rick.Liefting@waikatoregion.govt.nz>
Subject: Ohinewai - stop bank breach scenario

Hi Ian.

Further to the planning conferencing – I've sent you a copy of the flooding JWS.
You'll note that the stop bank breach scenario discussion wasn't formally recorded in the JWS.

Are you happy to review the information around the stop bank breach modelling and confer with say Rick Leifting at WRC so you can land on a position by this coming Wednesday?

It would be beneficial to close this one off (our opinion is that the investigations show flooding from the stop bank breach scenario does not affect the OSP).
For completeness, we would note this to the other conferencing participants.

Happy to chat further on this Monday.

Thanks
Stuart

Stuart Penfold
SENIOR PLANNER
B.R.S, Assoc.NZPI, MRMLA
Level 4, 18 London Street , PO Box 9041, Hamilton 3240
R +64 7 838 0144 D + 64 7 834 8532 M + 64 21 500 552
E spenfold@bbo.co.nz W www.bbo.co.nz