Binks Vertical

Proposed Residential Scheme
Ledgards Bridge
Mirfield
West Yorkshire

Flood Risk Assessment

Prepared by EWE Associates Ltd
Final RevJ December 2025

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CLIENT DETAILS

Binks Vertical
Blakeridge Mill
Batley

FAO Helen Davies

CONTRACT

This report describes work commissioned by Binks Vertical following written instruction by their representative during September 2017. Binks Vertical representative for the contract was Helen Davies. Lea Favill of EWE Associates Ltd carried out the work.

Date: 8th December 2025

Prepared by: …… Lea Favill
Director

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1. INTRODUCTION

Terms of Reference

This report was commissioned by Binks Vertical to support a planning application for the construction of residential apartment blocks adjacent to former Ledgard Mill near Ledgard Bridge in Mirfield. The site can presently be accessed from the north off Back Station Road which runs parallel with the railway embankment. The location of the site is shown on Table 2-1.

The area within the development site proposed for the extension lies within Zone 3 of the Environment Agency Flood Map (version 2.8.2), being the zone with risk of 1 in 100 year (1% AEP) or greater for river flooding. The overall size of the development is less than 1 hectare.

It is usual for the Agency to raise an objection to development applications within the floodplain or Zone 2 or 3 of the flood map until the question of flood risk has been properly evaluated. The Agency will also object to developments where the total site area is more than 1 hectare until suitable consideration has been given to surface water runoff.

Approach to the Assessment

As there are two sources of flood risk – River Calder and surface water runoff – it is necessary to determine flood water levels at the site for the desired return periods emanating from these sources. Consideration has also been given to the site flooding from either overland flow or ponding of localised rainfall within the site.

Kirklees Council was included in the Calder Valley SFRA completed by JBA Consulting during July 2016. References have been taken from the assessments; however, there is very little site-specific information within the report relevant to the area close to the site.

The River Calder is located to the south of the site. In line with the site the river is open channel. Upstream of the site the river passes under the Ledgard Bridge. The river is Main River, as such, the responsibility for flood defence and land drainage lies with the Environment Agency.

The Environment Agency has been approached for modelled flood data for the river. The Environment Agency has modelled flood data which may assist in predicting the design flood level for the river adjacent to the proposed development site.

The area proposed for development is partly existing car park and partly landscaped areas. The impermeable area will be increased following completion of the works. Therefore, consideration will need to be given to the existing drainage route and the drainage characteristics to evaluate the impact that surface water runoff from the site will have upon the site and elsewhere.

A walk over of the site was conducted by Mr Lea Favill, a senior river engineer during October 2017; during the visit a photograph survey of the site and adjacent river was undertaken. A topographic survey of the site has been provided by the clients representative. These surveyed levels have been utilised within this report.

The requirements for flood risk assessments are generally as set out in National Planning Policy Framework (NPPF). The detail and complexity of the study required should be appropriate to the scale and potential impact of the development. For the purposes of this study, the following have been considered: -

- Available information on historical flooding in the area.
- Site level information.
- Details of structures, which may influence hydraulics of the watercourse and consideration of the effect of blockage of structures.
- Estimates of design levels, equivalent to a 200-year (coastal/tidal) and a 100-year (fluvial) return period flood event.
- Allowances for increased flows resulting from the effects of climate change.
- Allowances for sea level rise resulting from the effects of climate change.

Assess the existing runoff characteristics and the potential impact the proposed development will have on the runoff.

Further guidance is also provided in the CIRIA Research Project 624 “Development and Flood Risk: Guidance for the Construction Industry”.

Consultation with Environment Agency

The draft flood risk assessment dated 26th February 2017 was forwarded to the Environment Agency for pre application comments. The Environment Agency responded 15th March 2018 with the following specific requests.

- Site specific hydraulic modelling for a range of return periods, including current climate change allowances.

- Pre- and post-development scenarios need to be undertaken to see what impact the development has on flood risk both on and off site.

JBA Consulting were commissioned by the client to undertake the requested modelling. The modelling was completed July 2018 and forwarded to the Environment Agency for technical review. The Environment Agency confirmed 25th October 2019 that the modelling was fit for purpose.

Following this the Environment Agency were consulted regards the accuracy of the flood maps during 2021. Letters and emails were received from the Environment Agency during 2021. Correspondence is provided at Appendix J of this report.

Email dated 18th January 2021 the EA acknowledged the floodplain designation was incorrect and requested is removal internally. This paragraph clearly states it’s not a controlled flood area.

Email dated 21st May 2021 the EA have clarified specifically this is not Flood zone 3B and that a flood storage area is something different (and is confirmed to be under review). Hence, the EA are essentially saying that notwithstanding the flood storage area being shown on the EA maps or otherwise, they are treating the site as zone 2 / 3a.

Email dated 23rd July 2021 confirms that EA would use the most up to date maps – i.e. the current EA planning flood map is based on data pre-dating the Kirklees Strategic Flood Risk assessment (which doesn't contain the flood storage area).

Letter dated 2nd September 2021 acknowledging modelling undertaken and technical approval.

Comments where received in letter dated 3rd April 2024 from the Environment Agency. Subsequently, a teams meeting was held with the EA on 14th May 2024 to discuss the comments and agree away forward for the project. JBA undertook additional modelling works and assisted with flood levels and design. A technical note was produced and provided at Appendix K. Subsequently, the EA confirmed there acceptance 12th July 2024, letter provide Appendix L.

Application of Sequential & Exceptions Test

The whole of the area proposed for the extension lies within Zone 3 of the Environment Agency Flood Map (version 2.8.2), being the zone with risk of 1 in 100 year (1% AEP) or greater for river flooding. The proposed development is residential, as such, is more vulnerable.

Table 1: Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability classification		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	**Exception Test required**	✓
	Zone 3b	Exception Test required	✓	×	×	×

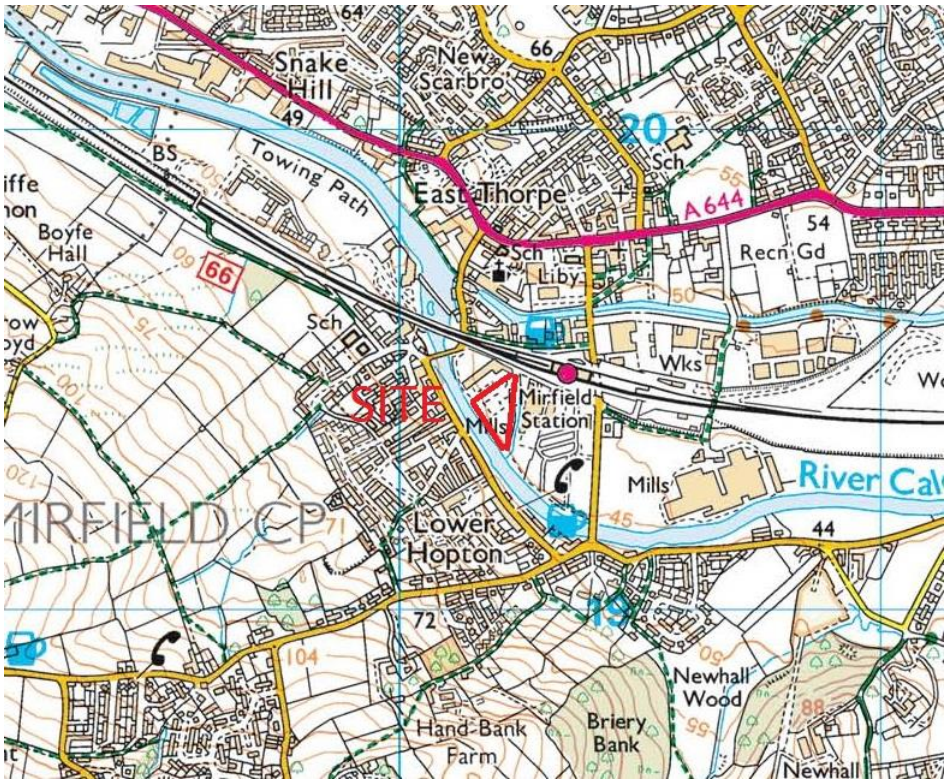
✓ Development is appropriate

× Development should not be permitted

2. DETAILS OF THE SITE

Site Location

Table 2-1: Location Plan



Ordnance Survey Licence no.: WL1005160

Site Details

Table 2-2: Site Details

Site Name	Ledgard Bridge Mirfield
Existing Land Use	Car parking and landscaped areas
Proposed Development	Residential
Grid Reference	SE 20192 19423
County	West Yorkshire
Local Planning Authority	Kirklees Council
Internal Drainage Board	Not Applicable
Others	Not Applicable
Post Code	WF14 8LS

Site Description

The proposed development site is currently a mixture of existing car parking, single storey building and landscaped area. An aerial photograph of the site is shown below in Figure 2.1. During the day of the site inspection there was evidence of formalised drainage in the form of roof gutters and down pipes to all roofed areas and slot drains to the paved areas which conveyed runoff below ground. The total site area has been estimated at approximately 5174m² of which 1290m² is occupied by the existing building and car parking area. The remainder is vegetated areas and landscaping.

The site lies at a level of between 44.50mOD and 45.57mOD. The ground levels within the site are illustrated at Appendix A of this report.

There are existing residential developments to the east and west and the railway line to the north. The River Calder is directly to the south.

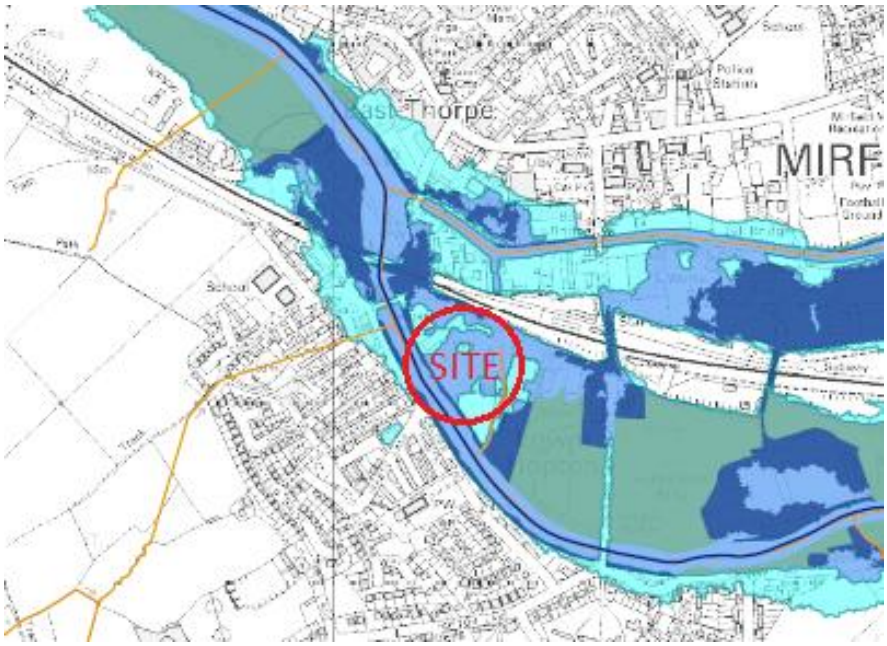
The proposal is to construct a residential apartment block facing the River Calder. The proposed development will be constructed with ground floor, first floor, second and third floor residential units. The impermeable area within the site will be increased to 5174m². The proposed layout plan is provided at Appendix B of this report.

Site Photographs

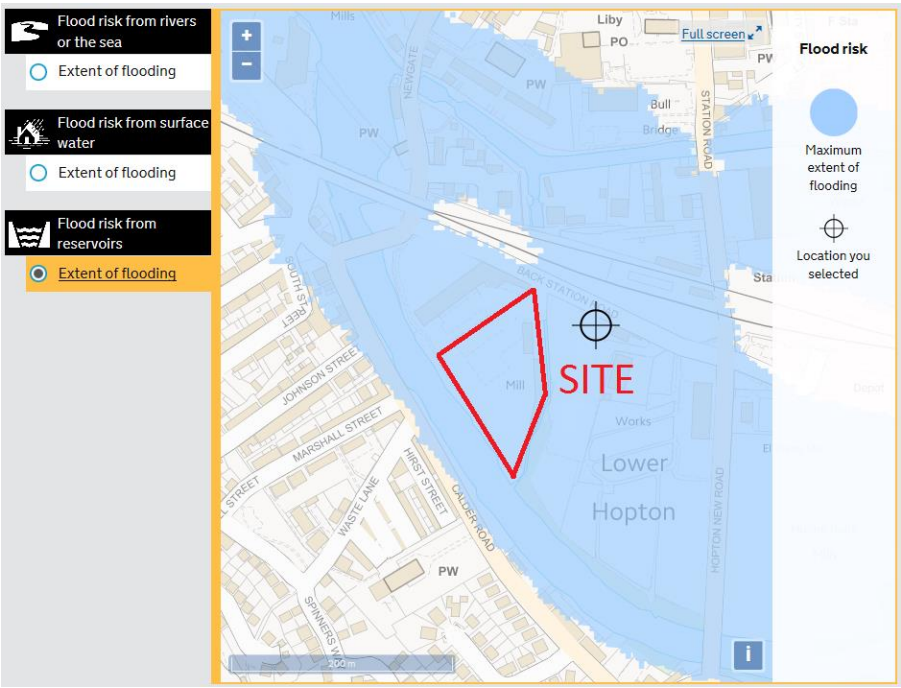
Figure 2.1: Aerial Photograph of the Existing Site.

3. INITIAL ASSESSMENT

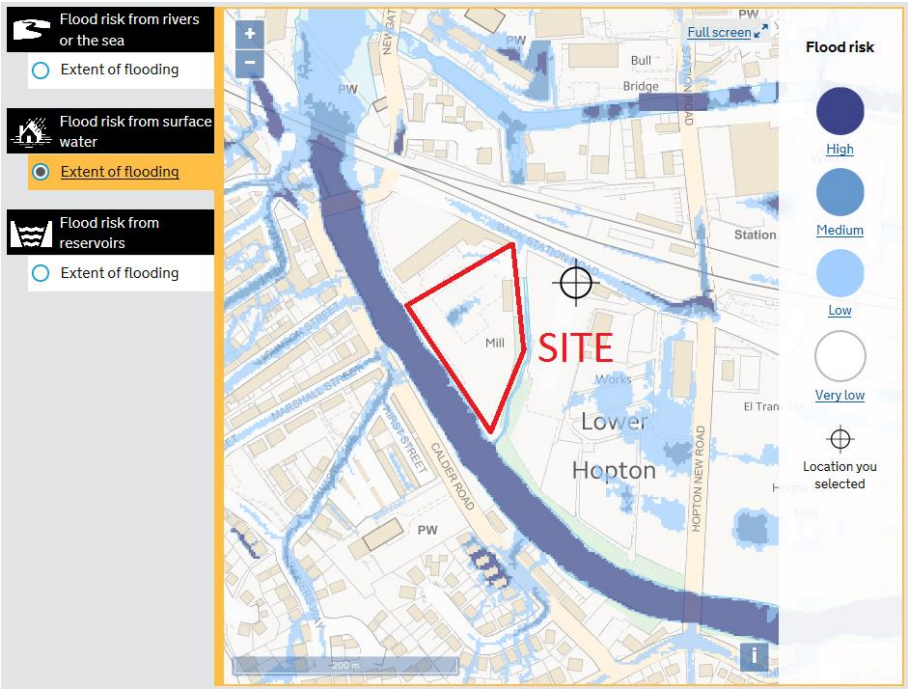
SFRA Flood Map



Environment Agency Reservoir Flood Map



Environment Agency Surface Water Flood Map



Environment Agency Flood Map

The Environment Agency are unable to agree to remove the flood storage area from their maps at this time, although they are unable to determine the reason behind the designation of this area of land as a flood storage area, due to the length of time that has passed since its designation (which they believe might be possibly sometime around the 1980s). They can, however, confirm that this area does not contain any Environment Agency assets, nor is it storage area within which they manage water levels. Subsequently, the SFRA map has been adopted as the most up to date flood risk map for the area.

Past Flooding History

A search on the British Hydrological Society Chronology of British Hydrological Events website[1] found no records of past flooding close to the site.

Undertaking an internet based search for flooding found reference to flooding close to the site during February 2020.

The management company for the adjacent building confirmed that lower parts of the building were flooded to a shallow depth (approx. 100mm) during the February 2020 event. The corridor and lift shaft are at level of 45.239mOD. Therefore 2020 flood level approx. 45.339mOD (45.239+100mm). The JBA 100yr+CC30% design level is 45.38mOD with recommend flood floor level to be 300mm higher at 45.68mOD, therefore new building would be dry during February 2020 event.

[1] http://www.dundee.ac.uk/geography/cbhe/

SFRA Flooding History

The SFRA contained references to the area being flooded during 2000, 2002 and 2015.

Environment Agency Flooding History

The Environment Agency provided historical flood information close to the site for the Autumn 2000, February 2002 and December 2015 flood events. Part of the site was affected during the December 2015 floods where a peak flood level of 44.763mOD was recorded. The historical flood maps are provided at Appendix C of this report.

Environment Agency Reservoir Flood Risk

The Environment Agency reservoir risk map shows that the site and Mirfield are located in an area which could be affected by a reservoir failure. The reservoir flood map shows the consequences of a full breach of the dam structure with the reservoir at full capacity, as such a worst-case scenario. However, the flood maps do not consider the probability of such a failure. Following discussions with Yorkshire Water who are responsible for the reservoirs it was commented that the probability of failure is low as the reservoir is inspected and maintained in accordance with the Reservoirs Act. As such the dam is regularly inspected for defects and any necessary works undertaken prior to a failure. As such the probability of a failure is extremely low.

Environment Agency Surface Water Flood Risk

The Environment Agency reservoir risk map shows there is a single area of low risk flooding within the car park of the existing site. Estimated flood depths during a 1 in 100 year event are likely to be less than 300mm.

Possible Flooding Mechanisms

As there are two sources of flood risk – River Calder and surface water runoff – it is necessary to determine flood water levels at the site for the desired return periods emanating from these sources.

The River Calder is directly to the south of the site. The river is open channel with no flood defences inline and therefore only overtopping will need to be considered.

The proposed development will introduce significant impermeable areas into the site, therefore, consideration will need to be given to the existing drainage route and the drainage characteristics in order to evaluate the impact that surface water runoff from the site will have on the site and elsewhere.

There is no higher ground adjacent to the site which could promote overland flow of water across the site. There are no depressed areas within the site which could encourage ponding, therefore these flood mechanisms have not been considered further.

Information on groundwater flooding is limited within the Kirklees Council. The SFRA provided no further information. In addition, reference to the Groundwater Vulnerability Map and Source Protection Zones produced by the Environment Agency indicate that district is predominantly underlain by secondary A aquifer and are therefore unlikely to be source of significant flood risk.

Yorkshire Water is the statutory water undertaker and is responsible for the public sewer systems within Mirfield area. Yorkshire Water maintains a register of historical sewer flooding events (DG5 Register) within the area. There are no report incidents close to the site. The SFRA provided no further information.

4. FLOOD RISK ASSESSMENT

Requirements of the Environment Agency

The Environment Agency, as part of its development control procedures, generally require finished floor levels to be set above the 1% AEP plus climate change flood water level at the site. The development is residential in nature, as such it is considered that access and egress from the development site will be essential during times of extreme floods.

River Calder

The River Calder rises in the Pennine Moors west of Todmorden. It is predominantly an urban river, flowing through the West Yorkshire towns of Brighouse, Huddersfield, Dewsbury and Wakefield, before it joins the River Aire at Castleford.

The River Calder is located directly to the south of the site. The site is located downstream of Ledgard Road Bridge and upstream of Hopton New Road Bridge.

There are no formal flood defences between the two road bridges and in line with the site. As such, the site relies upon the natural river bank level to provide a flood defence. The river bank is generally at 44.5mOD and above in line with the site.

1 in 100 year flood event within the River Calder

The Environment Agency has provided modelled flood levels for the River Calder directly in line with the site. The data provided is shown at Appendix D of this report. It is considered that node reference CALD09_4198U which is directly upstream of Ledgard Road Bridge and CALD09_3936 which is downstream of the site are the most representative. The 1 in 100 year flood level has been estimated at 44.78mOD (3936) and 45.32mOD (4198U) at these nodes.

JBA as part of the flood volume compensation model constructed an existing baseline model which included improved cross section and hydrological information. The model stage hydrographs are provided at Appendix H of this report. It is estimated that the existing 1 in 100 year flood level in line with the site varies between 44.84mOD and 45.24mOD.

The River Calder is directly adjacent to the site and the general ground level directly on the river bank is 44.50mOD and above. As such, during the 1 in 100 year event flood water could overtop the river bank at a maximum depth of 0.74m and flood part of the site.

Increase in estimated flood level due to Climate Change

NPPF states that *'…Flood risk assessment should be carried out to the appropriate degree at all levels of the planning process, to assess the risks of all forms of flooding to and from development taking climate change into account. The future*

users of the development must not be placed in danger from flood hazards and should remain safe throughout the lifetime of the plan or proposed development and land use.'

As the proposed development is for a residential land use, consideration has therefore been given to consider the potential effects of climate change over the next 100 years in accordance with NPPF. The Environment Agency provided an estimated 1 in 100 year plus climate change flood level in line with the site.

It is considered that node reference CALD09_4198U which is directly upstream of Ledgard Road Bridge and CALD09_3936 which is downstream of the site are the most representative. The 1 in 100 year plus climate change (20%) flood level has been estimated at 44.84mOD (3936) and 45.58mOD (4198U) at these nodes.

The February 2016 climate change allowances produced by the Environment Agency need to be considered. The River Calder is part of the Humber catchment and the site is residential and located within flood zone 3. As such, a climate change increase of 30% and 50% should be considered. JBA as part of the flood volume compensation model constructed an existing baseline model which included improved cross section and hydrological information. The model stage hydrographs are provided at Appendix H of this report. It is estimated that the existing 1 in 100 year flood level in line with the site varies between 44.84mOD and 45.24mOD.

JBA as part of the flood volume compensation model constructed an existing baseline model which included improved cross section and hydrological information. The model stage hydrographs are provided at Appendix H of this report. It is estimated that the existing 1 in 100 year plus climate change 30% flood level in line with the site varies between 45.24mOD and 45.72mOD. It is estimated that the existing 1 in 100 year plus climate change 50% flood level in line with the site varies between 45.49mOD and 46.00mOD.

JBA has confirmed a 100yr+CC30% design level of 45.38mOD for the building.

Extreme 1 in 1,000 year flood event within the River Calder

It is considered that node reference CALD09_4198U which is directly upstream of Ledgard Road Bridge and CALD09_3936 which is downstream of the site are the most representative. The 1 in 1,000 year flood level has been estimated at 46.18mOD (3936) and 46.88mOD (4198U) at these nodes.

JBA as part of the flood volume compensation model constructed an existing baseline model which included improved cross section and hydrological information. The model stage hydrographs are provided at Appendix H of this report. It is estimated that the existing 1 in 1,000 year flood level in line with the site varies between 45.64mOD and 46.14mOD.

Increased Runoff due the Development

Existing Development Site

The total site area has been estimated at 5174m². This consists of 1290m² of existing roofed and paved areas which are supported by formalised drainage and 3884m² of grass and landscaped areas which don't appears to be drained. As such, the existing site is semi permeable. The roofed and paved areas currently drain via a piped drainage system to an outfall into the River Calder. The drainage areas are shown on the plan provided at Appendix E of this report.

Based on the soil maps and from experience of other developments local to Mirfield it is considered that infiltration drainage is not a practical option. As such, at this stage it is assumed that infiltration is not a practical solution for the development site and therefore the proposed point of discharge is to the River Calder.

The peak discharge rates from the 3884m² landscaped area is shown below in Table 4-1. The ICP SUDS Method has been used to calculate the Greenfield runoff from the undeveloped part of the site. The calculation sheet is provided at Appendix E of this report.

Table 4-1: ICP SUDS flows from grass land area of 3884m²

Return Period	Flow in litres per second (l/s)
Qbar	2.0
1 in 1 year	1.7
1 in 30 year	3.5
1 in 100 year	4.2

The peak discharge rates from the 1290m² of roofed and paved area is shown below in Table 4-2. The Modified Rational Method has been used to calculate the peak runoff from the developed part of the site. The calculation sheet is provided at Appendix E of this report.

Table 4-2: Modified Rational Method flows from impermeable area of 1290m²

Return Period	Flow in litres per second (l/s)
1 in 1 year	10.25
1 in 30 year	34.48
1 in 100 year	49.04

It is assumed that a 30% reduction to the 1 in 1 year brownfield rate of 10.25l/s will need to be applied, hence a rate of 7.2l/s is derived. This added to the Qbar

greenfield rate for the remaining part of the site gives a peak restricted discharge rate of 9.2l/s.

Proposed Drainage Strategy

The proposed development site covers an approximate area of 5174m² and will discharge to the adjacent River Calder at a peak rate of 9.2l/s.

An assessment of the required balance volume has been made using the estimated post development impermeable area of 5174m² (0.528 hectares). Using WinDes Source Control software developed by Microdrainage the required attenuation has been calculated for the 1 in 100 year plus climate change (40%) event.

Reference should be made to Appendix F where the drainage strategy drawing is provided and Appendix G where the calculation sheets are provided. The attenuation size has been tabulated below in Table 4-2 for the 1 in 100 year plus climate change (40%) return period.

It is estimated that during the 1 in 100 year plus climate change (40%) event that 297m³ of storage will be required. Therefore, a crate tank will need to be construct within the car park area to accommodate the increased runoff during the 1 in 100 year plus climate change event. The drainage strategy drawing provided at Appendix F shows the approximate area of the crate tank.

Table 4-3: WinDes 1 in 100 year+CC Storage Volume

Return Period	Required Attenuation	WinDes Calculated Volume (m³)
1 in 100 year + CC	Crate tank 330m2 by 0.8m deep	297

Additional car parking

An additional 2645m² of car parking is proposed to the north of the existing building. The area is semi permeable stone but undrained. Therefore, the existing Qbar runoff rate has been estimated on a pro rata basis using the previous calculation. A rate of 1.36l/s is estimated. It is considered impractical to restricted to less than 2l/s therefore this has been adopted. It is estimated that during the 1 in 100 year plus climate change (40%) event that 214.7m³ of storage will be required. Therefore, a crate tank will need to be construct within the car park area to accommodate the increased runoff during the 1 in 100 year plus climate change event. The drainage strategy drawing provided at Appendix F shows the approximate area of the crate tank.

Sustainable Urban Drainage

The Environment Agency requires that adequate pollution control is incorporated into the proposed drainage system in order to prevent deterioration of the quality of the water environment. However, this is only applicable for surface water originating from access roads and communal parking areas, which needs to be passed through a

petrol/oil interceptor or equivalent system prior to discharge into the existing surface water sewer or infiltration system. It is noted however, that this will not apply to surface water originating from roof drainage.

To reduce the impact of surface water runoff from the development in accordance with the requirements of the Environment Agency and Local Authority, the employment of SUDS techniques to limit runoff volumes and rates from the site are recommended. SUDS techniques can also be used to provide an appropriate level of treatment to the runoff.

It is normal practice to ensure that the 1 in 30 year event is maintained within the drainage system and the 1 in 100 year is permitted to flood the surface as long as there is no flooding to buildings and the flood volume is contained within the site boundary in specific areas proposed for this purpose.

The following section will provide some possible SUDS techniques which could be employed on the site to balance flows in excess of the 1 in 30 year event. SUDS techniques will also provide treatment to the runoff to remove a proportion of the pollution and protect the quality of the downstream watercourses. Following guidance from CIRIA Report C522 the following levels of treatment will be provided:

- • Roofs – 1 level
- • Driveways – 1 level
- • Roads and communal parking areas – 2 levels.

The level of treatment indicates the number of SUDS techniques that will be used to treat pollution. For example if two levels are required the runoff may enter a filter drain that leads to a basin or pond before outfall. It is recommended that source control techniques are used. In practice there will be little outflow from these techniques for a 1 in 2 year storm as most of the rainfall will be held within the system and will disperse via evapotranspiration. Further detail of the potential to use SUDS within this site it provided overleaf within Table 4-4. The precise combination of methods used will be dependent upon the site constraints identified at the final design stage.

Initial data suggests that the site is underlain by an impermeable layer which is unlikely to allow infiltration at a reasonable rate therefore making infiltration drainage impractical.

The impermeable area within the site has been estimated at 5174m² following development. It is considered that the site currently drains to the River Calder to the south.

The development site is considered to be small with limited space set aside, in which to incorporate appropriate SUDs techniques. As such, the following SUDS techniques shown below in Table 4-4 have been considered for use at this site.

Table 4-4: SUDS Techniques

SUDs Group	Suitability for Proposed Development
Retention	✘
Wetland	✘
Infiltration	✘
Filtration	✘
Detention	✘
Open Channel	✘
Source Control	**Under drained permeable paving on parking spaces discharging to crate tank**

Adoption & Maintenance

It is considered that the piped drainage systems and attenuation structure will be maintained by owner/onsite management company.

Crate Tank Maintenance

Following construction regular inspection is recommended. The main concern is to reduce the level of siltation entering the crate tank and as such a catchpit manhole should be located directly upstream of the tank to intercept any silt being washed down the surface water system. It is recommended that this manhole is lifted and inspected on a monthly basis and any silt located in the bottom removed. Furthermore the location of the tank within the site should be clearly marked on a plan. This area should also be inspected for any deformation of the topsoil/pavement which could indicate settlement or failure. A log book should be completed which will show the inspection and maintenance history of the system. The log book, site plan and construction check list should form maintenance manual for the system.

The maintenance plan has been tabulated below and will be the responsibility of the appointed management company.

Maintenance Schedule	Required action	Frequency
Monitoring	Inspect catchpit manhole for silt and debris	Monthly
	Inspect crate tank locations for ground deformation	3 monthly
	Inspect crate tank for silt buildup	6 monthly
Regular Maintenance	Litter and debris removal from road gullies	Monthly
	Remove silt and debris from catchpit manholes	Monthly
Occasional Maintenance	Remove silt from crate tank	6 monthly
Remedial actions	Repair deformation of topsoil once settlement stopped	As required
	Repair deformation of paved areas once settlement stopped	As required

Void Maintenance

JBA within their most recent technical note (section 2.8) have provided a void maintenance schedule.

5. MITIGATION MEASURES

Raising Floor Levels/Land Raising

The site is located directly adjacent to the River Calder which is not protected by any flood walls or embankments in line with the site. JBA have undertaken update river modelling which has been reviewed and approved by the Environment Agency. The modelling included post development modelling to establish the impacts of the proposed building on local flood levels and flow routes. The JBA report is provided at Appendix I and makes the following recommendations.

- The proposed building blocks fall within the River Calder's 100-year, 100-year with (+30%) climate change and 1,000-year floodplain.
- **JBA has confirmed a 100yr+CC30% design level of 45.38mOD for the building.**
- To minimise their impact on flood depths, the proposed buildings will be built on a void/on stilts. The soffit of the void should be set to a minimum elevation of 45.68mOD which is 300mm above the 100yr+CC40% level.

Access & Egress

Based on the modelling undertaken by JBA it is considered that dry access and egress will not be available at all times from the development. However, the habitable parts of the proposed building will be constructed sufficiently above the design flood level (45.38mOD) that the building will be a safe area during flood times.

The Environment Agency will provide at least a 2 hour warning of flooding to the area, however, this is a catchment wide warning which is not as accurate and robust as an onsite warning system.
Kirklees Emergency Planning team have raised concerns regards the potential escape route for vehicles along Station Road due to the flood water depths that could be experienced.

Therefore, it is proposed that dry access and egress is provided from the proposed building to the Ledgards Bridge over the River Calder. This will involve constructing an elevated walkway within the site to the bridge abutment/parapet wall where flood levels are less than 200mm deep and safe to access. Steps will be required over the bridge parapet wall to allow access. The walkway will be within the site boundary and requires lifting levels between 0.16m and 0.68m. The escape route is 110m from the building to the bridge. Approximately 55m of the route the increase in levels is 300mm or less. The remaining 55m is between 300mm and 680mm increase in levels. The proposed access will be constructed using timber post and boards with voids beneath. Following discussions with JBA it was confirmed that the flood route will result in lowering of flood levels adjacent to the river bank and within the site.

Flood Warning

The access and egress route away from the development and local area may become inundated as a result of overtopping during an extreme flood events within the River Calder.

It is therefore recommended that the occupants of the site are made aware that the entire site itself and likely evacuation route from the local area are at risk from flooding. It is also recommended that the occupants signs up to the 'Floodline Warnings Direct' service operated by the Environment Agency. The development itself is designated to receive flood warnings by the Environment Agency and can be registered with the local Environment Agency office as an area of interest in order to receive warnings. The service is able to provide flood warnings via telephone, mobile, fax or pager. More information on the likely timing and extent of warnings can be obtained by request from the Environment Agency, via their website or obtained by their 'Quickdial' recorded information service.

The adjacent apartments which are owned by this client operate a telemetry-based warning system which could be extended to include this development. The warning system incorporates the following: -

- When the river rises to approximately 1,000mm below the site level, flashing warning lights are activated in the communal areas to indicate that the river level is rising and there is a possibility of flooding
- When the river rises to a level approx. 300mm below the site level and audible pre-recorded warning message would be transmitted by loudspeakers in communal areas to indicate that flooding is imminent
- A prominent display board in the main entrance area would explain about the operation of the flood warning system.

Flood warnings could then be monitored to allow more time to enable emergency access and egress from the local area during a flood event. It is also recommended that occupants are made aware that the site lies within an area which could be flooded to a depth hazardous to people, emphasising the risk within the site itself and larger vicinity of the site.

Flood Volume Compensation

JBA have undertaken update river modelling which has been reviewed and approved by the Environment Agency. The modelling included post development modelling to establish the impacts of the proposed building on local flood levels and flow routes. The JBA report is provided at Appendix I and concludes that the proposed building will have an insignificant impact on local flood levels and flood flow routes. Further compensation modelling was undertaken by JBA which concluded insignificant impact. This report is provided at Appendix K.

JBA also confirmed that the proposed escape walkway will not impact on food levels in the local area.

Control of Runoff

Consideration has been given to the hierarchy for surface water disposal which recommends the SUDs approach which includes infiltration as the first tier. Further

investigation is required to confirm that infiltration drainage will be a practical solution for the site.

However, other SUDs techniques can be used within the site and they have been considered. The second tier is to discharge to a watercourse. The River Calder is directly adjacent to the site and is considered to be a point of discharge.

Following the proposed development, the impermeable area will be increased from 1290m² up to 7819m². It is considered that the site currently discharges runoff via a combination of infiltration, evaporation and overland flow to the River Calder.

Using software developed by Microdrainage the required attenuation has been calculated for the 1 in 100 year plus climate change (40%) event. The site will discharge into the River Calder via two headwall outfalls. The primary attenuation will be provided within crate tanks 0.8m deep.

The tank will be used to accommodate the storage during 1 in 1 year, 30 year, 100 year and 100 year +CC storms (worst case scenario).

The proposal is to provide a hydro-brake to restrict flows from the site. The hydro-brake will reduce the runoff from the development site during higher return periods, hence, there will be a significant reduction in runoff and as such the development will provide significant betterment in terms of runoff being passed forward from the site into the River Calder

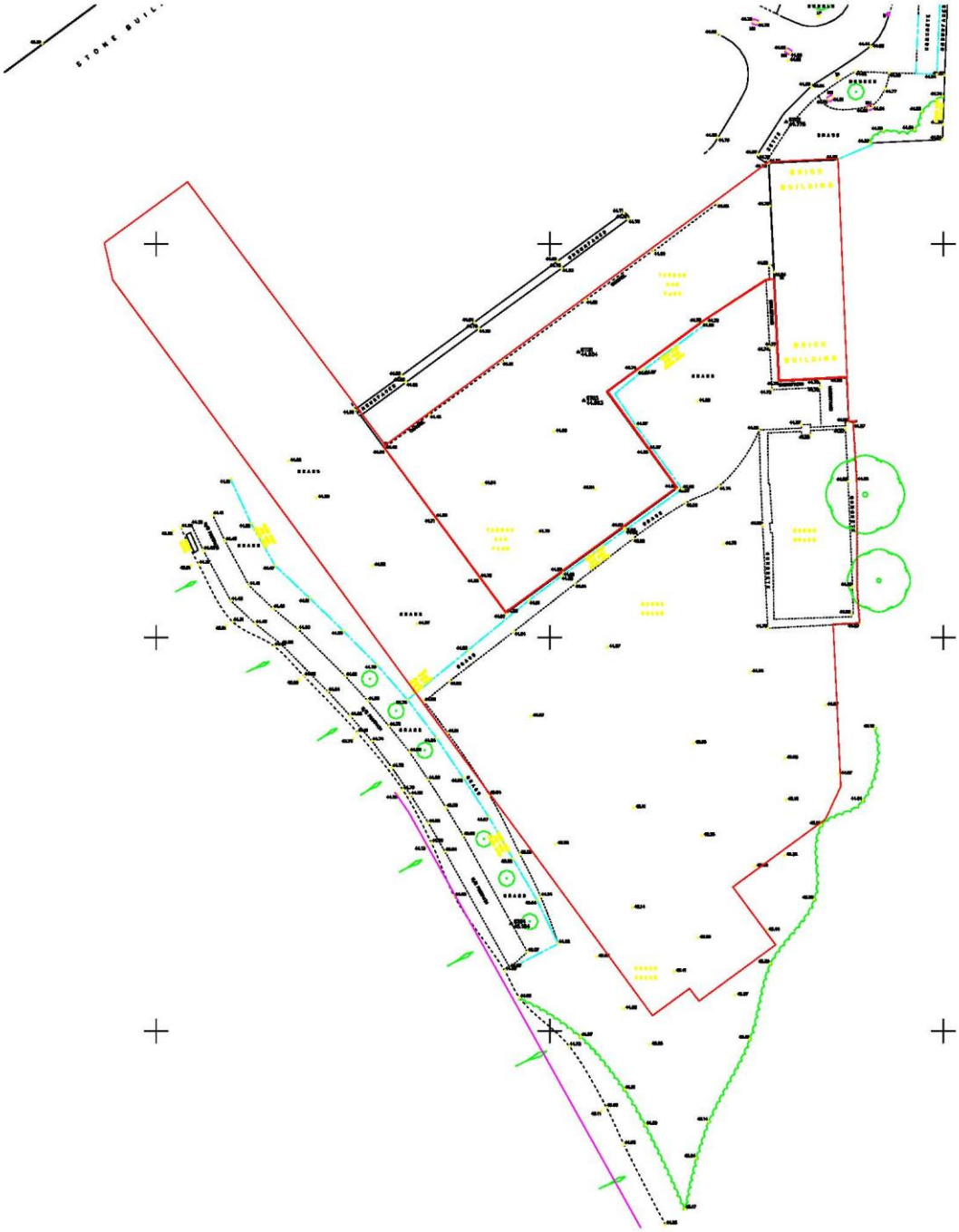
It is recommended that during the detailed phase of the development the following items are considered.

- The maintenance and adoption regimes for all elements of the development should be considered for the lifetime of the development.
- Consenting will be required from the Water Authority for any connections into the public sewer.

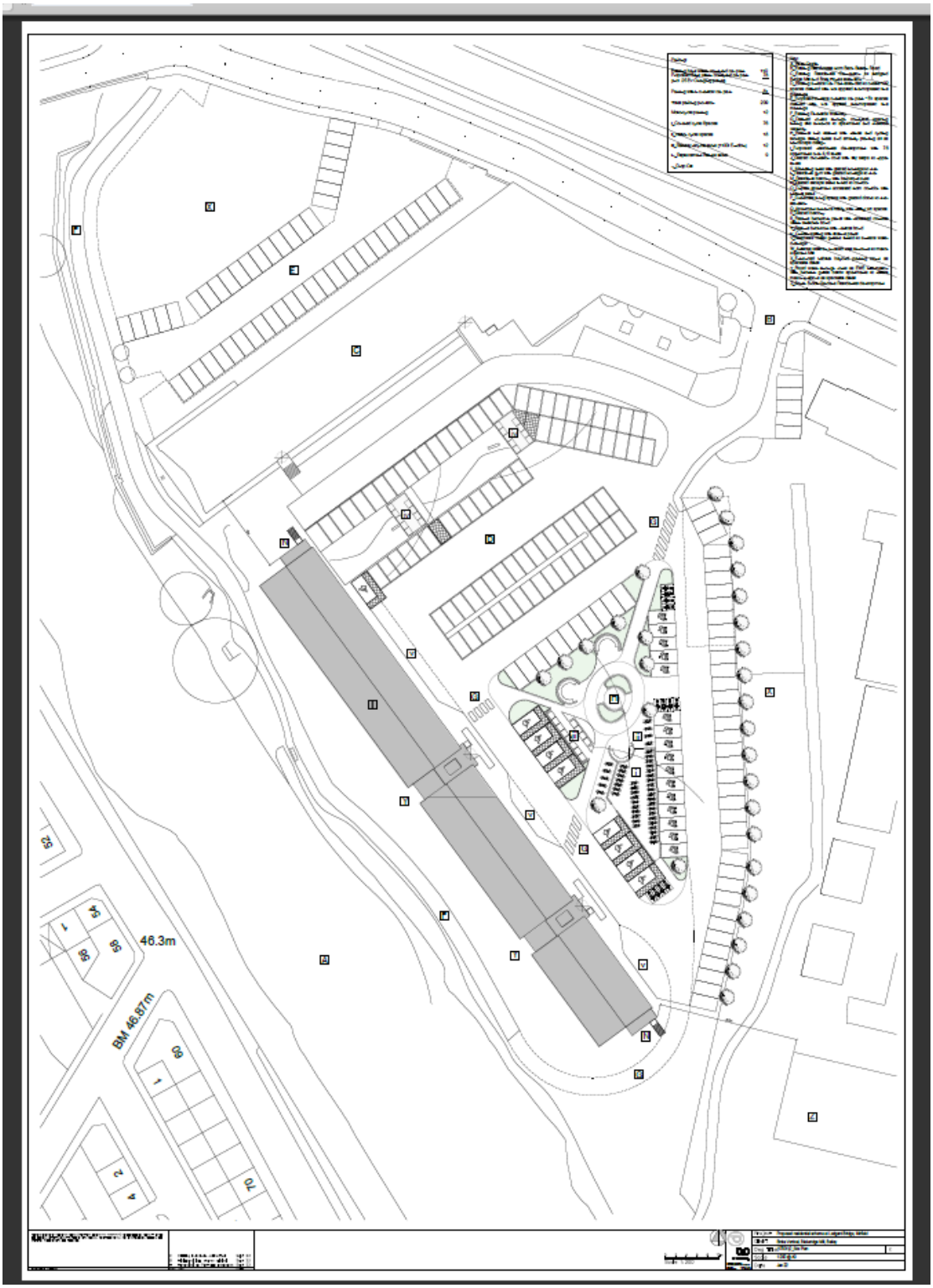
6. CONCLUSION

It is concluded that there is a risk of fluvial flooding to the proposed development from the River Calder. The proposal will elevate floor levels above the extreme climate change flood level and a robust flood warning system will be provided. It is also unlikely that the proposed development will have any adverse impact on the surface water drainage in the area.

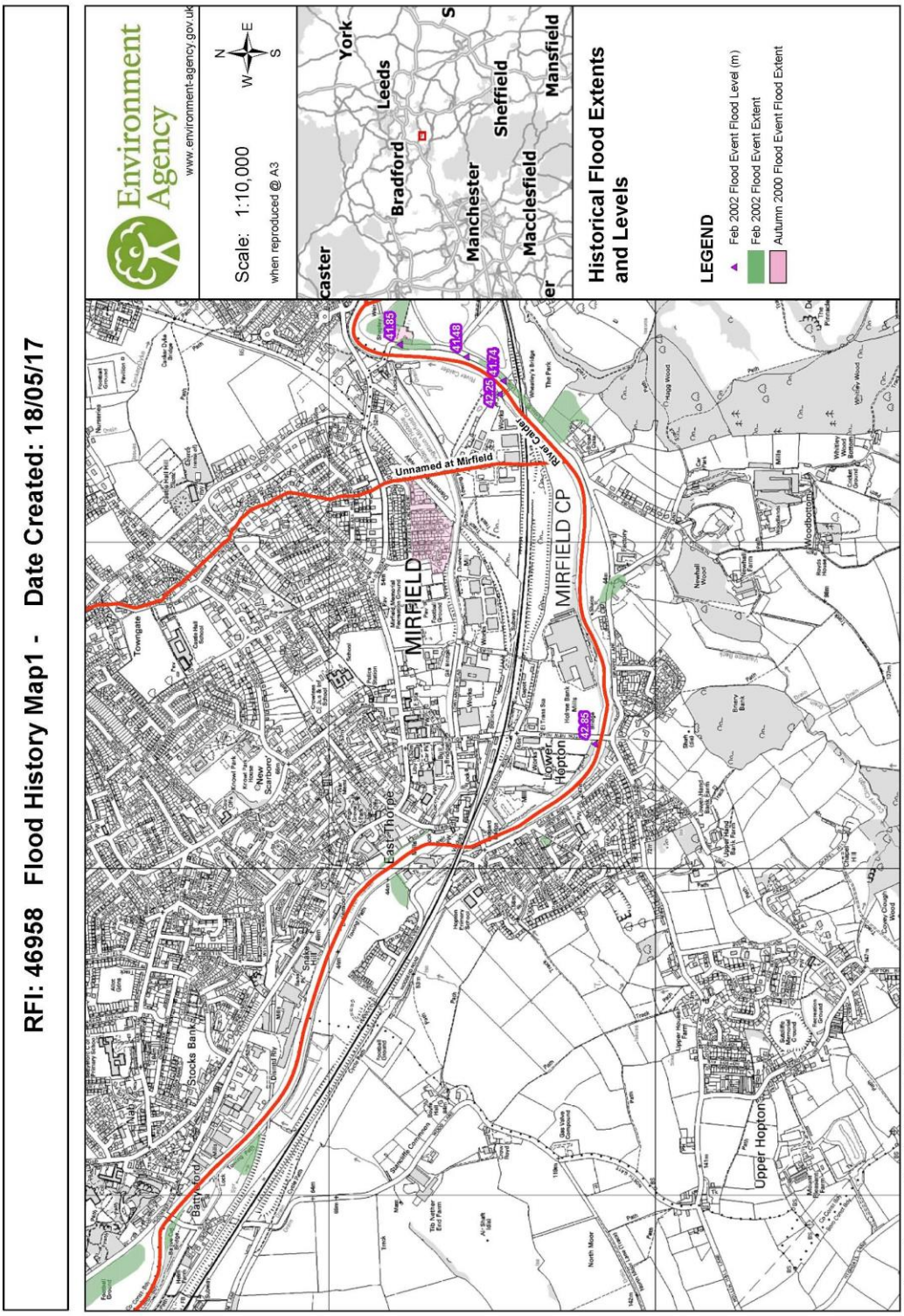
Appendix A: - Existing Ground Levels

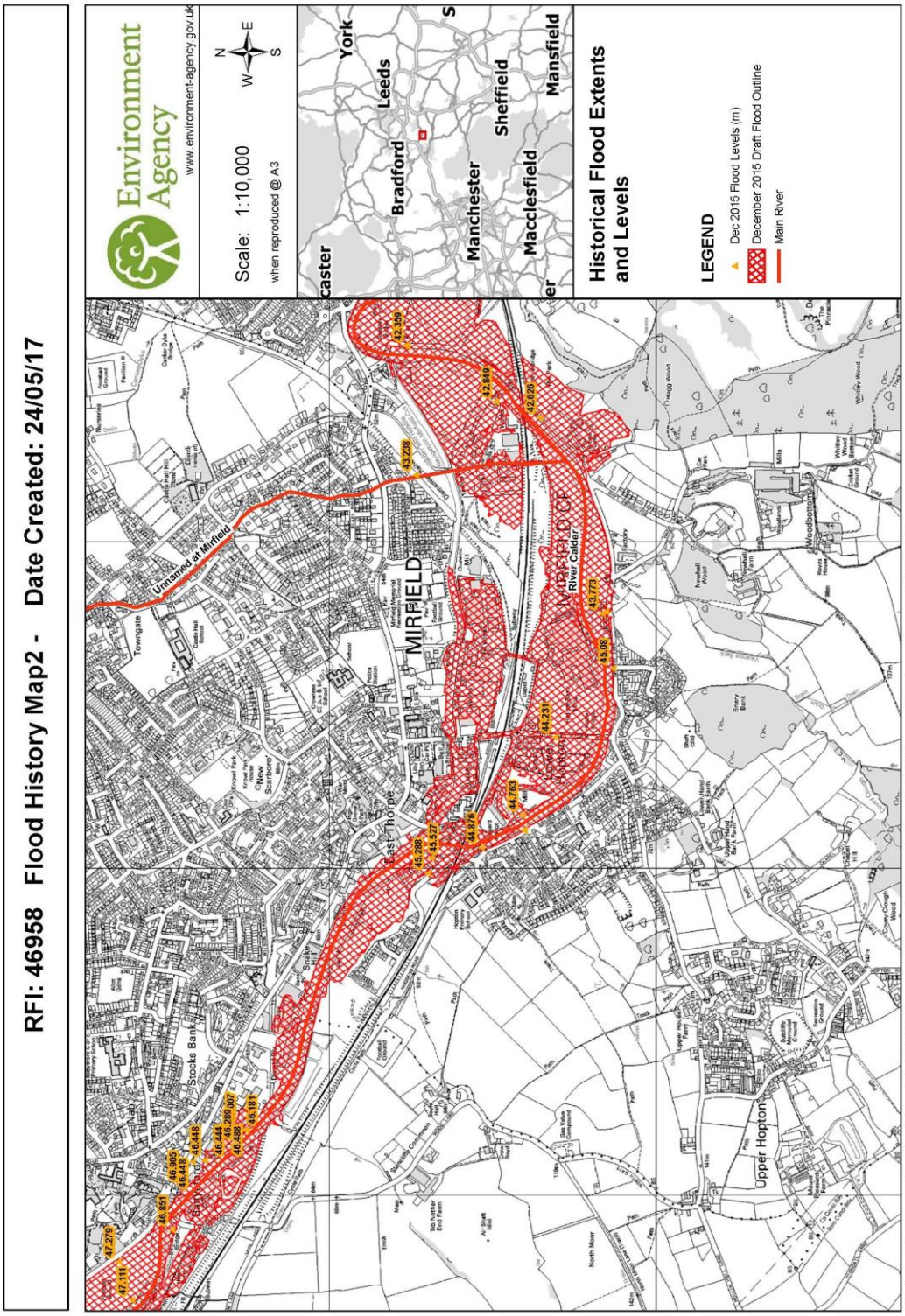


Appendix B: - Proposed Layout Plan



Appendix C: - Environment Agency Historical Flood Data




RFI: 46958 Flood History Map2 - Date Created: 24/05/17
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N
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E
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York
Leeds
Bradford
Manchester
Sheffield
Macclesfield
Mansfield
Historical Flood Extents and Levels
LEGEND
Dec 2015 Flood Levels (m)
December 2015 Draft Flood Outline
Main River
MIRFIELD
Unnamed at Mirfield
Towngate
Stocks Bank
East Thorpe
River Calder
Upper Hopton
Moodbottom
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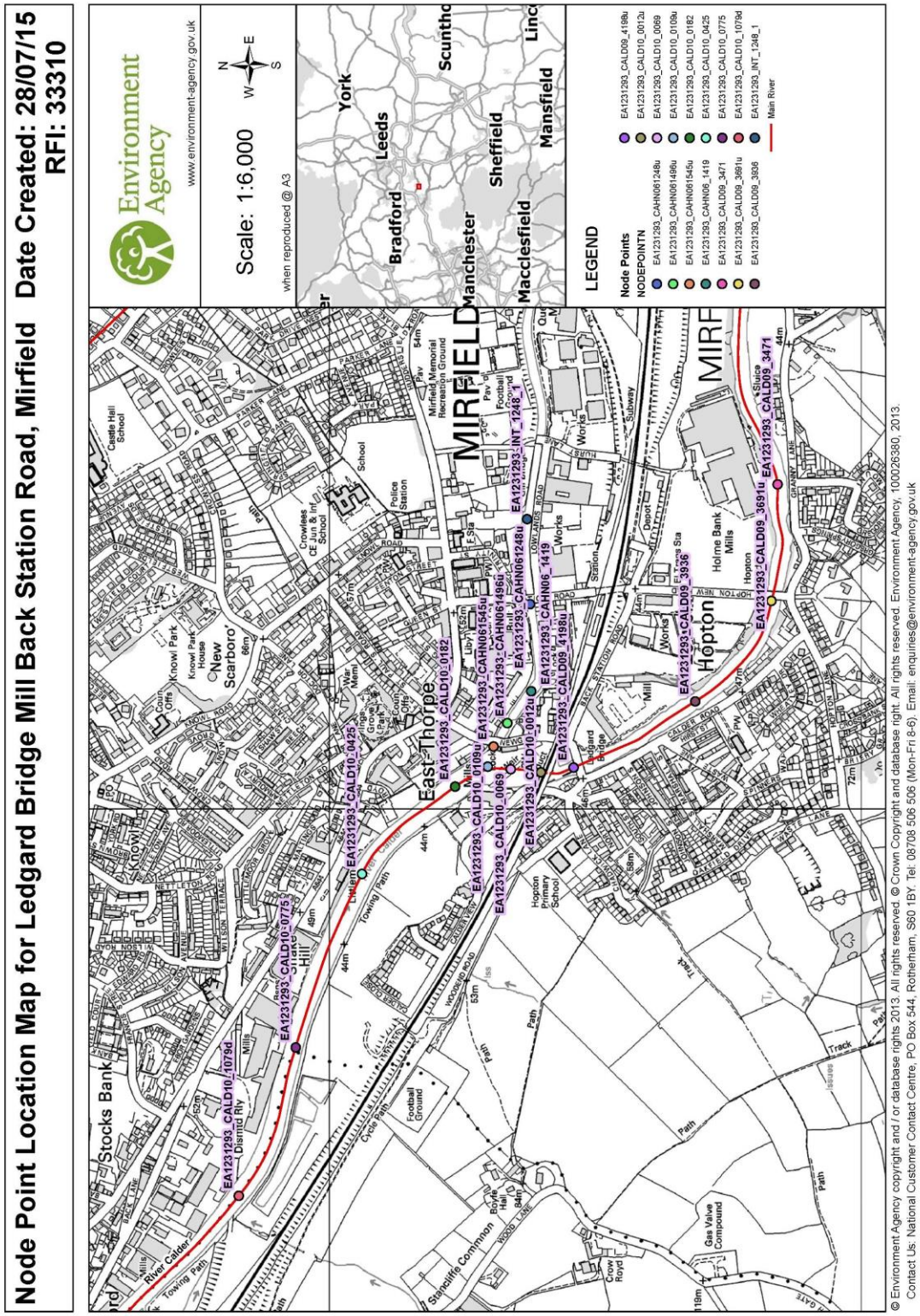
Appendix D: - Environment Agency Flood Data



Node Point Information

RFI: 33310

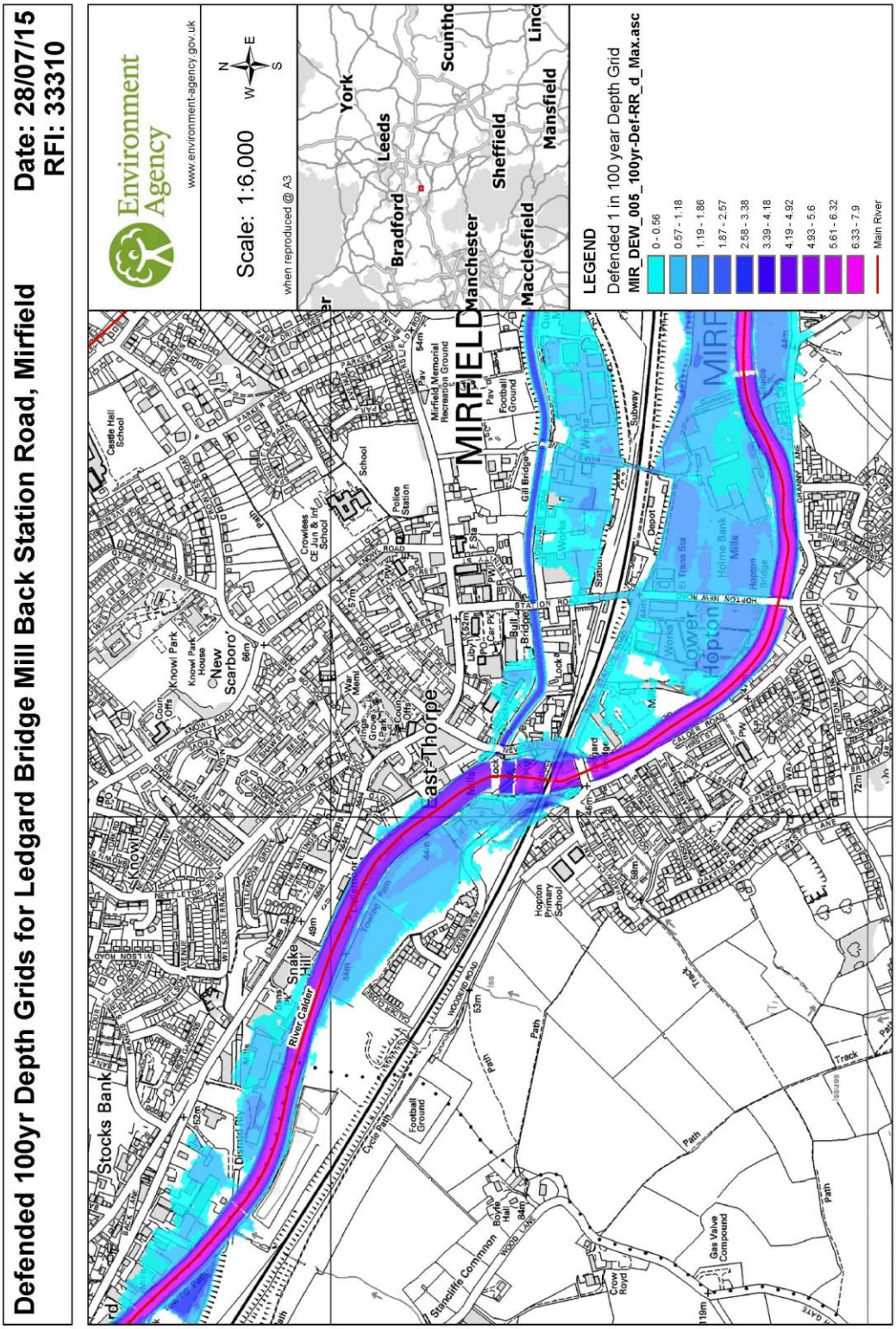
2015 Model Information

Node Point ID	Defended (Return Period)																					
	Level											Flow										
	2	5	10	25	30	50	75	101	200	100	1000	2	5	10	25	30	50	75	101	200	100	1000
EA1231293_CALD10_0425	44.76	45.23	45.32	45.68	45.73	45.83	45.9	46.2	46.07	45.92	47.31	231.53	312.47	329.82	407.59	415.15	439.79	458.34	532.5	501.75	483.25	806.52
EA1231293_CALD10_0182	44.66	45.11	45.19	45.52	45.56	45.65	45.71	45.96	45.85	45.75	46.89	231.26	312.98	330.08	410.41	422.69	450.37	471.19	554.65	519.73	483.18	876.93
EA1231293_CALD10_0069	44.62	45.07	45.15	45.5	45.54	45.63	45.7	45.98	45.86	45.74	47.18	230.38	312.01	328.88	400.59	409.7	430.65	446.53	507.34	483.2	455.72	628.82
EA1231293_CALD10_0012u	43.32	44.06	44.2	44.82	44.9	45.09	45.22	45.69	45.51	45.4	46.95	230.35	313.43	331.1	410.35	419.99	439.81	454.37	490.56	479.19	466.62	629.99
EA1231293_CALD09_4198u	43.27	44.01	44.15	44.76	44.84	45.02	45.15	45.58	45.42	45.32	46.86	226.14	300.14	316.04	389.06	399.36	420.78	438.71	500.67	478.88	455.75	586.76
EA1231293_CALD10_0775	44.91	45.4	45.49	45.86	45.9	46	46.07	46.35	46.23	46.16	47.53	231.57	314.73	332.62	421.51	431.9	461.48	483.94	575.44	536.99	481.87	803.37
EA1231293_CALD09_3691u	42.85	43.46	43.56	44.03	44.1	44.23	44.31	44.61	44.51	44.59	46.18	230.3	313.76	331.63	415.34	426.55	452.41	471.73	535.15	510.02	465.94	577.8
EA1231293_CALD09_3471	42.7	43.29	43.39	43.81	43.87	43.99	44.06	44.27	44.22	44.34	45.43	230.27	313.67	331.15	406.87	415.94	438.95	457.72	528.27	499.52	462.1	655.32
EA1231293_CALD09_3936	43	43.64	43.76	44.25	44.32	44.46	44.55	44.84	44.74	44.78	46.17	230.33	313.84	331.73	416.59	428.63	455.34	476.75	555.14	523.3	472.02	654.9
EA1231293_CALD10_1079d	45.08	45.62	45.72	46.14	46.19	46.3	46.39	46.72	46.58	46.45	47.89	231.61	315.51	333.2	426.49	434.79	465.71	489.24	584.43	544.44	487.5	818.83
EA1231293_CAHN061248u	42.84	42.95	43	43.42	43.47	43.6	43.68	43.91	43.84	43.71	46.31	0.83	0.91	1.12	4.43	5.05	6.4	7.48	13.5	10.81	8.3	113.57
EA1231293_CAHN06_1419	42.84	42.95	43	43.42	43.47	43.6	43.68	43.93	43.85	43.71	46.49	0.86	0.94	1.18	4.45	5.02	6.4	7.57	13.18	10.53	8.31	103.38
EA1231293_CAHN061496u	43.42	43.68	43.82	44.08	44.1	44.16	44.21	44.4	44.31	44.23	46.55	0.87	0.95	1.2	4.44	4.98	6.41	7.58	13.17	10.53	8.33	81.69
EA1231293_CAHN061545u	44.63	45.07	45.15	45.47	45.51	45.59	45.65	45.89	45.78	45.68	46.81	0.88	0.97	1.2	4.43	4.98	6.42	7.58	13.18	10.53	8.33	43.71
EA1231293_INT_1248_1	42.84	42.95	43	43.41	43.47	43.6	43.67	43.9	43.83	43.7	46.34	0.81	0.88	1.08	4.46	5.06	6.39	7.44	13.51	10.81	8.29	117.88
EA1231293_CALD10_0109u	44.63	45.07	45.15	45.47	45.51	45.59	45.65	45.89	45.78	45.69	46.84	231.26	312.98	330.13	410.7	422.69	450.61	471.06	556.56	521.09	482.32	845.66

Node Point ID	Undefended (Return Period)			
	Level		Flow	
	100	1000	100	1000
EA1231293_CALD10_0425	45.89	47.32	454.78	804.3
EA1231293_CALD10_0182	45.7	46.89	467.08	880.53
EA1231293_CALD10_0069	45.69	47.18	443.53	630.43
EA1231293_CALD10_0012u	45.21	46.96	451.2	633.26
EA1231293_CALD09_4198u	45.14	46.86	435.1	579.31
EA1231293_CALD10_0775	46.06	47.54	479.65	808.36
EA1231293_CALD09_3691u	44.32	46.19	467.6	578.61
EA1231293_CALD09_3471	44.07	45.44	453.67	656.36
EA1231293_CALD09_3936	44.55	46.18	472.77	656.33
EA1231293_CALD10_1079d	46.38	47.9	482.55	816.79
EA1231293_CAHN061248u	43.67	46.32	7.29	113.74
EA1231293_CAHN06_1419	43.68	46.48	7.35	113.33
EA1231293_CAHN061496u	44.2	46.58	7.36	80.76
EA1231293_CAHN061545u	45.64	46.81	7.37	43.93
EA1231293_INT_1248_1	113.62	113.62	0.53	1.03
EA1231293_CALD10_0109u	45.64	46.85	467.43	844.95

2011 Model Information

Node Point ID	10 Year		25 Year		50 Year		75 year		100 Year		200 Year		Climate Change		1000 Year	
	Flow	Max Stage	Flow	Max Stage	Flow	Max Stage	Flow	Max Stage	Flow	Max Stage	Flow	Max Stage	Flow	Max Stage	Flow	Max Stage
CALD09_3691u	331.79	43.54	375.75	43.84	414.93	44.05	438.31	44.16	456.77	44	500.54	44.45	523.54	44.59	706	45.84
CALD09_3691d	331.79	43.52	375.75	43.80	414.93	44.00	438.31	44.10	456.77	44	500.54	44.37	523.54	44.48	706	45.31
CALD09_3471	331.72	43.35	375.47	43.63	412.71	43.87	434.51	44.00	451.66	44	494.04	44.30	527.35	44.43	750	45.40
CALD09_4198u	331.93	44.12	375.86	44.48	415.06	44.76	438.39	44.91	456.85	45	500.61	45.28	523.64	45.45	724	46.99
CALD09_4198d	331.98	44.01	375.92	44.34	415.13	44.59	438.46	44.72	456.92	45	500.69	45.04	523.72	45.19	724	46.41
CALD09_3936	331.86	43.73	375.83	44.04	415.01	44.27	438.38	44.39	456.84	44	500.61	44.69	523.63	44.83	707	46.07
CALD10_0069	332.14	45.17	381.30	45.41	427.67	45.63	455.52	45.75	477.79	46	531.13	46.08	559.56	46.20	838	47.40
CALD10_0069d	332.14	44.15	381.30	44.51	427.67	44.78	455.52	44.92	477.79	45	531.13	45.28	559.56	45.45	838	46.95
CALD10_0012u	331.98	44.24	375.93	44.62	415.26	44.91	438.65	45.07	457.18	45	501.11	45.46	524.27	45.63	726	47.19
CALD10_0012d	331.98	44.18	375.93	44.56	415.26	44.85	438.65	45.02	457.18	45	501.11	45.42	524.27	45.59	726	47.16
CALD10_0425	332.13	45.33	381.32	45.58	427.71	45.80	455.52	45.93	477.77	46	531.15	46.26	559.54	46.38	839	47.54
CALD10_0182	332.13	45.20	381.30	45.44	427.68	45.65	455.51	45.77	477.78	46	531.13	46.09	559.55	46.21	838	47.34
CALD10_1079u	335.06	45.73	387.82	46.00	428.08	46.26	455.87	46.40	478.11	47	531.26	46.76	558.57	46.89	770	48.18
CALD10_1079d	335.06	45.73	387.82	46.00	428.08	46.26	455.87	46.40	478.11	47	531.26	46.76	558.57	46.89	770	48.18
CALD10_0775	332.36	45.51	380.73	45.77	425.78	46.00	451.94	46.14	472.57	46	521.10	46.49	546.40	46.62	775	47.87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Date: 28/07/15
RFI: 33310
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LEGEND
Defended 1 in 100 year Depth Grid
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0 - 0.56
0.57 - 1.18
1.19 - 1.86
1.87 - 2.57
2.58 - 3.38
3.39 - 4.18
4.19 - 4.92
4.93 - 5.6
5.61 - 6.32
6.33 - 7.9
Main River
MIRFIELD
Stocks Bank
Snake Hill
River Calder
East Thorpe
New Scarboro'
Knowl Park
Castle Hill School
Crowlees CE Jun & Inf School
Police Station
Mirfield Memorial Recreation Ground
Gill Bridge
Butt Bridge
Lower Hopton
Hopton Primary School
Holme Bank Mills
Hopton Bridge
Stepcliffe Common
Boyle Hall
Crow Royd
Gas Valve Compound
Football Ground
Cycle Path
Path
Track
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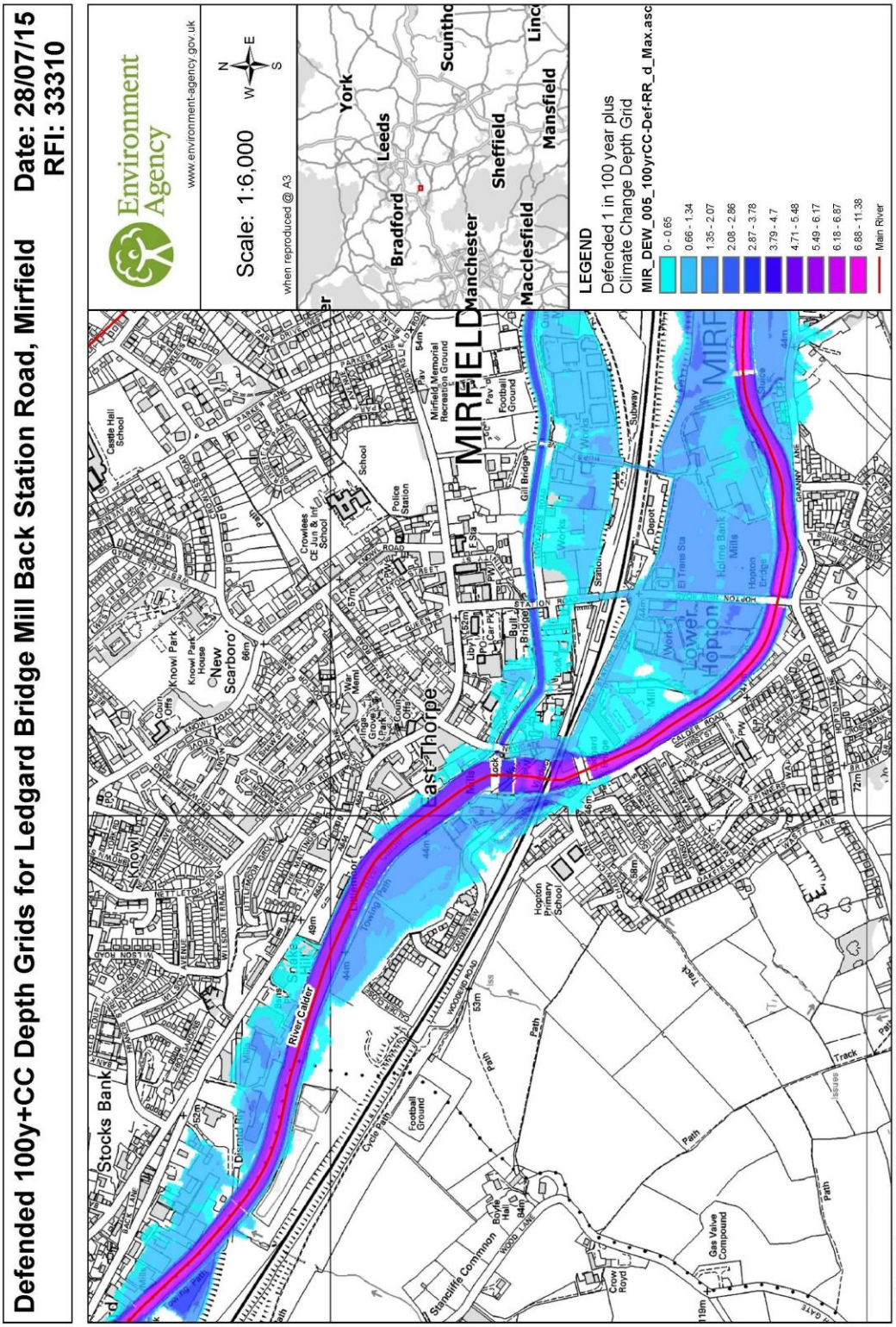
Defended 100y+CC Depth Grids for Ledgard Bridge Mill Back Station Road, Mirfield
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LEGEND
Defended 1 in 100 year plus Climate Change Depth Grid
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2.87 - 3.78
3.79 - 4.7
4.71 - 5.48
5.49 - 6.17
6.18 - 6.87
6.88 - 11.38
Main River
MIRFIELD
Stocks Bank
New Scarboro'
East Thorpe
Lower Hopton
River Calder
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Appendix E: - Existing Runoff Calculations

EWE Associates Ltd		Page 1
Windy Ridge Barn Thealby Lane Winterton DN15 9TG		
Date 21/02/2018 15:21 File	Designed By Lea Checked By	
Micro Drainage	Source Control W.12.4	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.450
Area (ha)	0.388	Urban	0.000
SAAR (mm)	803	Region Number	Region 3

Results	**l/s**
QBAR Rural	2.0
QBAR Urban	2.0
Q1 year	1.7
Q1 year	1.7
Q30 years	3.5
Q100 years	4.2

©1982-2010 Micro Drainage Ltd

Modified Rational Method

Length (m)	68	m
Area (ha)	0.129	Ha
Max Height	44.8	mAOD
Min Height	44.5	mAOD
DeltaH	0.4	
Slope (%)	0.54	
Te (mins)	15.41	mins
ARF	0.999	
SAAR	803.000	mm
UCWI	80	mm
PIMP	100.0	%
SOIL	0.45	
Percentage Runoff PR	79.69	
DEEPSTOR	0.95	

Cv	0.7969	
Cr	1.3	
allowable outflow		
1 year	10.25	l/s

Return Period flood 1 years
Post Development Rainfall 2 years

Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	Effective Depth (mm)	Rainfall Intensity (mm/hr)	FLOW (l/s)	FLOW (l/s/ha)
0.25	0.010	6.9	8.5	27.6	10.3	79.5
0.3	0.013	7.1	7.4	23.7	8.8	68.2
0.5	0.021	10.52	10.9	21.0	7.8	60.6
0.75	0.031	12.13	12.6	16.2	6.0	46.6
1	0.042	13.42	13.9	13.4	5.0	38.6
1.25	0.052	14.51	15.0	11.6	4.3	33.4
1.5	0.063	15.46	16.0	10.3	3.8	29.7
1.75	0.073	16.31	16.9	9.3	3.5	26.8
2	0.083	17.09	17.7	8.5	3.2	24.6
2.25	0.094	17.8	18.4	7.9	2.9	22.8
2.5	0.104	18.46	19.1	7.4	2.7	21.3
2.75	0.115	19.08	19.8	6.9	2.6	20.0
3	0.125	19.67	20.4	6.6	2.4	18.9
3.25	0.135	20.22	20.9	6.2	2.3	17.9
3.5	0.146	20.74	21.5	5.9	2.2	17.1
3.75	0.156	21.24	22.0	5.7	2.1	16.3
4	0.167	21.72	22.5	5.4	2.0	15.6
4.25	0.177	22.18	23.0	5.2	1.9	15.0

Modified Rational Method

Length (m)	68	m
Area (ha)	0.129	Ha
Max Height	44.8	mAOD
Min Height	44.5	mAOD
DeltaH	0.4	
Slope (%)	0.54	
Te (mins)	15.41	mins
ARF	0.999	
SAAR	803.000	mm
UCWI	80	mm
PIMP	100.0	%
SOIL	0.45	
Percentage Runoff PR	79.69	
DEEPSTOR	0.95	

Cv	0.7969	
Cr	1.3	
allowable outflow		
30 year	34.48	l/s

Return Period flood 30 years
Post Development Rainfall 50 years

Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	Effective Depth (mm)	Rainfall Intensity (mm/hr)	FLOW (l/s)	FLOW (l/s/ha)
0.25	0.010	23.2	27.6	92.8	34.5	267.3
0.3	0.013	25.1	26.0	83.7	31.1	241.0
0.5	0.021	32.34	33.5	64.7	24.0	186.3
0.75	0.031	36.04	37.3	48.1	17.9	138.4
1	0.042	38.9	40.3	38.9	14.5	112.0
1.25	0.052	41.27	42.8	33.0	12.3	95.1
1.5	0.063	43.3	44.9	28.9	10.7	83.1
1.75	0.073	45.09	46.7	25.8	9.6	74.2
2	0.083	46.7	48.4	23.4	8.7	67.2
2.25	0.094	48.17	49.9	21.4	8.0	61.7
2.5	0.104	49.51	51.3	19.8	7.4	57.0
2.75	0.115	50.76	52.6	18.5	6.9	53.2
3	0.125	51.93	53.8	17.3	6.4	49.9
3.25	0.135	53.03	54.9	16.3	6.1	47.0
3.5	0.146	54.06	56.0	15.4	5.7	44.5
3.75	0.156	55.04	57.0	14.7	5.5	42.3
4	0.167	55.97	58.0	14.0	5.2	40.3
4.25	0.177	56.86	58.9	13.4	5.0	38.5

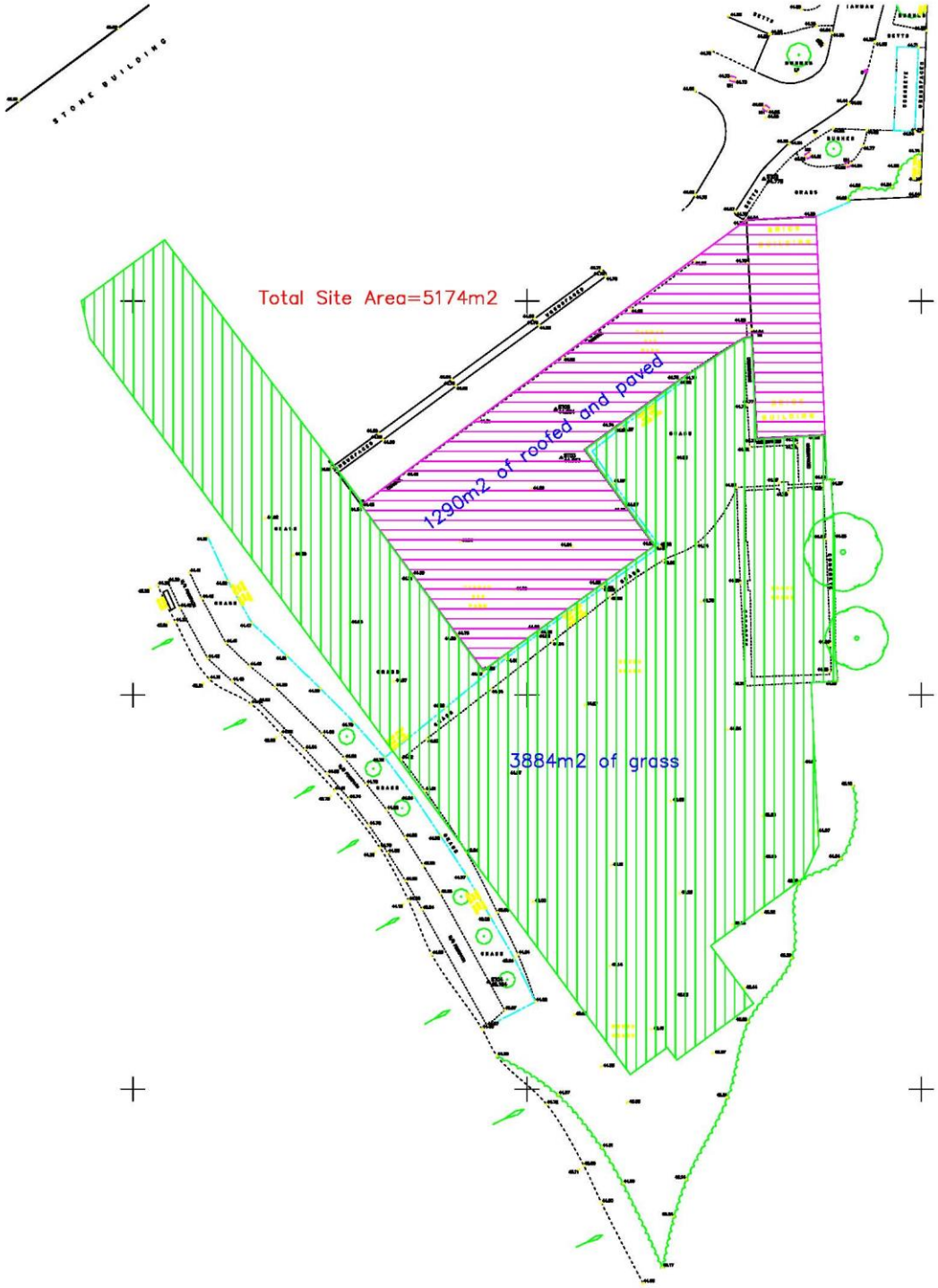
Modified Rational Method

Length (m)	68	m
Area (ha)	0.129	Ha
Max Height	44.8	mAOD
Min Height	44.5	mAOD
DeltaH	0.4	
Slope (%)	0.54	
Te (mins)	15.41	mins
ARF	0.999	
SAAR	803.000	mm
UCWI	80	mm
PIMP	100.0	%
SOIL	0.45	
Percentage Runoff PR	79.69	
DEEPSTOR	0.95	

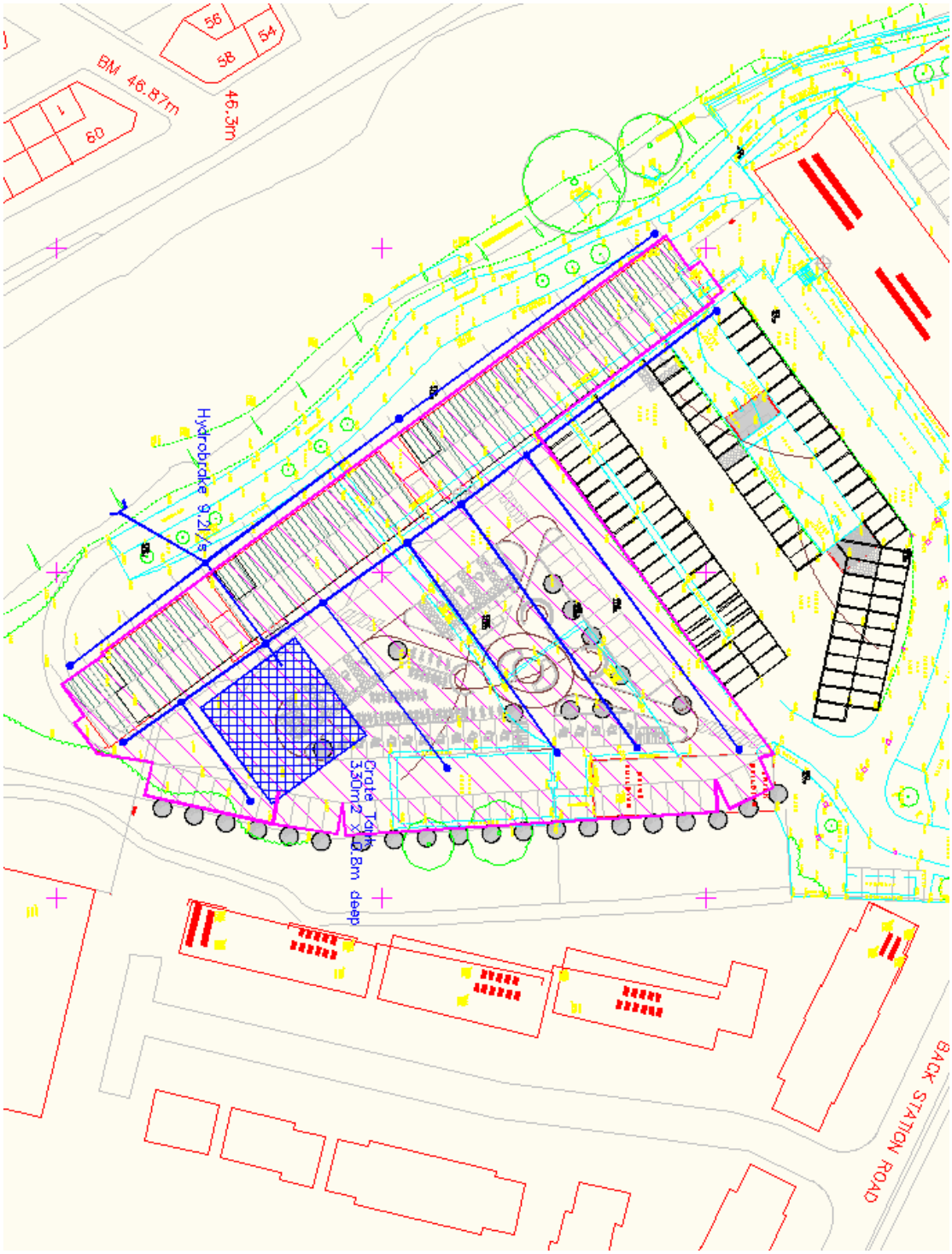
Cv	0.7969	
Cr	1.3	
allowable outflow		
100 year	49.04	l/s

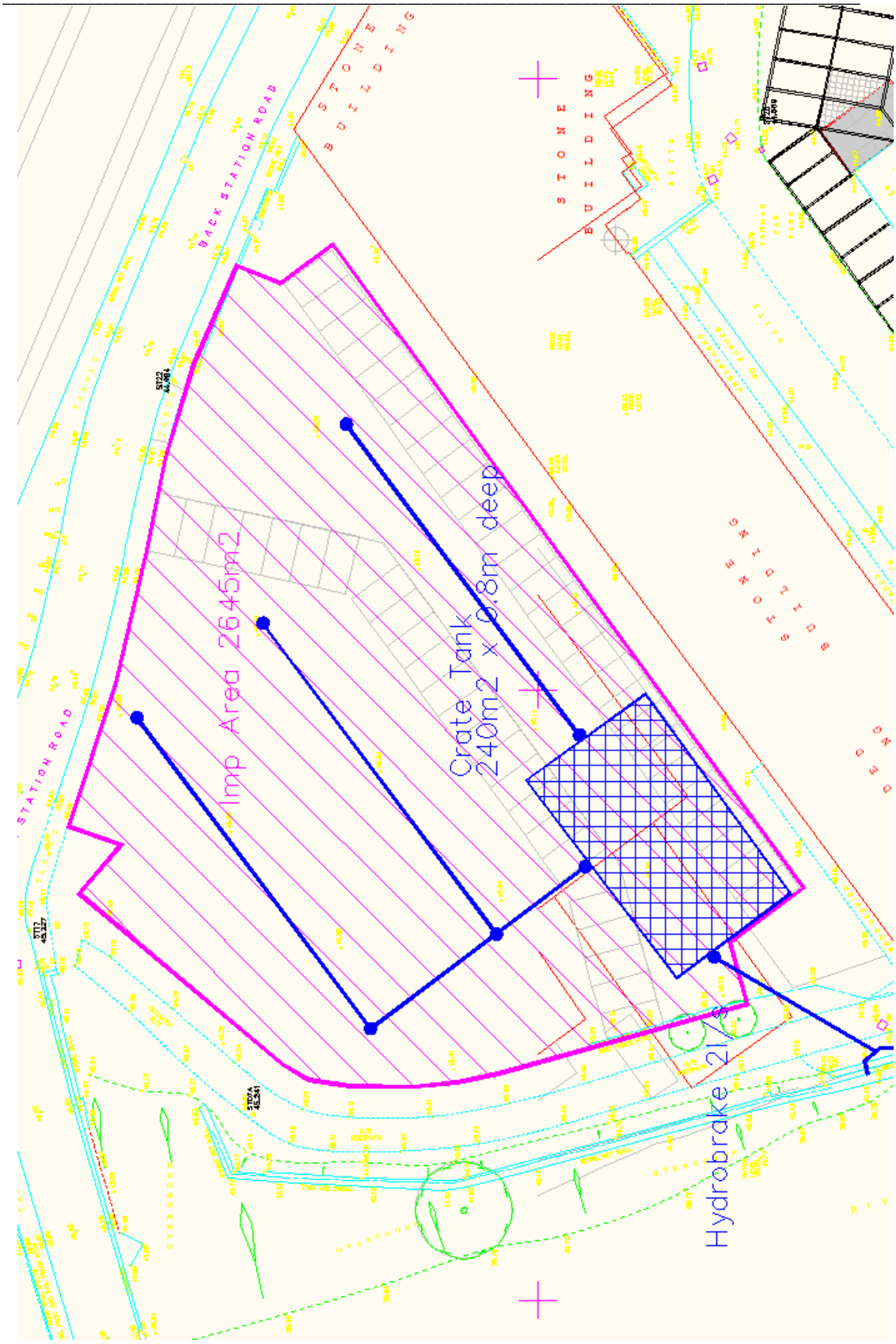
Return Period flood 100 years
Post Development Rainfall 140 years

Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	Effective Depth (mm)	Rainfall Intensity (mm/hr)	FLOW (l/s)	FLOW (l/s/ha)
0.25	0.010	33	39.1	132.0	49.0	380.2
0.3	0.013	34.5	35.7	115.0	42.7	331.2
0.5	0.021	44.94	46.6	89.9	33.4	258.9
0.75	0.031	49.58	51.4	66.1	24.6	190.4
1	0.042	53.14	55.1	53.1	19.7	153.0
1.25	0.052	56.06	58.1	44.8	16.7	129.2
1.5	0.063	58.55	60.7	39.0	14.5	112.4
1.75	0.073	60.74	62.9	34.7	12.9	100.0
2	0.083	62.7	65.0	31.4	11.6	90.3
2.25	0.094	64.48	66.8	28.7	10.6	82.5
2.5	0.104	66.11	68.5	26.4	9.8	76.2
2.75	0.115	67.62	70.1	24.6	9.1	70.8
3	0.125	69.02	71.5	23.0	8.5	66.3
3.25	0.135	70.34	72.9	21.6	8.0	62.3
3.5	0.146	71.58	74.2	20.5	7.6	58.9
3.75	0.156	72.75	75.4	19.4	7.2	55.9
4	0.167	73.87	76.5	18.5	6.9	53.2
4.25	0.177	74.93	77.6	17.6	6.6	50.8


STONE BUILDING
Total Site Area=5174m2
1290m2 of roofed and paved
3884m2 of grass

Appendix F: - Proposed Drainage Strategy




Imp Area 2645m2
Crate Tank
240m2 x 0.8m deep
Hydrobrake 21/s
STATION ROAD
BACK STATION ROAD
STONE BUILDING
STONE BUILDING

Appendix G: - WINDES Storage Calculation

EWE Associates Ltd		Page 1
Windy Ridge Barn Thealby Lane Winterton DN15 9TG		Micro Drainage
Date 21/02/2018 15:27 File 100yr+CC40% crate...	Designed By Lea Checked By	
Micro Drainage	Source Control W.12.4	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	43.477	0.477	6.2	157.3	O K
30 min Summer	43.560	0.560	6.2	184.7	O K
60 min Summer	43.648	0.648	6.2	213.8	O K
120 min Summer	43.730	0.730	6.5	240.9	O K
180 min Summer	43.767	0.767	6.7	253.0	O K
240 min Summer	43.783	0.783	6.8	258.3	O K
360 min Summer	43.789	0.789	6.8	260.4	O K
480 min Summer	43.788	0.788	6.8	259.9	O K
600 min Summer	43.782	0.782	6.8	257.9	O K
720 min Summer	43.773	0.773	6.7	255.0	O K
960 min Summer	43.762	0.762	6.7	251.6	O K
1440 min Summer	43.727	0.727	6.5	239.9	O K
2160 min Summer	43.664	0.664	6.2	219.3	O K
2880 min Summer	43.602	0.602	6.2	198.7	O K
4320 min Summer	43.440	0.440	6.2	145.1	O K
5760 min Summer	43.273	0.273	6.2	90.0	O K
7200 min Summer	43.192	0.192	6.1	63.3	O K
8640 min Summer	43.163	0.163	5.6	53.7	O K
10080 min Summer	43.146	0.146	5.1	48.2	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	167.683	26
30 min Summer	99.663	40
60 min Summer	59.235	68
120 min Summer	35.207	126
180 min Summer	25.969	184
240 min Summer	20.925	242
360 min Summer	15.435	312
480 min Summer	12.437	374
600 min Summer	10.519	438
720 min Summer	9.174	506
960 min Summer	7.497	646
1440 min Summer	5.641	924
2160 min Summer	4.244	1336
2880 min Summer	3.468	1736
4320 min Summer	2.489	2516
5760 min Summer	1.967	3176
7200 min Summer	1.638	3752
8640 min Summer	1.411	4416
10080 min Summer	1.244	5144

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Windy Ridge Barn Thealby Lane Winterton DN15 9TG		Micro Drainage
Date 21/02/2018 15:27 File 100yr+CC40% crate...	Designed By Lea Checked By	
Micro Drainage	Source Control W.12.4	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	43.535	0.535	6.2	176.6	O K
30 min Winter	43.629	0.629	6.2	207.5	O K
60 min Winter	43.729	0.729	6.5	240.6	O K
120 min Winter	43.827	0.827	6.9	272.3	O K
180 min Winter	43.891	0.891	7.2	287.3	O K
240 min Winter	43.943	0.943	7.4	294.4	O K
360 min Winter	44.059	1.059	7.9	297.0	O K
480 min Winter	43.957	0.957	7.5	295.5	O K
600 min Winter	43.929	0.929	7.4	292.8	O K
720 min Winter	43.898	0.898	7.2	288.5	O K
960 min Winter	43.864	0.864	7.1	281.9	O K
1440 min Winter	43.793	0.793	6.8	261.7	O K
2160 min Winter	43.691	0.691	6.4	227.9	O K
2880 min Winter	43.592	0.592	6.2	195.4	O K
4320 min Winter	43.314	0.314	6.2	103.6	O K
5760 min Winter	43.170	0.170	5.8	56.3	O K
7200 min Winter	43.142	0.142	4.9	47.0	O K
8640 min Winter	43.127	0.127	4.3	41.9	O K
10080 min Winter	43.116	0.116	3.8	38.4	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Winter	167.683	26
30 min Winter	99.663	40
60 min Winter	59.235	68
120 min Winter	35.207	124
180 min Winter	25.969	180
240 min Winter	20.925	236
360 min Winter	15.435	338
480 min Winter	12.437	386
600 min Winter	10.519	464
720 min Winter	9.174	542
960 min Winter	7.497	698
1440 min Winter	5.641	998
2160 min Winter	4.244	1432
2880 min Winter	3.468	1852
4320 min Winter	2.489	2640
5760 min Winter	1.967	3056
7200 min Winter	1.638	3744
8640 min Winter	1.411	4416
10080 min Winter	1.244	5144

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EWE Associates Ltd		Page 3
Windy Ridge Barn Thealby Lane Winterton DN15 9TG		
Date 21/02/2018 15:27 File 100yr+CC40% crate...	Designed By Lea Checked By	
Micro Drainage	Source Control W.12.4	

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	419950 419400 SE 19950 19400
C (1km)	-0.026
D1 (1km)	0.369
D2 (1km)	0.418
D3 (1km)	0.301
E (1km)	0.305
F (1km)	2.342
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time / Area Diagram

Total Area (ha) 0.518

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.173	4-8	0.173	8-12	0.173

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EWE Associates Ltd		Page 4
Windy Ridge Barn Thealby Lane Winterton DN15 9TG		Micro Drainage
Date 21/02/2018 15:27 File 100yr+CC40% crate...	Designed By Lea Checked By	
Micro Drainage	Source Control W.12.4	

Model Details

Storage is Online Cover Level (m) 44.500

Tank or Pond Structure

Invert Level (m) 43.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	330.0	1.400	0.0	2.800	0.0	4.200	0.0
0.200	330.0	1.600	0.0	3.000	0.0	4.400	0.0
0.400	330.0	1.800	0.0	3.200	0.0	4.600	0.0
0.600	330.0	2.000	0.0	3.400	0.0	4.800	0.0
0.800	330.0	2.200	0.0	3.600	0.0	5.000	0.0
1.000	0.0	2.400	0.0	3.800	0.0		
1.200	0.0	2.600	0.0	4.000	0.0		

Hydro-Brake® Outflow Control

Design Head (m) 1.500 Hydro-Brake® Type Md4 Invert Level (m) 43.000
Design Flow (l/s) 9.2 Diameter (mm) 99

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.0	1.200	8.3	3.000	13.1	7.000	20.1
0.200	6.1	1.400	9.0	3.500	14.2	7.500	20.8
0.300	5.3	1.600	9.6	4.000	15.2	8.000	21.5
0.400	5.1	1.800	10.2	4.500	16.1	8.500	22.1
0.500	5.4	2.000	10.7	5.000	17.0	9.000	22.8
0.600	5.9	2.200	11.3	5.500	17.8	9.500	23.4
0.800	6.8	2.400	11.8	6.000	18.6		
1.000	7.6	2.600	12.2	6.500	19.3		

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Windy Ridge Barn Thealby Lane Winterton DN15 9TG		Micro Drainage
Date 22/11/2023 10:28 File 100yr+CC40% crate...	Designed By Lea Checked By	
Micro Drainage	Source Control W.12.4	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	43.344	0.344	1.0	82.6	O K
30 min Summer	43.407	0.407	1.1	97.7	O K
60 min Summer	43.479	0.479	1.1	114.9	O K
120 min Summer	43.558	0.558	1.2	133.9	O K
180 min Summer	43.606	0.606	1.3	145.4	O K
240 min Summer	43.639	0.639	1.3	153.5	O K
360 min Summer	43.683	0.683	1.4	164.0	O K
480 min Summer	43.710	0.710	1.4	170.4	O K
600 min Summer	43.727	0.727	1.4	174.4	O K
720 min Summer	43.736	0.736	1.4	176.7	O K
960 min Summer	43.755	0.755	1.4	181.2	O K
1440 min Summer	43.775	0.775	1.5	186.0	O K
2160 min Summer	43.784	0.784	1.5	188.1	O K
2880 min Summer	43.780	0.780	1.5	187.1	O K
4320 min Summer	43.713	0.713	1.4	171.1	O K
5760 min Summer	43.655	0.655	1.3	157.2	O K
7200 min Summer	43.604	0.604	1.3	144.9	O K
8640 min Summer	43.557	0.557	1.2	133.8	O K
10080 min Summer	43.515	0.515	1.2	123.7	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	167.683	19
30 min Summer	99.663	34
60 min Summer	59.235	64
120 min Summer	35.207	124
180 min Summer	25.969	182
240 min Summer	20.925	242
360 min Summer	15.435	362
480 min Summer	12.437	482
600 min Summer	10.519	600
720 min Summer	9.174	720
960 min Summer	7.497	914
1440 min Summer	5.641	1140
2160 min Summer	4.244	1536
2880 min Summer	3.468	1960
4320 min Summer	2.489	2768
5760 min Summer	1.967	3624
7200 min Summer	1.638	4400
8640 min Summer	1.411	5192
10080 min Summer	1.244	5960

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Windy Ridge Barn Thealby Lane Winterton DN15 9TG		Micro Drainage
Date 22/11/2023 10:28 File 100yr+CC40% crate...	Designed By Lea Checked By	
Micro Drainage	Source Control W.12.4	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	43.386	0.386	1.0	92.6	O K
30 min Winter	43.456	0.456	1.1	109.5	O K
60 min Winter	43.537	0.537	1.2	128.8	O K
120 min Winter	43.627	0.627	1.3	150.5	O K
180 min Winter	43.682	0.682	1.4	163.7	O K
240 min Winter	43.721	0.721	1.4	173.0	O K
360 min Winter	43.773	0.773	1.4	185.5	O K
480 min Winter	43.806	0.806	1.5	193.3	O K
600 min Winter	43.829	0.829	1.5	198.5	O K
720 min Winter	43.846	0.846	1.5	201.8	O K
960 min Winter	43.887	0.887	1.6	208.3	O K
1440 min Winter	43.925	0.925	1.6	212.6	O K
2160 min Winter	43.953	0.953	1.6	214.7	O K
2880 min Winter	43.922	0.922	1.6	212.4	O K
4320 min Winter	43.793	0.793	1.5	190.2	O K
5760 min Winter	43.709	0.709	1.4	170.2	O K
7200 min Winter	43.636	0.636	1.3	152.6	O K
8640 min Winter	43.571	0.571	1.2	137.1	O K
10080 min Winter	43.514	0.514	1.2	123.4	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Winter	167.683	19
30 min Winter	99.663	33
60 min Winter	59.235	64
120 min Winter	35.207	122
180 min Winter	25.969	180
240 min Winter	20.925	238
360 min Winter	15.435	356
480 min Winter	12.437	470
600 min Winter	10.519	584
720 min Winter	9.174	698
960 min Winter	7.497	914
1440 min Winter	5.641	1184
2160 min Winter	4.244	1624
2880 min Winter	3.468	2104
4320 min Winter	2.489	2988
5760 min Winter	1.967	3864
7200 min Winter	1.638	4688
8640 min Winter	1.411	5536
10080 min Winter	1.244	6352

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Windy Ridge Barn Thealby Lane Winterton DN15 9TG		
Date 22/11/2023 10:28 File 100yr+CC40% crate...	Designed By Lea Checked By	
Micro Drainage	Source Control W.12.4	

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	419950 419400 SE 19950 19400
C (1km)	-0.026
D1 (1km)	0.369
D2 (1km)	0.418
D3 (1km)	0.301
E (1km)	0.305
F (1km)	2.342
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time / Area Diagram

Total Area (ha) 0.265

Time (mins)	Area (ha)
0-4	0.265

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Windy Ridge Barn Thealby Lane Winterton DN15 9TG		Micro Drainage
Date 22/11/2023 10:28 File 100yr+CC40% crate...	Designed By Lea Checked By	
Micro Drainage	Source Control W.12.4	

Model Details

Storage is Online Cover Level (m) 44.500

Tank or Pond Structure

Invert Level (m) 43.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	240.0	1.400	0.0	2.800	0.0	4.200	0.0
0.200	240.0	1.600	0.0	3.000	0.0	4.400	0.0
0.400	240.0	1.800	0.0	3.200	0.0	4.600	0.0
0.600	240.0	2.000	0.0	3.400	0.0	4.800	0.0
0.800	240.0	2.200	0.0	3.600	0.0	5.000	0.0
1.000	0.0	2.400	0.0	3.800	0.0		
1.200	0.0	2.600	0.0	4.000	0.0		

Hydro-Brake® Outflow Control

Design Head (m) 1.500 Hydro-Brake® Type Md4 Invert Level (m) 43.000
Design Flow (l/s) 2.0 Diameter (mm) 46

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.9	1.200	1.8	3.000	2.9	7.000	4.4
0.200	0.8	1.400	2.0	3.500	3.1	7.500	4.6
0.300	0.9	1.600	2.1	4.000	3.3	8.000	4.7
0.400	1.1	1.800	2.2	4.500	3.5	8.500	4.9
0.500	1.2	2.000	2.4	5.000	3.7	9.000	5.0
0.600	1.3	2.200	2.5	5.500	3.9	9.500	5.1
0.800	1.5	2.400	2.6	6.000	4.1		
1.000	1.7	2.600	2.7	6.500	4.3		

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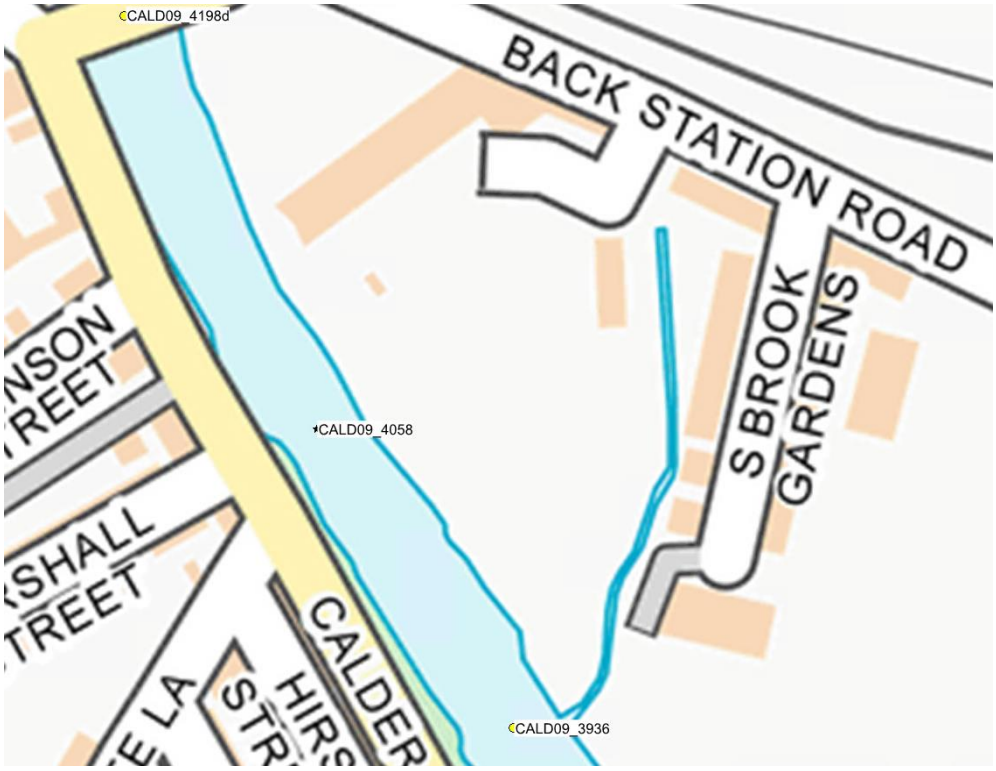
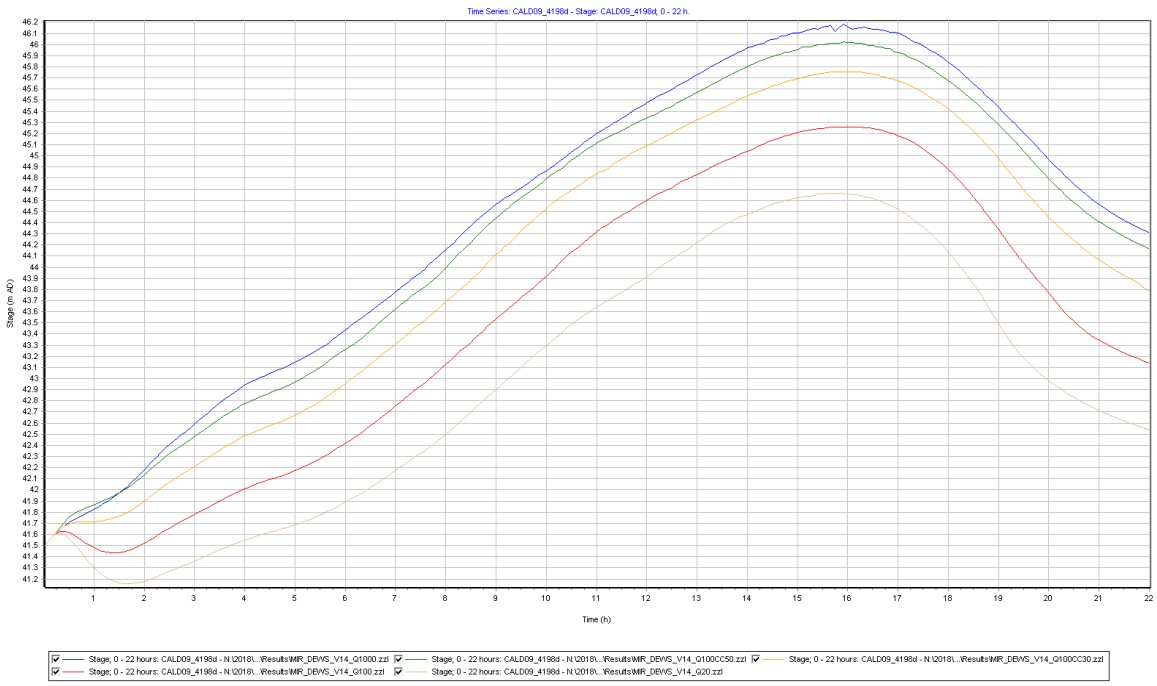
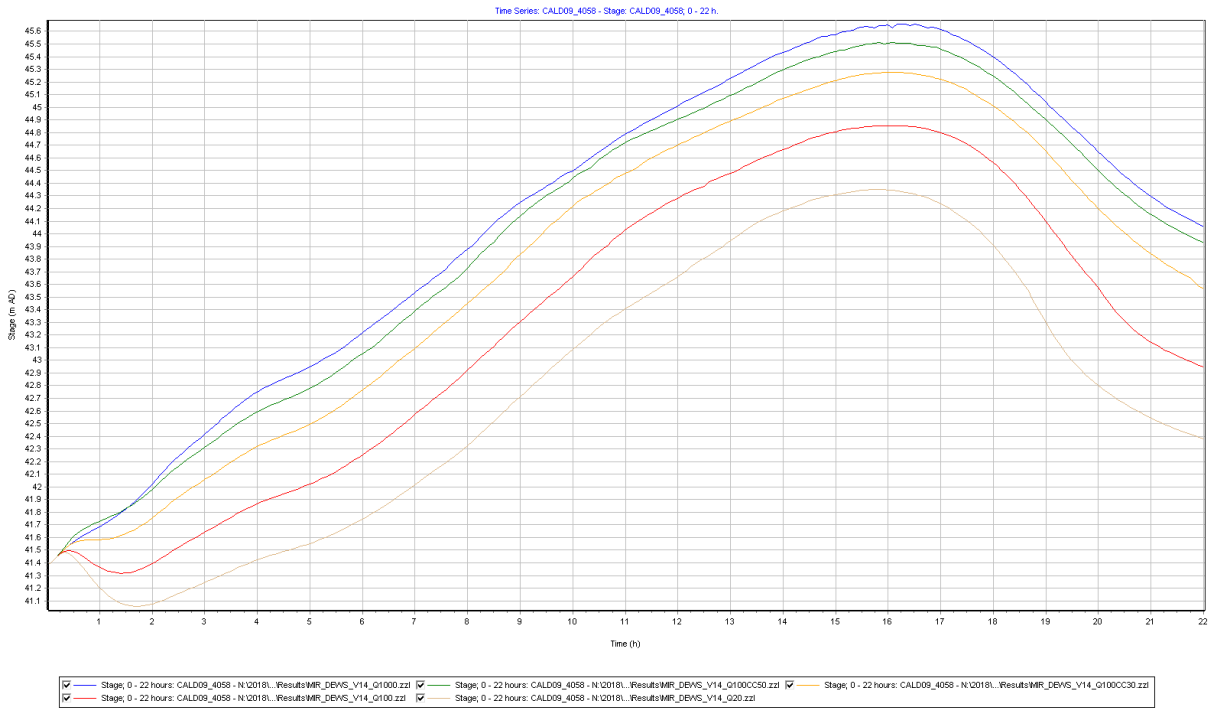
Appendix H: - JBA Baseline Model Results



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Time (h)
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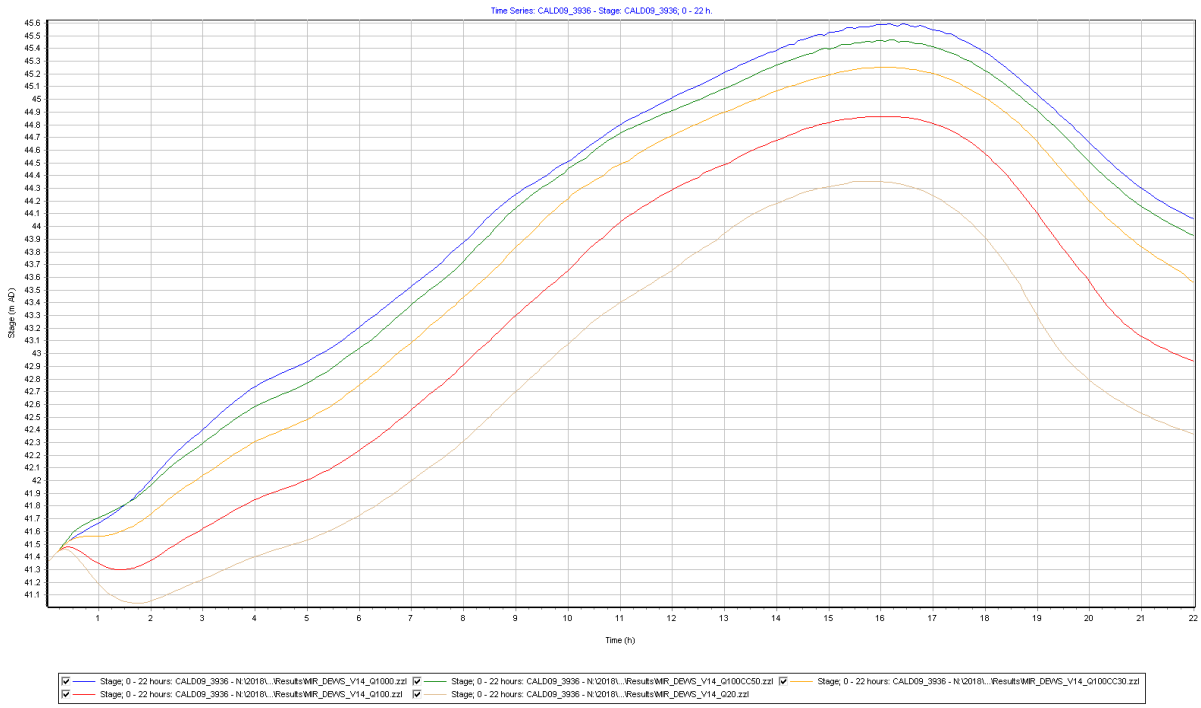
Stage; 0 - 22 hours: CALD09_4058 - N:\2018\...\Results\MR_DEWS_V14_Q100.zzl
Stage; 0 - 22 hours: CALD09_4058 - N:\2018\...\Results\MR_DEWS_V14_Q20.zzl


Time Series: CALD09_3936 - Stage: CALD09_3936; 0 - 22 h.
Stage (m AD)
Time (h)
Stage; 0 - 22 hours: CALD09_3936 - N:\2018\...\Results\MIR_DEWS_V14_Q1000.zzl
Stage; 0 - 22 hours: CALD09_3936 - N:\2018\...\Results\MIR_DEWS_V14_Q100CC50.zzl
Stage; 0 - 22 hours: CALD09_3936 - N:\2018\...\Results\MIR_DEWS_V14_Q100CC30.zzl
Stage; 0 - 22 hours: CALD09_3936 - N:\2018\...\Results\MIR_DEWS_V14_Q100.zzl
Stage; 0 - 22 hours: CALD09_3936 - N:\2018\...\Results\MIR_DEWS_V14_Q20.zzl

Appendix I: - JBA Flood Compensation Model Report

TECHNICAL NOTE

JBA Project Code	2018s0597
Contract	Hydraulic Model for Ledgards Mill, Mirfield
Client	C.B.Collier Limited
Day, Date and Time	July 2018
Author	Ella Albrighton
Subject	Hydraulic Modelling at Ledgards Mill, Mirfield

1 INTRODUCTION

1.1 Terms of Reference

JBA was commissioned by C.B. Collier Limited to undertake a hydraulic modelling study at Ledgards Mill, Mirfield, West Yorkshire (WF14 8NZ). This technical note provides details the modelling approach, the hydraulic modelling results and any recommendations.

1.2 Context

To accurately represent flood risk in relation to the site at Ledgards Mill, the existing 1D-2D model of the **River Calder)** was obtained from the Environment Agency (EA). The 1D-2D model was upgraded to enhance the representation of the floodplain and the river channel in the vicinity of the site and re-run for a range of fluvial flood scenarios.

1.3 Approach

To simulate fluvial flood levels at Ledgards Mill, the 1D-2D hydraulic model has been upgraded as follows:

- Inclusion of an ascii grid generated from topographic survey information collected by Ellam Land Surveys in September 2010 (to enhance the representation of the development site's ground levels in the model);
- New channel survey in the areas surrounding the site was carried out by Grantham Coates Surveys Ltd in June 2018 (to enhance the representation of the river channel in the vicinity of the site).

The upgraded baseline model was then run using Flood Modeller v4.3.0.290 and TUFLOW 2018-03-AA-iDP-w64 for the following scenarios:

- 1 in 25-year (4% Annual Exceedance Probability or AEP) fluvial flood event;
- 1 in 100-year (1% AEP) fluvial flood event;
- 1 in 100-year (1% AEP) + 30% climate change fluvial flood event;
- 1 in 100-year (1% AEP) + 50% climate change fluvial flood event, and;
- 1 in 1,000-year (1% AEP) fluvial flood event.

The baseline model was then amended to represent the post-development conditions of the site, i.e. three building blocks built above a void / on stilts. The footprints of the new building blocks were modelled by increasing their Manning's 'n' value by 30% increase. Between the building blocks, the floodable stairways (which lowest parts will be designed to flood) were modelled as a 20% increase in Manning's 'n' value.

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2 MODEL RESULTS

2.1 Baseline flood outlines

The baseline flood outlines for the 25-year, 100-year and 1,000-year fluvial flood events are represented in Figure 2-1.

Figure 2-1: 25-year, 100-year and 1,000-year flood extents – baseline scenario

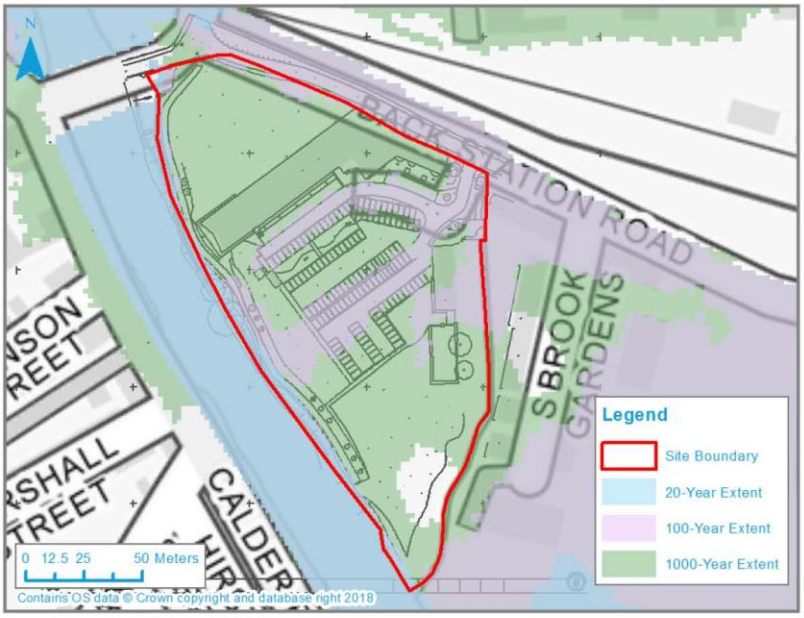

Figure 2-1 shows the western boundary of the site is within the extent of the 20-year floodplain, however the proposed development is outside of this area. The site also floods during the 100-year and 1,000-year floodplain.

The effect of the proposal was modelled during the design flood event, i.e. the 100-year with (+30%) Climate Change fluvial flood event (see Figure 2-2) and the impact on flood depths generated by the development was quantified (see Figure 2-3).

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Figure 2-2: 100-year with (+30%) Climate Change flood depths – post-development scenario

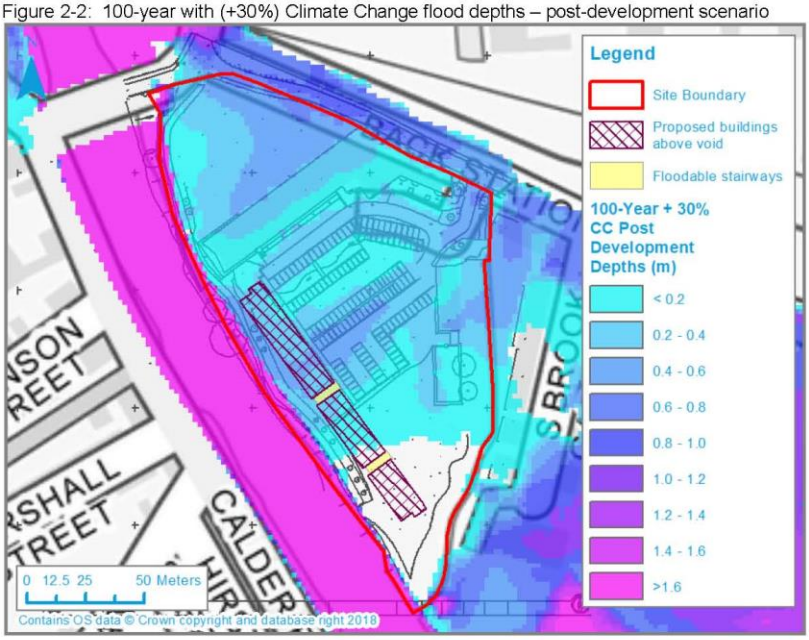

Figure 2-2 indicates that:

- Flood depths of up to 0.6m may occur along the northern building block.
- The southern building block is outside of the 100-year with (30%) climate change flood extent. Given its small impact on floodplain capacities, it is considered that this building block do not need to be raised on a void.

During the 100-year with (30%) climate change event the site floods via Back Station Road and flows through the site before joining with flooding along the bank of the River Calder. Animation 2-3 represents the overland flow route during the 100-year with (30%) climate change flood event.

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Animation 2-3: 100-year with (35%) climate change overland flow routes

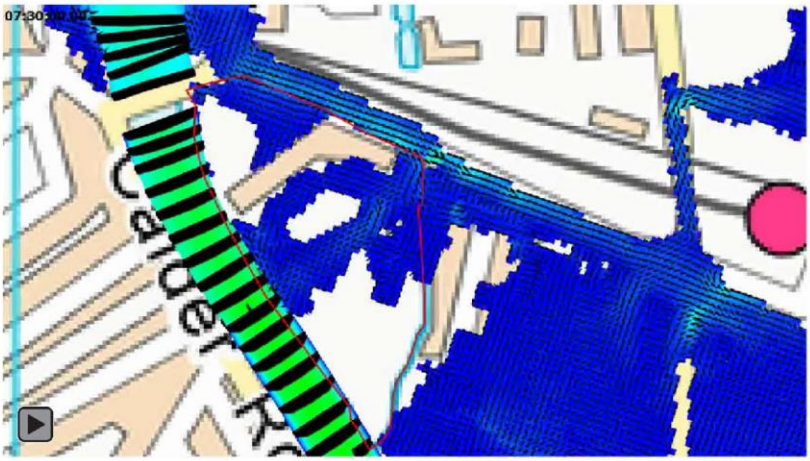

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Figure 2-4: Impact of proposal on 100-year with (+30%) Climate Change flood depths

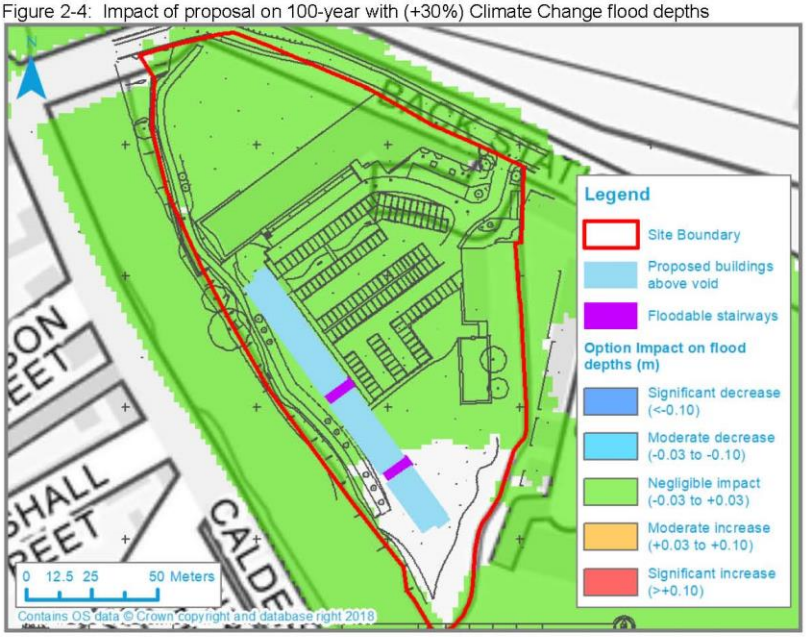

Figure 2-4 shows the proposal will generate a negligible impact on flood depths within the development site boundary and across third-party land.

Figure 2-5 overleaf shows the 100-year with (30%) climate change flood levels along the proposed building blocks.

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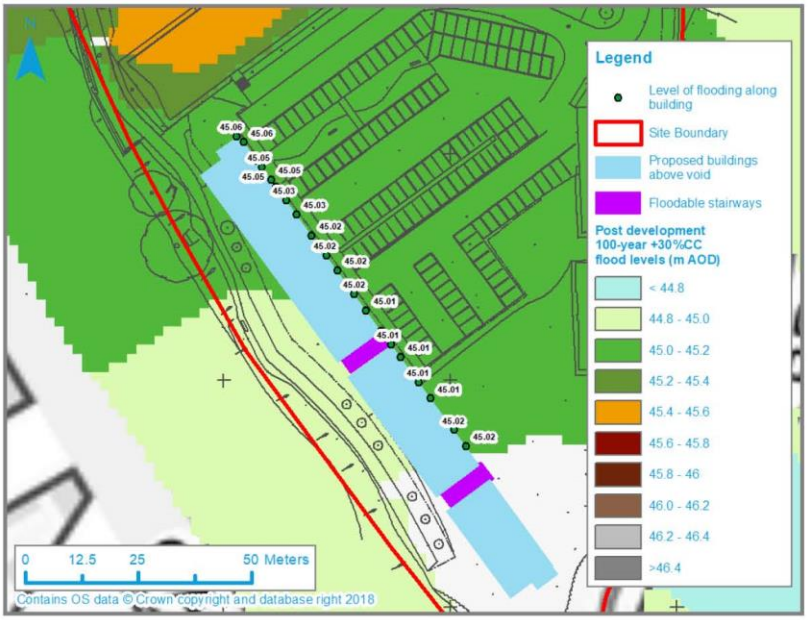
Figure 2-5: Post development flood levels along proposed buildings



It is recommended that the voids are designed with a soffit level set at least 300mm above the 100-year with (30%) climate change flood levels represented in Figure 2-5, i.e. between 45.32 (south) and 45.36m AOD (north).

TECHNICAL NOTE

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Subject	Hydraulic Modelling at Ledgards Mill, Mirfield

3 CONCLUSION

The model results show that:

- The proposed building blocks fall within the River Calder's 100-year, 100-year with (+30%) climate change and 1,000-year floodplain.
- To minimise their impact on flood depths, the proposed buildings will be built on a void/on stilts. The soffit of the void should be set to a minimum elevation of between 45.32 (to the south) and 45.36m AOD (to the north), i.e. 300mm above the 100-year with (30%) climate change water levels.
- The southern building block falls outside of the River Calder's 100-year with (+30%) climate change floodplain. As this building block will have not impact on flood depths during the most frequent flood events (i.e. flood events lower than 100-year with (+30%) climate change), this block does not need to be built on a void / raised on stilts.

Appendix J: - EA Correspondence

Environment Agency

Mr Lea Favill
EWE Associates Ltd
7 Waveney Close
Burton-upon-Stather
Scunthorpe
DN15 9DT

Our ref: RA/2018/138287/03-L02
Your ref: N/A

Date: 02 September 2021

Dear Mr Favill

LEDGARD BRIDGE MIRFIELD RESIDENTIAL DEVELOPMENT FRA - PRE APPLICATION COMMENTS - FOLLOW ON REQUEST. LEDGARD BRIDGE, MIRFIELD.

We refer to your email, dated 27 May 2021, regarding your wish to remove the flood storage area from our Flood Map for Planning at the above location. On this matter, we can advise as follows:

FSA Designation

We are unable to agree to remove the flood storage area from our maps at this time, although we are unable to determine the reason behind the designation of this area of land as a flood storage area, due to the length of time that has passed since its designation (which we believe might be possibly sometime around the 1980s). We can, however, confirm that this area does not contain any Environment Agency assets, nor is it storage area within which we manage water levels.

We are aware that there are some historic records of flooding on the site, although the source of the flooding is unknown. These should be investigated and considered within any flood risk assessment (FRA).

Should a planning application be forthcoming on this site, you would need to address the following issues, before we could consider supporting it:

Strategic Flood Risk Assessment

The flood storage area on the Flood Map for Planning is not shown within Kirklees Council's Strategic Flood Risk Assessment. However, the site is still shown to be within Flood Zones 2 and 3a, with a small strip also within Flood Zone 3ai (developed land within Flood Zone 3b). Policy LP27 of Kirklees Council's adopted Local Plan states that new more vulnerable uses will not be permitted within Flood Zone 3ai, so care should be taken to avoid development within this area. The same policy also makes clear that, within Flood Zone 3ai, 'development will not be permitted on any part of the site identified through a site specific flood risk assessment as performing a functional floodplain role'. The developer will be responsible for demonstrating this.

Environment Agency
Kings Pool Peasholme Green, York, North Yorkshire, YO1 7PX.
Customer services line: 03708 506 506
www.gov.uk/environment-agency

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Sequential Test

As this site has not been allocated within the Local Plan, it has not yet been subject to the Sequential Test. In accordance with the National Planning Policy Framework (NPPF; paragraph 158), development should not be permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding.

It is for the local planning authority to determine if the Sequential Test has to be applied and whether or not there are other sites available at lower flood risk. In this case, the modelling undertaken confirms that this site is at risk in the 1% and 0.1% annual probability events, so it is likely that there are other sites that may be preferential to this one. We therefore recommend that you contact the planning department at Kirklees Council to progress discussions on this as early as possible. Our understanding is that the proposals are for a residential use, so only once the Sequential and Exception Tests have been passed should consideration be given to technical assessments, such as a FRA.

Flood Risk Mitigation

As with any site at risk of flooding, flood risk mitigation measures, such as raised floor levels, must be incorporated into the proposals to ensure the development and any occupants are kept safe. This mitigation must be sufficient to protect the development over its lifetime.

The Planning Practice Guidance (Paragraph: 029 Reference ID: 7-029-20140306) is clear that the broad approach of assessing, avoiding, managing and mitigating flood risk should be followed. A sequential approach should first be applied to the layout of the site, to locate all more vulnerable aspects of the development in the lower risk areas within the site. The assessment of risk should then be used to inform the design of the development, rather than considered as an afterthought.

Compensatory Flood Storage

As the site is located within Flood Zones 2 and 3, compensatory flood storage must be provided for any floodplain volume lost as a result of development. This is supported by paragraph 163 of the NPPF, which states that 'when determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere'. Consideration should also be given to flow routes, to ensure that there is no impact on others as a result of them being blocked or diverted.

Detailed Model Review

We acknowledge that a detailed model was submitted to us in April 2019 which we reviewed and concluded in October 2019 that it was considered appropriate for its intended purpose to support an application for development on the site, having taken into account climate change allowances and shows the development can be located outside the 20 year flood outline.

We trust this advice is useful. We'd be happy to review any draft assessment prior to formal submission of any planning application, under our planning advice service. Please advise us if you wish us to do so.

Cont/d.. 2

Yours sincerely

Mrs Bev Lambert
Sustainable Places - Planning Advisor

Direct dial 020 302 57982
Direct e-mail bev.lambert@environment-agency.gov.uk

Team phone 020 302 56862
Team e-mail sp-yorkshire@environment-agency.gov.uk

End 3

From: Yorks P&SO D&E RFI <yorks.pso.dande.RFI@environment-agency.gov.uk>
Sent: 18 January 2021 11:42
To: lea.favill@eweassociates.com
Subject: RE: Evidential Review GE12128

Dear Lea,

Apologies for the delay in responding to your enquiry. This query has resulted in requiring input from a variety of teams as Flood Storage Areas are not something our team typically deal with and they are currently under review for the Yorkshire area.

We define Flood Storage Areas as: Engineered or controlled flood storage areas that act as a balancing reservoir, storage basin or balancing pond. Their purpose is to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel. It may also delay the timing of a flood peak so that its volume is discharged over a longer time interval. They are not defined by a AEP Flood event, unlike the Flood Zone 3B, Functional Flood Plain areas which mostly are and are managed by the Local Lead Flood Authority.

As our assets team have confirmed that this area is not a 'controlled' flood storage area, we have asked if it can be removed from the Flood Map for Planning – I'm awaiting their response.

In the meantime, I have also spoken to our Sustainable Places team that comment on planning applications and they have advised the following- we can provide a free preliminary basic response if you can supply a narrative and location plan of the proposed works.

For more detailed advice / meetings / reviews we can provide a project manager to coordinate specialist advice / organise meetings which costs £100 per hour per officer, plus VAT. For a free preliminary opinion complete our Pre-planning application enquiry form available at https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion, and email it with details of what advice you are looking for and a location plan to sp-yorkshire@environment-agency.gov.uk. The terms and conditions of our service can be found at https://www.gov.uk/government/publications/planning-and-marine-licence-advice-standard-terms-for-our-charges/planning-and-marine-licence-advice-standard-terms-for-our-charges

Again, apologies for the delay with this query. I will contact you as soon as we hear from the assets team regarding their decision. In the interim, if you would like to contact the SP team regarding the proposed planning application, they should be able to provide you with information on what requirements are likely

to be required for the planning application, with the sites location in Flood Zone 3 and its current location within a Flood Storage Area.

Kind regards

Katie

Katie Chalk
FCRM Officer
Environment Agency | Lateral, 8 City Walk, Leeds, LS11 9AT

From: Yorks P&SO D&E RFI <yorks.pso.dande.RFI@environment-agency.gov.uk>
Sent: 21 May 2021 16:58
To: lea.favill@eweassociates.com
Cc: hdavies@branchwater-developments.com; Nick Willock <nick@roberthalstead.co.uk>
Subject: RE: Evidential Review GE12128

Dear Lea,

Thank you for your email and associated letter.

After reviewing the letter, I'm concerned that there may be some misinterpretation with the flood zones on your site, particularly between Flood Storage and 3b. I've set out what flood zones cover your site below and as previously advised on the 18th January we would recommend you contacting our sustainable places team for some pre-app advice to determine firstly what barrier to planning this layer has and if the planning application should be stalled while you wait for an outcome on the Flood Storage Layer designation. Unfortunately I am unable to provide this advice.

The flood maps for planning show the site to be located within Flood Zone 2, Flood Zone 3 and a Flood Storage Area.

Flood Zone 2 means - Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000

annual probability of sea flooding. (Land shown in light blue on the Flood Map).
Flood Zone 3 means - Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.(Land shown in dark blue on the Flood Map)

Flood Storage Area means (*Please note this is under review*) - Those areas that act as a balancing reservoir, storage basin or balancing pond. Their purpose is to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel. It may also delay the timing of a flood peak so that its volume is discharged over a longer time interval. **This is different to Flood Zone 3b.**

The classification of Flood Zone 2 and 3 also fits with the findings of JBA's report. It is important to note that the 1 in 20yr Flood extent does not always confirm whether an area lies within a Flood Storage Area.

Flood Zone 3b means - A zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map. This layer is the LPA's responsibility to look after.

In terms of the flood storage area designation, this mapping layer is currently under review both within the region and nationally. We have raised to our national team that this ERR is dependent on the outcome and have asked them to advise. We are hoping for an update from them next week (although we have been warned that a final decision could be some time off) and we apologise at the length of time this is taking to be resolved. We understand the frustration this will be causing and therefore advise engaging with our sustainable places team asap to understand how the application can be progressed in light of the above. I am speaking with the sustainable places lead in this area next week so will discuss with them also what the best route for the overall application will be.

Show flood zones

Kind regards

Katie

From: Lambert, Bev <bev.lambert@environment-agency.gov.uk>
Sent: 23 July 2021 13:58
To: Lea Favill <lea.favill@eweassociates.com>
Cc: Griffiths, Lizzie <lizzie.griffiths@environment-agency.gov.uk>; Helen Davies <hdavies@branchwater-developments.com>
Subject: RE: LEDGARD BRIDGE MIRFIELD, RESIDENTIAL DEVELOPMENT FRA - PRE APPLICATION COMMENTS - RA/2018/138287/01-L01

Morning Lea

I'm sorry this is still dragging on, I'm still trying to confirm a couple of things before I can make a more formal response to your email.

With regards to using the SFRA versus our Flood Map for Planning – I would advise that you use the most up to date information. The SFRA is dated July 2016, and our Calder and Canals Model was published in 2015. It might be that the SFRA used our Calder model as a starting point and expanded on it. I note that the SFRA 3b area is different to the FSA (as we've already established). The 3b area does cover part of the FSA outline but not all of it, and it stops short of the area that you're interested in.

I am aware that your client provided a model which we reviewed and the Model Review Reports (consisting of a Model Audit and a Hydrology Audit) were sent to Olivier Saillofest on 18 July 2019. However, looking at those reports (and mindful that I'm not that familiar with reading them), it appears there were some 'actions recommended' in one and 'actions required' in the other. There is no record in my files to show that a response was made to these – and as a result, I'm not sure whether we did sign it off. I have asked for clarification on this (which I'm still waiting for), but if you have any correspondence from us to say that we did – I'd be grateful if you could send that to me.

I'll keep pushing for an answer to this and reply as soon as I get one.

Kind regards

Bev Lambert
Sustainable Places - Planning Advisor and Assistant Flood Warning Duty Officer

Appendix K: - JBA Voids Tech Note

Appendix L: - EA response

Environment Agency

Nick Hirst
Kirklees Metropolitan Borough Council
Development Management

By email: dc.admin@kirklees.gov.uk

Our ref: RA/2023/146640/04-L01
Your ref: 2023/93539

Date: 12 July 2024

Dear Nick

OUTLINE APPLICATION, INCLUDING THE CONSIDERATIONS OF ACCESS APPEARANCE, LAYOUT, AND SCALE, FOR THE ERECTION OF A SIX-STOREY BUILDING TO HOST 76 RESIDENTIAL APARTMENTS (C3 USE) AND ANCILLARY WORKS COMPRISING DEMOLITION OF VACANT BUILDING, FORMATION OF NEW ACCESS, PARKING AREAS, OPEN SPACE AND LANDSCAPING; ERECTION OF CYCLE AND BIN REFUSE STORAGE STRUCTURES – LAND ADJ, LEDGARD BRIDGE MILL, BACK STATION ROAD, MIRFIELD, WF14 8NZ

We have reviewed:

- Technical Note - JBA Project Code 2024s0643, Ledgard Mill, 27 June 2024 - Building on void - Technical parameters

We have also revisited:

- 2018s0597-A-N001-10_APP 'Hydraulic Modelling at Ledgards Mill, Mirfield' September 2019
- Binks Vertical, Proposed Residential Scheme, Ledgard Bridge, Mirfield – Flood Risk Assessment, Final Report RevE November 2023, Reference: 2017/2153

Based on our review of these documents, our comments are below:

2.1 - Point 1 - Design Flood Level
The design flood level is confirmed as 45.38mAOD (%AEP 30%CC). This is based on the approved 2019 JBA model. It is important that all parts of the planning submission are amended to reflect this consistent design flood level.

2.2 - Point 2 - Proposed Void Solution
The void soffit is given as 45.68mAOD. This is above the design flood level so considered appropriate.

There will be vertical bars – 10mm diameter with 100mm spacing. This stops people getting in but also is bad for debris collection. Because of this, maintenance of the void entrances is critical.

Figure 1 shows a sketch of the proposed void solution. It says that it is recommended that Architectural Drawings on planning portal should be updated to reflect these design parameters. This will need to be done in order for us to be able to recommend

Environment Agency
Kings Pool Peasholme Green, York, North Yorkshire, YO1 7PX.
Customer services line: 03708 506 506
www.gov.uk/environment-agency
Cont/d..

approval.

2.3 – Point 3 – Combined Solid Footprint
The technical note confirms the following:

- Calculated total footprint area of ~254m^2
- Ground level 44.55mAOD
- Design flood 45.38mAOD
- 0.83m flood water depth.

This equates to 210m^3 of lost storage.

2.4 – Point 4 - Impact on flood flows
2018s0597-A-N001-10_APP 'Hydraulic Modelling at Ledgards Mill, Mirfield' September 2019 report summarises approved model outputs. 100% blockage shows 0.035m increase in depth in some gardens to the east of the site, during design event. Given a higher than necessary CC allowance was used, this is considered conservative. In the context of this proposal, this level of increase can be considered negligible.

2.5 – Point 5 - Soffit Level of the Void Space
The soffit levels are appropriate as they are a suitable amount above the design flood level.

2.6 – Point 6 - Impact on Flood Extent
2019 and 2024 model appear to show no significant impact on flood extent in design flood.

The 2019 model showed no significant impact on flood levels and 2024 model shows no significant difference compared to 2019 model. As such we have no concern over impact on flood extent or depth.

2.7 - Point 7 - Blockage Risk Analysis
The 2019 100% blockage model (from 2018s0597-A-N001-10_APP 'Hydraulic Modelling at Ledgards Mill, Mirfield' September 2019) indicates a small increase in depth offsite of 0.035m.

Considering that a conservative CC Allowance has been used the overall impact on offsite properties during baseline and with development is likely to be lower. The impact of 100% blockage indicated by the approved 2019 model is not considered to be unacceptable.

Also, a 50% blockage has been modelled using new methodology. It is reasonable that 50% blockage is more likely than 100%. Because the assessment based on the older model is not unacceptable it isn't considered necessary to review the 2024 model, but the new model gives weight to the view that there are no unacceptable offsite impacts.

2.8 – Point 8 – Inspection and Maintenance Regime
It is positive that an inspection and maintenance regime has been provided. This will need to be reviewed for approval by the Kirklees Council in their roles as the Lead Local Flood Authority, Emergency Planners and Local Planning Authority.

It is important that there is a mechanism to ensure the maintenance continues for as long as the building is in place, even if ownership changes hands. We would require the LPA to confirm that they can secure the maintenance through a suitable legal mechanism before recommending approval.

Cont/d..

Conclusion
Based on our review of this technical note, in conjunction with previous information submitted in support of this application, we are now in a position to consider that the proposals will not pose an unacceptable increase in flood risk and would be able to recommend approval subject to the following:

- This technical note and any documents referred to within it are submitted to the LPA in support of the application.
- The planning application is updated so that all details are consistent with the information provided in the Technical Note (consistent finished floor levels/design details etc.)
- Kirklees Council can confirm that they are satisfied with the proposed maintenance regime.
- The LPA can confirm that they are willing and able to secure the maintenance regime through a suitable legally binding mechanism.

Additional Notes
Binks Vertical, Proposed Residential Scheme, Ledgard Bridge, Mirfield – Flood Risk Assessment, Final Report RevE November 2023, Reference: 2017/2153 contains proposals for emergency evacuation in anticipation of a flood event. We are not able to comment on or approve the adequacy of flood emergency response procedures accompanying development proposals, as we do not carry out these roles during a flood. Our involvement with this development during an emergency will be limited to delivering flood warnings to occupants/users covered by our flood warning network. As such, LPA/Lead Local Flood Authority will need to review your emergency response proposals.

This proposal goes against our standard policy of objecting to proposals that use stilts and voids as a means of compensating for loss of floodplain storage. In principle, a new building with stilts and voids can never completely replicate the flooding characteristics of a site with nothing on it. Our position on this proposal is only possible because of the level of assessment and modelling that has been done to support the proposal and the level of risk the assessment has shown. Our position should not be interpreted as setting a precedent for future proposals using stilt and void solutions for floodplain compensation.

Yours sincerely

Bev Lambert
Sustainable Places - Planning Advisor

Telephone 020 3025 7982
Mobile 07833 234623
Direct e-mail bev.lambert@environment-agency.gov.uk
Team e-mail sp-yorkshire@environment-agency.gov.uk

CC Olivier Saillofest, JBA Consulting

End 3

Appendix M: - Evac Plan