

Technical Note

Project Mayfield Appointments 2020
Subject Information to Support Discharge of Condition 10 and Condition 22 – Application Ref. 124972/FO/2019
Project no 0046688
Date 20 April 2021

Revision	Description	Issued by	Date	Approved (signature)
00	Issue to LPA	RG	16/10/2020	CB
01	Issue to LPA	RG	18/10/2020	CB
02	Issue to LPA	JF	29/10/2021	CB
03	Update following EA approval of hydraulic modelling	JF	10/03/2021	CB
04	Update following EA review of Condition 66 details	JF	20/04/2021	CB

1 Introduction

The purpose of this Technical Note is to present the information required to discharge Condition 10 and to set out the modelling phasing which will be progressed to discharge Condition 22 of planning application ref. 124972/FO/2019.

The flood modelling and phasing described in this Technical Note been developed to demonstrate that there is no increase in flood risk on or off the site for any phase of the works, as set out within the approved FRA.

This Technical Note should be read in conjunction with the following other Technical Notes prepared by Buro Happold, submitted to the Environment Agency (EA) to accompany the hydraulic modelling of the Mayfield Park development:

- Hydraulic Modelling – Mayfield Park Enabling Works (Rev. 01, dated 05/02/2021); and
- Hydraulic Modelling – Mayfield Park Full Build Out (Rev. 02, dated 20/04/2021).

2 Planning Conditions 10 and 22

The following planning conditions have been set by the Environment Agency (EA) for the Mayfield development, under planning application ref. 124972/FO/2019:

- 10) *Prior to the commencement of the development, a detailed phasing programme for the delivery of Phases A through to I shall be submitted to and approved in writing by the local planning authority. The details shall confirm the overall aims of the approved FRA (Buro-Happold ref 0042912 dated 13/9/2019) will be met.*
- 22) *Prior to the commencement of Phase A of the development as detailed in condition 3 outputs of the hydrological model are required for the proposed phasing of the works. The phasing should include details of any temporary works necessary to maintain the agreed river flow rates and attenuation volumes provided within the proposed area of the Park so as not to change the flood risk upstream or downstream of the Park.*

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3 Consultation with the EA

Two meetings have been held with the EA on the 2nd October 2020 and 16th November 2020 to discuss the hydraulic modelling for Mayfield Park. The following points have been agreed with the EA:

- Following a review of the BHE Baseline 2019 Model by the EA on 11/11/2020, and subsequent agreement via email correspondence between Buro Happold and the EA, the baseline model was updated (referred to as the BHE Baseline 2020 Model) and resubmitted along with the Enabling Works Models in December 2020. Further details are provided in the Enabling Works Modelling TN.
- For the Enabling Works modelling, the 1 in 100 year flood event will be considered the Design Flood Event. Allowances for climate change are not required for the enabling works, as the works will be undertaken in a very short time period (over the next year).
- For the Full Build Out modelling the Design Flood Event will be the 1 in 100 year plus 35% climate change. Checks will also be undertaken for the 1 in 25 year and the 1 in 100 year events.

Rev. 02 of this note was updated in response to comments received from the EA and discussed during a conference call on 15th January 2021.

Rev. 03 of this note was updated following the approval of the hydraulic modelling of the Enabling Works and Full Build Out scenarios by the EA on 4th March 2021. Confirmation is included in Appendix A.

This revision (Rev. 04) has been updated to refer to the latest revision of the Full Build Out Modelling Technical Note, which was updated following a review of the engineering drawings by the EA as part of the discharge of Condition 66. For clarity, the drawing updates include minor amendments which reflect clarifications rather than design changes. There have been no changes to the hydraulic modelling since the approval by the EA on 4th March 2021.

4 Hydraulic Model Phasing

Based on the proposed construction programme, the relevant hydraulic models are summarised in Table 1. These correspond to the three phases of works, demonstrated in Figure 1. These phases capture the works associated with construction in the flood plain and provide a set of models to demonstrate the flood impact of the different stages.

Table 1: Summary of hydraulic models used for each phase of construction

Model	Estimated delivery date of works on site	Date model submitted to EA	Return periods to be assessed
Baseline model – BHE Baseline 2020 model: Used to compare the flood levels and extents on and off site, caused by the enabling works or proposed development	N/A	18 th December 2020	1 in 25 1 in 100 1 in 100 + 35% CC
Enabling Works Model A: Works to Mayfield Lawn area, (removal of slabs, earthworks, removal of culvert roof)	Early 2021	18 th December 2020	1 in 100 only
Enabling Works Model B: Works at Wildscape area (building removal, earthworks, new temporary bridge)	Early/mid 2021	20 th January 2021	1 in 100 only
Phase 1 Full Build Out Model: River wall works, replacement of bridges, all landscaping works, all works within floodplain complete	Late 2021	24 th February 2021	1 in 25 1 in 100 1 in 100 + 35% CC

Note: Updates to the Technical Notes that accompany the hydraulic models have been made since the submission of the model files in order to provide additional commentary on the modelling methodology. The model issue dates in this table may therefore not correspond to the latest revision of the accompanying Technical Note, given in Section 1.

Following the conference call with the EA on 15th January 2021 and subsequent correspondence via email, the following statement is provided:

Alterations to site levels / flood storage will be carried out in accordance with the SEW landscape drawings dated 29/01/2021, as represented in the Full Build Out Model. There shall be no further alterations to site levels in other phases (as defined under Condition 3) which would result in an increase in flood risk elsewhere or off site.

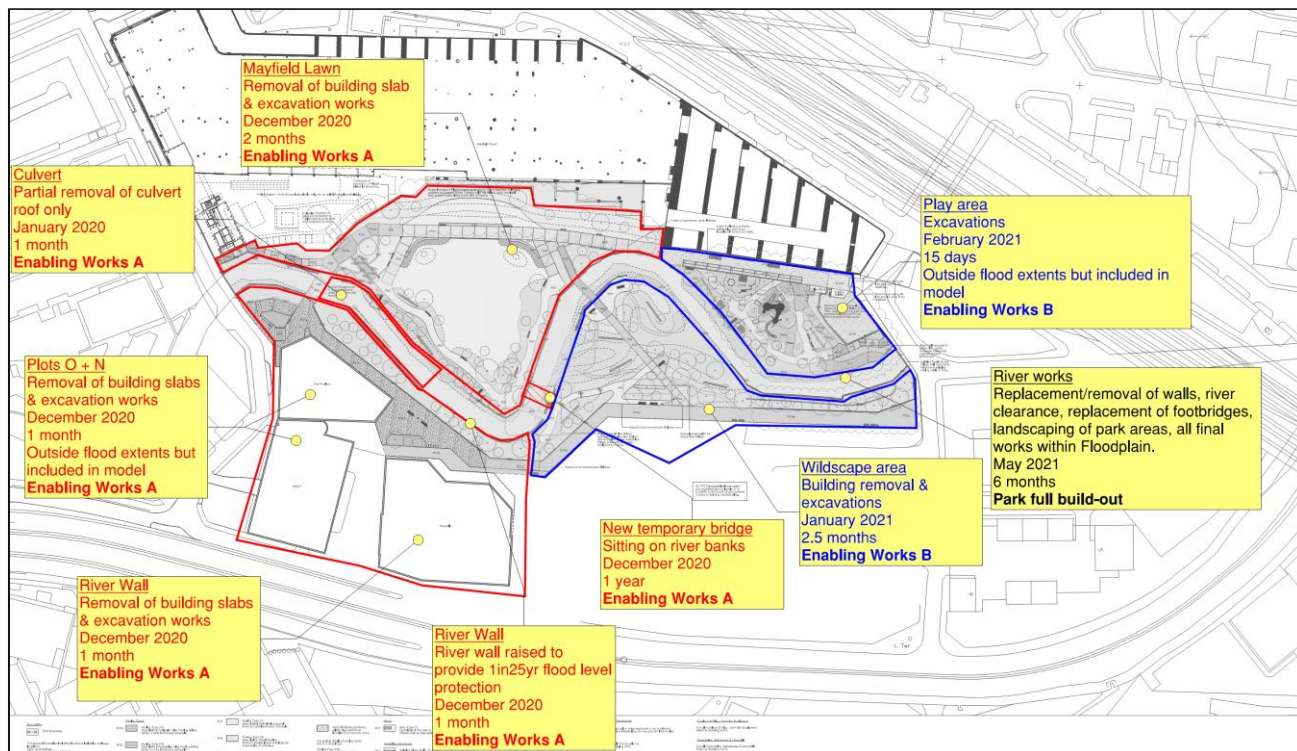


Figure 1: Planned Works (dates indicated are proposed subject to EA approvals)

Appendix A – Environment Agency Correspondence

Jack Foster

From: Kirwan-Evans, Jenny <Jenny.KirwanEvans@environment-agency.gov.uk>
Sent: 04 March 2021 11:56
To: Jack Foster
Cc: Davies, Andy; Telfer, Helen; Ruckledge, John; Pankhurst, Catherine; Michael Percival; Colin Byrne; Harry Mansfield; Mike Harrison
Subject: RE: Mayfield - 124972/FO/2019 - ENVPAC/1/GMC/00284 -Full-Build Out Flood Modelling Issue
Attachments: Non-Real Time Hydraulic Model Review Mayfield+FullBuilt_FINAL.xlsm
Categories: Important

****External Email. This email originated from outside Buro Happold.****

Hi,

I've checked over the Full Built Model files and updated the Review Spreadsheet – see attached. Everything now looks fine and we accept the model as fit for purpose.

Note – I believe in order to update the flood mapping, we need the 0.1% AEP (1000 year return period) event to be modelled.

John – can you confirm that this is the case? I'm not sure if flood map updates are part of the scope of this work.

Thanks,
Jenny



Jenny Kirwan-Evans

Pronouns: she/her/hers ([why is this here?](#))

Advisor, Service Delivery, Evidence and Risk
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✉ Currently working at home during the Covid-19 pandemic

From: Jack Foster [mailto:Jack.Foster@BuroHappold.com]
Sent: 24 February 2021 20:28
To: Kirwan-Evans, Jenny <Jenny.KirwanEvans@environment-agency.gov.uk>
Cc: Davies, Andy <Andy.Davies1@environment-agency.gov.uk>; Telfer, Helen <helen.telfer@environment-agency.gov.uk>; Ruckledge, John <john.ruckledge@environment-agency.gov.uk>; Pankhurst, Catherine <Catherine.Pankhurst@fgould.com>; Michael Percival <mipercival@deloitte.co.uk>; Colin Byrne <Colin.Byrne@BuroHappold.com>; Harry Mansfield <Harry.Mansfield@BuroHappold.com>; Mike Harrison <MikeHarrison@uandiplc.com>
Subject: RE: Mayfield - 124972/FO/2019 - ENVPAC/1/GMC/00284 -Full-Build Out Flood Modelling Issue

Hi Jenny,

Further to my email below, the updated Technical Note, model files and completed Model Review spreadsheet for the Full Build Out model are available to download from the following link:

https://burohappold-my.sharepoint.com/:f/p/jack_foster/EhHBdjjFqNFKkaNZjGRy_WQBtMTH0VCNS_JBfWJ6LJDL4w?e=C6Y2iG

Best regards,

Jack

Jack Foster CEng MICE
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From: Jack Foster
Sent: 23 February 2021 12:21
To: Kirwan-Evans, Jenny <Jenny.KirwanEvans@environment-agency.gov.uk>
Cc: Davies, Andy <andy.davies1@environment-agency.gov.uk>; Telfer, Helen <helen.telfer@environment-agency.gov.uk>; Ruckledge, John <john.ruckledge@environment-agency.gov.uk>; Pankhurst, Catherine <Catherine.Pankhurst@fgould.com>; Michael Percival <mipercival@deloitte.co.uk>; Colin Byrne <Colin.Byrne@BuroHappold.com>; Harry Mansfield <Harry.Mansfield@BuroHappold.com>; Mike Harrison <MikeHarrison@uandiplc.com>
Subject: RE: Mayfield - 124972/FO/2019 - ENVPAC/1/GMC/00284 -Full-Build Out Flood Modelling Issue

Hi Jenny,

Thanks very much for your email, and for confirming agreement with our approach to the mass balance error. We will update the Technical Note accordingly and plan to issue this tomorrow, along with the package of model files.

We will also provide further commentary, including figures / diagrams, to respond to the comments regarding channel and bridge geometry. We will include references to the updated sections of the report within the model review spreadsheet.

Best regards,

Jack

Jack Foster CEng MICE
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From: Kirwan-Evans, Jenny <Jenny.KirwanEvans@environment-agency.gov.uk>
Sent: 22 February 2021 10:41
To: Jack Foster <Jack.Foster@BuroHappold.com>
Cc: Davies, Andy <andy.davies1@environment-agency.gov.uk>; Telfer, Helen <helen.telfer@environment-agency.gov.uk>; Ruckledge, John <john.ruckledge@environment-agency.gov.uk>; Pankhurst, Catherine <Catherine.Pankhurst@fgould.com>; Michael Percival <mipercival@deloitte.co.uk>; Colin Byrne <Colin.Byrne@BuroHappold.com>; Harry Mansfield <Harry.Mansfield@BuroHappold.com>; Mike Harrison <MikeHarrison@uandiplc.com>
Subject: RE: Mayfield - 124972/FO/2019 - ENVPAC/1/GMC/00284 -Full-Build Out Flood Modelling Issue

****External Email. This email originated from outside Buro Happold.****

Hi Jack,

Thanks for your email and additional clarifications.

I'm happy with the approach you've undertaken to reduce the mass balance error and now that it is in line with the Baseline values, this is acceptable. Please go ahead and update the reporting to reflect this change.

With regards to the channel and bridge geometry, in order to be clear and ease my review, please add detail of how the elevations have been calculated including figures of channel/structure design within the reporting itself.

Please can you give a date for when I'll receive the updated reporting and model files?

Thanks,
Jenny



Jenny Kirwan-Evans

Pronouns: she/her/hers ([why is this here?](#))

Advisor, Service Delivery, Evidence and Risk
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From: Jack Foster [<mailto:Jack.Foster@BuroHappold.com>]

Sent: 18 February 2021 18:55

To: Kirwan-Evans, Jenny <Jenny.KirwanEvans@environment-agency.gov.uk>

Cc: Davies, Andy <Andy.Davies1@environment-agency.gov.uk>; Telfer, Helen <helen.telfer@environment-agency.gov.uk>; Ruckledge, John <john.ruckledge@environment-agency.gov.uk>; Pankhurst, Catherine <Catherine.Pankhurst@fgould.com>; Michael Percival <mipercival@deloitte.co.uk>; Colin Byrne <Colin.Byrne@BuroHappold.com>; Harry Mansfield <Harry.Mansfield@BuroHappold.com>; Mike Harrison <MikeHarrison@uandiplc.com>

Subject: RE: Mayfield - 124972/FO/2019 - ENVPAC/1/GMC/00284 -Full-Build Out Flood Modelling Issue

Hi Jenny,

I understand from Andy (via Catherine) that you are happy for us to contact you directly for informal review.

We have been investigating the mass balance error with regard to Item 14.1 in the model review spreadsheet, and thought it would be helpful to provide an update in advance of reissuing our deliverables formally.

Cause

- Accumulation of mass error occurs between the hours of 0 and 2, when flow in the river is low, and in-channel water levels are very similar to the low point of the bank;
- This causes constant flux between the 1D and the 2D domains at the part of the Wildscape area circled in the image in Figure 1, with no clear dominant flow direction;
- Concluded that this flux is the cause of the peak in mass error, as cumulative mass error begins to reduce as water levels increase (Figure. 2).

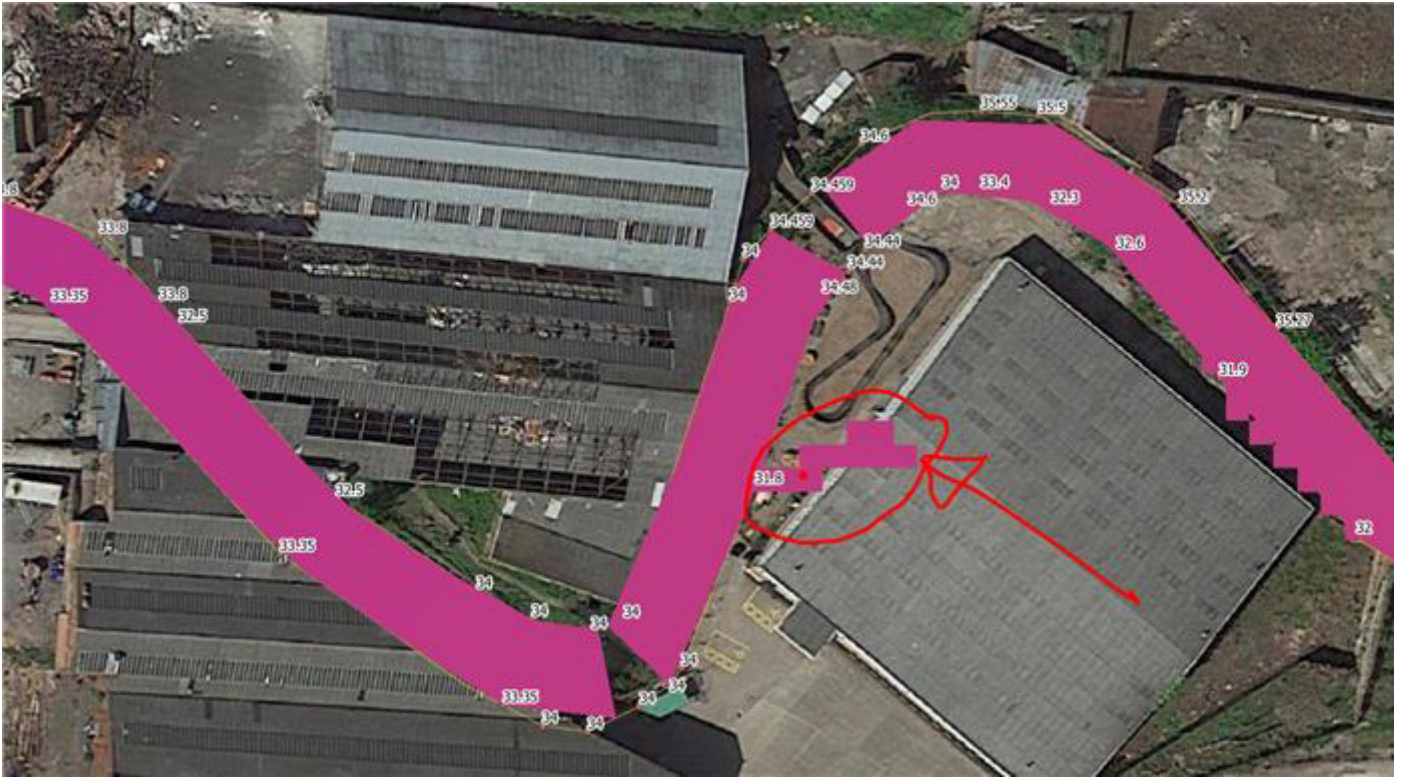


Figure 1: Baseline water level at the Wildscape area, annotated with location of cause of mass error

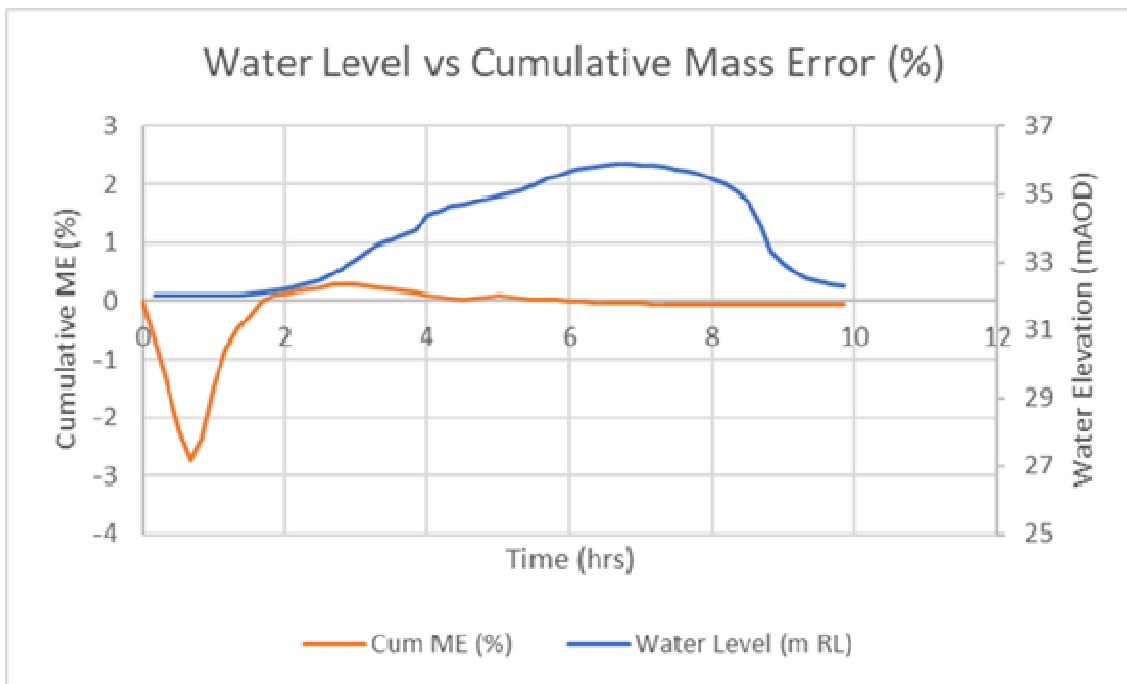


Figure 2: Comparison of cumulative mass error (%) against the water level recorded within the Wildscape Area 2D domain for the Full Build Out Model (192)

Solution

- Raise bank height from 31.8mAOD to 32mAOD locally, at inflow point from channel to Wildscape area, to match proposed level for low point of Wildscape area
- This prevents movement between 1D and 2D domain during low flow state (hours 0 to 2) and significantly reduces the mass error (Table 1 and Figure 3)
- This amendment is considered a more accurate representation of the proposed scheme, rather than a design change, and does not have an impact on water levels elsewhere within the model

Note: A test applying a roughness patch with localised increase in roughness to 1.00 was tested, but made negligible impact on mass error.

Table 1 provides a summary of the mass error for each run and return period, indicating that the amended Full Build Out model (197) has a maximum mass error of -1.19%, which matches the performance of the Baseline model (142). Although this exceeds the threshold of $\pm 1\%$, this is considered appropriate given the prior approval of the Baseline.

Table 1: Summary of absolute maximum cumulative mass error for Baseline and Full Build Out models

Event	Baseline (142)	Full Build Out (192)	Amended Full Build Out (197)	
25 year	1.19%	2.78%	1.19%	Matches baseline
100 year	0.95%	2.41%	0.98%	Less than 1%
100 year + 35% CC	1.19%	2.72%	1.16%	Less than baseline

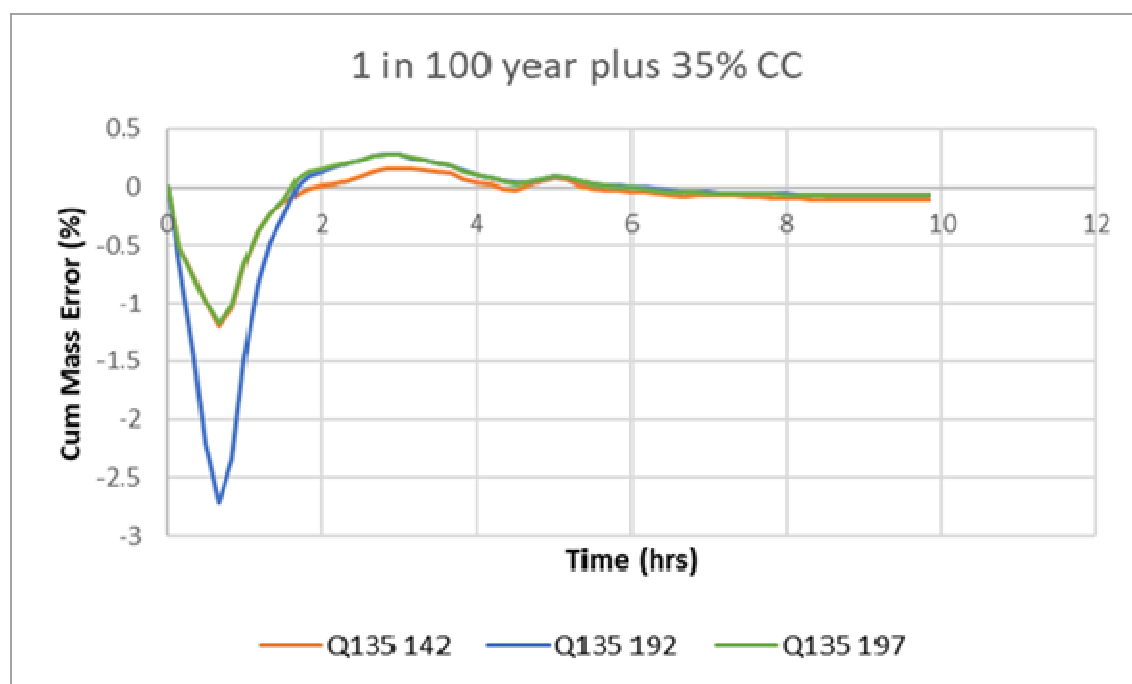


Figure 3: Comparison of cumulative mass error for the 100 year + 35% CC event for the Baseline and Full Build Out models

If you are in agreement with the approach outlined above, we will update our reporting, compile the relevant model files and submit along with the model review spreadsheet for formal review.

Regarding Items 3.5 and 5.2, we have checked the geometry of the model and are satisfied that it is an accurate representation of the latest set of drawings. We will update the Technical Note to provide additional commentary on the methodology used to represent the proposed scheme in the model, including sources of data.

Best regards,

Jack

Jack Foster CEng MICE

Senior Engineer

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From: Colin Byrne <Colin.Byrne@BuroHappold.com>
Sent: 10 February 2021 18:26
To: Jack Foster <Jack.Foster@BuroHappold.com>; Harry Mansfield <Harry.Mansfield@BuroHappold.com>
Subject: FW: Mayfield - 124972/FO/2019 - ENVPAC/1/GMC/00284 -Full-Build Out Flood Modelling Issue
Importance: High

FYI below

Colin Byrne
Associate Director
BuroHappold Engineering | Cities - Infrastructure
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From: Davies, Andy <Andy.Davies1@environment-agency.gov.uk>
Sent: 10 February 2021 18:18
To: catherine.pankhurst@fgould.com; FOSTER, Kevin <Kevin.Foster@cheshireeast.gov.uk>
Cc: Kirwan-Evans, Jenny <jenny.kirwanevans@environment-agency.gov.uk>; Telfer, Helen <helen.telfer@environment-agency.gov.uk>; Colin Byrne <Colin.Byrne@BuroHappold.com>; Harry Mansfield <Harry.Mansfield@BuroHappold.com>; Michael Percival <mipercival@deloitte.co.uk>; Ruckledge, John <john.ruckledge@environment-agency.gov.uk>; Mike Harrison <MikeHarrison@uandiplc.com>
Subject: Mayfield - 124972/FO/2019 - ENVPAC/1/GMC/00284 -Full-Build Out Flood Modelling Issue
Importance: High

****External Email. This email originated from outside Buro Happold.****

Good evening Jack / Catherine,

As discussed earlier in the week my colleague Jenny has been progressing review of the final Mayfield Enabling Works Model (attached above). Unfortunately, as submitted, we are unable to recommend approval of the 'final build out' flood model as two significant issues (translating to three red modelling review classifications) have been identified. These issues are summarised briefly as follows:

- **The 1D channel cross sections and structures do not appear to match the plans provided.**
- **2D mass balance error is out of tolerance (+/-1%) indicating model instability. This should be reviewed and improved.**

To expand in part on the above, for the purpose of the modelling review Jenny has made comparison of the model submissions made by B-H to the masterplan drawings and cross sectional drawings that are currently submitted under discharge of condition applications CDN/20/0689 and CDN/20/0866 (uploaded to MCC planning portal between December 21-23 2020) aiming to address the requirements of conditions 11 (park levels) and 66 (long/cross sections).

Further to the above, I have this morning been made aware by Manchester City Council (see attached email) on the submission of a series of updated level drawings regarding condition 11 (park levels). These revised drawings, on quick check, are dated 09.02.21 and consequently supersede in time the modelling submissions made to the EA on the 6th February and 8th February (see chargeable email attached for reference). Additionally no comment is made as part of these latest submissions confirming that the revised drawings are in conformity with the final build out flood modelling.

For clarity, it should be ensured the plans and drawings presented as part of planning submissions are informed and in conformity with the flood modelling (once approved). It is concerning that revised drawings have been submitted to planning post-flood modelling submission.

Please can B-H/ the Mayfield Project Team address the comments made with EA modelling review spreadsheet attached and as part of the response provide clear clarification on which plans/drawings/cross-sections which are considered to represent the final development intended for advancement / approval and have been informed by the modelling. Any reference to final drawings within relevant technical documents/reporting forming part of the planning submissions/ applications should also be ensured/updated.

As discussed previously it will not be possible for the EA to sign-off on conditions 11, 22 and 66 attached to planning permission 124972/FO/2019 until all elements of the flood modelling have been approved.

Happy to discuss further.

Regards,

Andy

Andy Davies

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