



Proof of Evidence of Mr. Colin Whittingham

Hydrology

On behalf of Gladman Developments Ltd:

Objection References OBJ/229 & OBJ/231

881592-PoE-(03)



FEBRUARY 2019

RSK GENERAL NOTES

OBJ/229 & OBJ/231

Proposal: Transport and Works Act 1992; Application for The Proposed Network Rail (East -West Rail Bicester To Bedford Improvements) Order

Location: Proposed compensational flood attenuations works on land to the East Great Horwood Road, Winslow (Route Section 2B)

Transport and Works Act 1992

Transport and Works (Applications and Objections Procedure) (England and Wales) Rules 2006

Transport and Works (Inquiries Procedure) Rules 2004

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APPENDICES (BOUND SEPARATELY)

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| Appendix 881592/1 | CFSA Summary |
| Appendix 881592/2 | RSK Statement of Case – 881592 – SoC (01) |
| Appendix 881592/3 | Network Rail Response to Objections OBJ229 & OBJ/231 |
| Appendix 881592/4 | EWR Alliance Response to RSK Statement of Case – Excel Sheet |
| Appendix 881592/5 | EWR Alliance Hydraulic Modelling Horwood Brook |
| Appendix 881592/6 | RSK Further Information Request– Excel Sheet |
| Appendix 881592/7 | EWR Alliance Updated Response to RSK Further Information– Excel Sheet |

1 INTRODUCTION

1.1 Qualification and Experience

- 1.1.1 My name is Colin Whittingham, I am an associate director with RSK and responsible for technical expertise in the impacts of development on the water environment, flood risk, drainage consultancy and design. I work within RSK's Land & Development Engineering (LDE) division, which specialises in sustainable engineering and environmental consultancy.
- 1.1.2 I am chartered through the Chartered Institute of Water and Environmental Management (CIWEM) and an Associate of the Institute of Environmental Management and Assessment (IEMA). I have significant experience in this field, gained through varied roles within a consultancy setting and through academic qualifications.
- 1.1.3 My experience covers a wide array of public and private sector projects. Public sector coverage includes flood mapping studies for the Environment Agency while private sector work covers flood and drainage studies for a range of residential, industrial and infrastructure projects. I am also experienced in the production of environmental impact assessment chapters on hydrology, flood risk and water resources. I am responsible for supervising and coordinating all aspects of RSK flood risk assessment production, reviewing and authoring, and for supervising and training staff on flood risk and sustainable drainage.
- 1.1.4 I have specialist skills in hydrological modelling: Flood Estimation Handbook (FEH), WINFAP-FEH, Revitalised Flood Hydrograph (ReFH), together with 1D and 2D hydraulic modelling: Flood Modeller Pro, ISIS, ISIS 2D, Hydrologic Engineering Centres River Analysis System (HEC RAS), WinDes.
- 1.1.5 Prior to joining RSK in 2010, I have been employed as senior hydrologist by Atkins (2008-2010) and previously as hydrologist by Egniol (2006-2008) and Weetwood (2004-2006)

1.2 Statement of Truth

- 1.2.1 The evidence that I shall provide has been prepared and is given in accordance with the guidance of my professional institution. I confirm that the opinions expressed are my true professional opinions. In providing expert evidence to the Inquiry, I am fully aware that my

duty is to the Inquiry and to provide my honestly held professional view, irrespective of by whom I am employed.

1.3 Background

- 1.3.1 RSK LDE Ltd has been appointed by Gladman Developments Ltd (GDL) to advise on flood risk matters in relation to its objections (refs. 228-231), on behalf of interested parties, to the Transport and Works Act 1992: Application for the proposed Network Rail (East West Rail Bicester to Bedford Improvements) Order (TWAO). Specifically, we were asked to review the background information relevant to the East West Rail Phase 2 (hereafter 'the project'), in particular the Flood Compensation Storage Area (Plot 0681) and associated compulsory purchase under the TWAO of approximately 0.65ha of land off Great Horwood Road, Winslow located at grid reference SP77432878 (see CFSA Summary enclosed at Appendix 881592/1). The TWAO relating to this parcel of land is to provide compensatory flood storage for flood plain lost as a result of the location of Route Section 2B. The land subject to the TWAO forms part of an arable location under the land ownership of GDL as such.
- 1.3.2 RSK previously reviewed the Hydrology and Flood Risk Chapter¹ of the 2018 Environmental Statement (hereafter the '2018 ES') and associated technical appendices including the Flood Risk Assessment². Our initial findings were relayed as part of our Statement of Case in September 2018 (provided as Appendix 881592/2).
- 1.3.3 Furthermore, Network Rail issued letters in response to GDL's objections (provided as Appendix 881592/3), dated 04/11/2018. GDL acts on behalf of a number of different interested parties / landowners and hence four response letters were issued by Network Rail (refs. 228-231). The response letters refs. 229 and 231 are relevant to CFSA and contain identical responses in relation to Plot 0681, and hereafter for simplicity are referred to collectively as the 'response letter'.
- 1.3.4 Meetings with the East West Rail Alliance acting on behalf of Network Rail on 03/01/2019 and on 25/01/2019 with their hydrologists Andrew Cox and Lucy Willis were undertaken in order to discuss outstanding areas of concern in relation to CFSA Plot 0681.
- 1.3.5 Following the meeting on 03/01/2019, the East West Rail Alliance hydrologist provided a response to RSK LDE's Statement of Case (Appendix 881592/4), including a Technical Note, EWR Alliance Hydraulic Modelling Horwood Brook (Appendix 881592/5), providing limited further information regarding the background modelling to the CFSA location. An RSK

¹ The Network Rail (East West Rail Bicester to Bedford Improvements) Order Environmental Statement

² The Network Rail (East West Rail Bicester to Bedford Improvements) Order Environmental Statement, Volume 3 – Appendices, Appendix 13.1-Flood Risk Assessment

LDE rebuttal (Appendix 881592/6) followed via issue on 17/01/2019 citing lack of information with respect to the detailed modelling associated with the citing of CFSA (Plot 0681).

1.3.6 A further response from the East West Rail Alliance (Appendix 881592/7) was forthcoming on 22/01/2019 seeking to address the outstanding comments remaining from the previous RSK LDE responses. The responses to the second round of the East West Rail Alliance's response was discussed during the meeting with the East West Rail Alliance hydrologist on 25/01/2019.

1.3.7 At the meeting on 25/01/2019 it was requested that assurances over the future ownership and usage of the CFSA area. In the meeting notes provided to Gladman Developments Ltd and RSK LDE following the meeting of the 25/01/2019 the East West Rail Alliance outlined the proposed maintenance of the CFSA to establish the future transferal of the land from Network Rail ownership to the undertaking of Gladman Developments Ltd. The current outlined maintenance as set out by the East West Rail Alliance is included below;

- *Ground levels must be maintained to the design levels*
- *No storage of materials on site*
- *Vegetation levels should be maintained as site current use i.e. grazed grassland (continuation of grazing or mowing)*
- *Ensure access to the watercourse is maintained to ensure access to the watercourse by the responsible maintainer*
- *No changes to the watercourse or floodplain should be undertaken without permission from the EA, IDB or Lead Local Flood Authority (LLFA)*

2 COMPENSATORY FLOOD STORAGE AREAS

2.1 Description

- 2.1.1 The principles of the Compensatory Flood Storage area (CFSA) are detailed in ES Volume 3 Chapter 13 Appendix 13.1 – Flood Risk Assessment with considers the CFSA areas and describes the reasons why each CFSA is required.
- 2.1.2 CFSA are proposed to compensate for EWR2 encroaching on existing floodplains. They comprise scrapes or excavations that have been designed to generally follow the existing topography where possible. These have been designed to extend the natural floodplain by reducing ground levels in the area adjacent to existing floodplain and are designed to mitigate for events up to the 1% annual chance event (including an allowance for climate change).
- 2.1.3 The CFSA's should be sited to be as close to the loss of floodplain as feasible, while avoiding existing utilities and exclusion zones. The CFSA needs to be located outside but adjacent to the existing floodplain to enable it to operate effectively.

2.2 Statutory Consultee responses and scheme requirements

- 2.2.1 It is noted from the submitted ES and associated Appendices that consultation has been held with a number of interested statutory consultees including the Environment Agency, the LLFA and the IDB operating in this area.
- 2.2.2 The key responses relevant to the flood compensation works in question are detailed below:

| Consultee | Comments |
|-----------|---|
| LLFA's | <ul style="list-style-type: none"> • Provision of cumulative flood storage to compensate loss of relatively small areas of the existing floodplain, will be assessed on a site by site basis. • LLFA's suggested that proposed flood compensation storage areas should be provided with access for maintenance purposes. The Environment Agency do not concur on this issue. • BCC and OCC recommend that hydraulic modelling is undertaken for the ordinary watercourse that have a significant risk of flooding shown by the RoFSW maps. |

| | |
|---------------------------|--|
| | <ul style="list-style-type: none"> • BCC and OCC recommend upstream storage for surface water routes where appropriate. |
| <p>Environment Agency</p> | <ul style="list-style-type: none"> • The general principles of mitigation as explained in the FRA are acceptable. However, the FRA acknowledges that demonstration for like for like compensatory flood storage has not been carried out and will be done at the further design stages. The Environment Agency have no objections with this approach providing it is confirmed that there is the space to deliver appropriate compensation on a level for level basis at the design stage. • The Environment Agency and LLFAs require level for level compensation for loss of floodplain storage (for both fluvial and surface water sources), and these should ideally be located adjacent the location where the loss occurs. CFSA's can be located remote to the loss but this would need to be agreed with the Environment Agency/LLFA with strong justification for the alternative location. • Floodplain losses need to be mitigated for the 1% annual chance event plus climate change event (applying the latest allowances defined by the Environment Agency/Defra in February 2016). • The Environment Agency confirmed that a staged approach was acceptable, provided that the red line boundary of any application provides suitable provision for the location on compensatory storage on a level-for-level and volume-for-volume basis at the detailed design stage (GRIP5). • The compensatory component of the CFSA's should be outside of the existing floodplain (fluvial, surface water, groundwater), but hydraulically connected to the existing floodplain (i.e. to ensure that the CFSA is active across a range of flood events). • CFSA's should not conflict with existing infrastructure and utilities, proposed infrastructure (temporary or permanent) and proposed mitigation measures, no infrastructure/assets or PROW between watercourse and CFSA. • There were constraints on the work to be completed to inform the TWAO, namely; <ul style="list-style-type: none"> • Topographic data is limited to LiDAR, with a mix of 2m and 5m resolution, • Whilst 1D-2D fluvial modelling is available for some of the areas where CFSA's are required, the majority of location are within the |

| | |
|--|---|
| | <p>surface water flood outlines for which only flood extents are available.</p> <ul style="list-style-type: none"> • Identify an area outside the existing floodplain where this level-area can be provided, taking into account the design criteria (local to the loss, in hydraulic connectivity, outside existing floodplain, not conflicting with other infrastructure). • Where flood storage cannot be provided locally, an appropriate alternative location will be proposed. This will look at frequency of flooding and apply a relative level-for-level assessment. |
|--|---|

2.2.3 From the above, it is noted and acknowledged that there is a potential requirement to provide a number of CFSAs along the route to ensure flood risk is not increased due to the proposed scheme.

3 COMPENSATORY FLOOD STORAGE AREA 2B0331/5.2/FH (PLOT 0681)

3.1 Consultation with interested parties

3.1.1 Gladman Developments were not initially consulted on the proposed location of Compensatory Flood Storage Area Number 2B0331/5.2/FH within land to the north of Great Horwood Brook.

3.1.2 Subsequent meetings with the Alliance, including the hydrologists working on the scheme have been undertaken on the 03/01/19 and 25/01/19.

3.1.3 Following the objection lodged by Gladman Developments (and associated land owners), further information has been supplied by the Alliance in response to this;

- Network Rail response to the Objections raised by Gladman Developments et. al. (04/11/2018)
- East West Rail Western Section Phase 2 Statement of Case³;
- Indicative Flood Modelling Technical Note (08/01/2019);
- Responses to Gladman Statement of Case (08/01/2019); and
- Responses to Gladman Statement of Case (24/01/2019).

3.2 Selection of CFSA

3.2.1 The original submissions did not provide sufficient evidence and information on the approaches utilised to determine the final location of the CFSA area and the benefits of the proposed mitigation. In particular no information or evidence was given to;

- the undertaking of any optioneering on other CFSA locations; and
- the hydraulic modelling undertaken to conclude the size and volume of the required CFSA and justify its location. It was noted that during the initial modelling, the Alliance did not have access to detailed topographic survey information for the location of the CFSA or Horwood Brook.

³ The Network Rail (East West Rail Bicester to Bedford Improvements) Order Statement of Case

3.2.2 The updated submissions provided limited further evidence and information on the approaches utilised to determine the final location of the CFSA area and the benefits of the proposed mitigation.

3.2.3 Further information was provided with respect to;

- the optioneering and consideration of alternatives, however all alternatives were readily discounted from predominantly infrastructure constraints.
- Updated information regarding the indicative modelling was provided though further detailed information is not available and will not be available until the GRIP5 phase.

3.2.4 In particular no further information or evidence was given to;

- The detailed hydraulic modelling undertaken to conclude the size and volume of the required CFSA to justify its location. It was noted that during the meeting of the 25/01/2019 that the detailed channel survey had been incorporated into the model build and that there were minor alterations to the extent of the indicative modelling, however, no further details were given.

4 MATTERS STILL CONTESTED

- 4.1.1 Detailed modelling is still to be undertaken for Horwood Brook and the proposed CFSA. As noted the proposed CFSA is located downstream of the proposed development and associated flood plain loss and the modelling is still to confirm that the location, size and volume of the proposed CFSA will deliver the outlined flood compensation storage.
- 4.1.2 Indicative flood modelling has been produced for the CFSA assessments, however at this stage, this is still considered a high level approach and based on a course grid LiDAR data. Detailed channel sections and site topography have been supplied to assist with any further detailed modelling to be undertaken as part of the GRIP5. It should still be noted that the levels quoted in the Hydraulic Modelling Horwood Brook Technical Note are still based on the watercourse upstream of the proposed railway works, and are not a direct representation of those at the location of the CFSA (up to 101mAOD). It has been noted that the approach has been deemed acceptable to the Environment Agency, though it should be confirmed that a volume for volume approach provides the required compensatory storage for the EWR2 works.
- 4.1.3 The proposed CFSA is located approximately 140m from the areas of floodplain loss and therefore the benefits of providing the flood compensation remote from the area of loss has not been suitably justified.
- 4.1.4 The Environment Agency noted that the works should be carried out adjacent to the area where the loss occurs, the proposals for this area are downstream of the proposed works and not directly adjacent to the area where floodplain is being lost. The alternative CFSA locations have been included for reference within this worksheet. 4 Alternatives have been assessed, alternatives 1-3 have been discounted due predominantly to the presence of a high pressure gas main, yet it has not been confirmed if minor ground works in the area of this gas main could be carried out. No evidence has been supplied to confirm if consultation with National Grid has taken place. It is acknowledged that diversion of the gas main to facilitate these works is not a feasible option should minor ground works be excluded.

5 MATTERS AGREED

- 5.1.1 It is noted that the area of land lowered (to be confirmed) will lie outside the relevant flood zone outline, and the area shown in the engineering drawings has been included for completeness to show connection back to the watercourse. I believe this is an appropriate method to provide flood compensation and to allow efficient use of such a structure.
- 5.1.2 It is agreed that should the development of the CFSA be approved in this location, following its completion that this area of land is returned to Gladman and/or future owner of the site to be utilised as managed open space.

6 SUMMARY

- 6.1.1 Compensatory Flood Storage Area (CFSA) Plot 0681, within Route Section 2B is located on land under the ownership of Gladman Developments Ltd. Accordingly, I have been asked by Gladman Developments Ltd, whom act on behalf of interested parties, to review the background information relating to the East West Rail Phase 2 project, in particular the compensatory flood storage area and associated compulsory purchase (under the Transport and Works Act Order) of approximately 0.65ha of land for Plot 0681.
- 6.1.2 Based on the description provided within the environmental information supporting the TWAO and subsequent information provided by the EWR Alliance, Plot 0681 is primarily intended to provide flood compensation for the works crossing Horwood Brook upstream of the site.
- 6.1.3 In terms of the siting of Plot 0681, I note the indicative hydraulic modelling of Horwood Brook and conclude that, at this point in time, insufficient information is available to fully assess the location of the CFSA and its efficiency in offsetting the lost flood plain upstream of the site.
- 6.1.4 In conclusion, at this stage, I consider there is insufficient evidence to fully justify the compulsory purchase of the land within Gladman Development's ownership and it would be justified to recommend further detailed modelling works to assess the validity of the location of CFSA Plot 0681.