A large teal graphic element on the left side of the page, consisting of a triangle at the top and a trapezoid below it, forming a shape that resembles a stylized letter 'M' or a mountain peak.

Deighton Waste Water Treatment Works

Flood Risk Assessment

April 2024

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Deighton Waste Water Treatment Works

Flood Risk Assessment

April 2024

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Table 0.1: Acronym Table

Word	Acronym
Climate Change	CC
Construction Environmental Management Plan	CEMP
Environment Agency	EA
Flood Emergency Plan	FEP
Flood Risk Assessment	FRA
Lead Local Flood Authority	LLFA
Mott MacDonald Bentley	MMB
National Planning Policy Framework	NPPF
Metres Above Ordnance Datum	mAOD
Motor Control Centre	MCC
Planning Practice Guidance	PPG
Primary Settlement Tanks	PST
Programmable Logic Controller	PLC
Sewage Treatment Works	STW
Strategic Flood Risk Assessment	SFRA
Sustainable Urban Drainage Systems	SuDS
Waste Water Treatment Works	WwTW
Water Framework Directive	WFD
Yorkshire Water	YW

Source: Mott MacDonald 2024.

Executive summary

Mott MacDonald on behalf of Mott MacDonald Bentley (MMB) has been appointed to undertake a Flood Risk Assessment (FRA) to support Yorkshire Water (YW) with a proposed development at Deighton Waste Water Treatment Works (WwTW).

The site

Deighton WwTW is in Huddersfield, West Yorkshire centred on National Grid Reference (NGR: SE171192). The site occupies an area of land approximately 0.2km² between the Huddersfield Broad Canal and the River Colne.

The proposed development

The proposed development involves the replacement and refurbishment of relic infrastructure within the site itself. The proposed development red line boundary also includes the internal access track. This track has no works proposed to it as part of the proposed development. However, it is included under essential utility infrastructure which must be in a flood-risk area for operational reasons, as the water treatment works need to remain operational in times of flood.

This FRA will focus on the construction of a new walk-in kiosk, which will provide power, control and monitoring of the newly installed equipment. This kiosk is the only asset which requires planning permission. Given the nature of the kiosk, it is necessary to be situated within the fluvial Flood Zone 3.

The proposed development is considered to be 'essential infrastructure' and 'water compatible development', therefore the Sequential Test and the Exception Test need to be passed. This FRA demonstrates that both tests have been passed.

Assessment of flood risk

This report has assessed flood risk from all sources, including fluvial, tidal, surface water, groundwater, and artificial sources.

At present, the primary sources of flood risk to the WwTW are fluvial flooding from the River Colne and, to a lesser degree, surface water flooding.

Fluvial hydraulic modelling assessment

Using an existing 1D/2D hydraulic model supplied by the Environment Agency a fluvial hydraulic modelling assessment was undertaken by Mott MacDonald. The NPPF Annex 3: Flood risk vulnerability classification¹ was used to assess the MCC kiosk, both water compatible development and essential infrastructure have been assessed throughout this report. Therefore the 1% AEP fluvial flood events were run with allowances for both the 23% and 31% climate change increases. These climate change allowances were taken from the National Planning Policy's advice for assessing essential infrastructure and water compatible developments. For the 2080s epoch both the 2080s epoch use:

- For the essential infrastructure uses the higher central allowance (31%); and
- Water compatible developments use the central allowance (23%)

¹ National Planning Policy Framework, Annex 3: Flood risk vulnerability classification, Department for Levelling Up, Housing and Communities. (2012) [National Planning Policy Framework - Annex 3: Flood risk vulnerability classification - Guidance - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/262402/NPPF_Annex_3_Flood_risk_vulnerability_classification_-_Guidance_-_GOV.UK_(www.gov.uk).pdf)

The proposed development modelling was compared against baseline results for the equivalent flood events to determine whether there was an impact on flood risk.

Modelling results showed for both the 1% AEP with a CC uplift of 23% and 31% there were very minor increases in flood depths of up to 0.1m immediate to the kiosk. These were not considered to be of concern given that:

- The maximum increase in depth were isolated and all within the WwTW site.
- Covered a very small area, with the maximum area of increase of approximately 25m² (deemed negligible in the context of wider fluvial flood risk within the River Colne catchment).
- The model representation of the kiosk is conservative; and
- No other increases were identified to impact third parties or other sensitivity receptors.

Conclusions of the assessment

The FRA has been successfully undertaken and has assessed the existing and potential impact on flood risk because of the construction of a MCC kiosk. The WwTW site is shown to be at a negligible risk of flooding from tidal, groundwater and artificial sources.

The results of the modelling show that the addition of the kiosk will not cause a significant increase in fluvial flood risk at the WwTW.

This FRA has demonstrated that the proposed development will not increase flood risk elsewhere.

1 Introduction

Mott MacDonald on behalf of Mott MacDonald Bentley (MMB) has been appointed to undertake a Flood Risk Assessment (FRA) for Yorkshire Water (YW) at Deighton Wastewater Treatment Works (WwTW), in Huddersfield, West Yorkshire. YW is undertaking improvement works (referred to in this document as “the proposed development”) at the WwTW (referred to as “the site”) to replace and refurbish infrastructure and to move an electrical kiosk to a new location to facilitate an increase in size.

1.1 Scope of this FRA

This FRA is intended to inform and assess whether the proposed development will impact flood risk. The FRA has assessed the current and potential change in flood risk for the proposed development from all viable sources of flooding. The scale and nature of the FRA is considered appropriate for the proposed development. This FRA has been carried out following the National Planning Policy Framework (NPPF)² and associated Planning Practice Guidance (PPG)³.

1.2 Flood risk disclaimer

This is a desk-based study and therefore there has been no site visit conducted. The assessment has been completed with available resources obtained online, via the client or from a Product Data request to the Environment Agency submitted in August 2023 and fully received in February 2024.

Information presented within this report is dependent upon the accuracy and reliability of the supplied information, correspondence, and data available to Mott MacDonald at the time of the assessment. Any party developing a detailed design should not rely on assumptions made in this report but should satisfy themselves in that regard.

Mott MacDonald has followed accepted procedures in providing the services but, given the residual risk associated with any prediction and the variability that can be experienced in flood conditions, Mott MacDonald takes no liability for and gives no warranty against actual flooding of any property (client’s or third party) or the consequences of flooding in relation to the performance of the service Mott MacDonald accepts no responsibility or liability for this document to any party other than by whom it was commissioned.

1.3 Report structure

This section introduces the current site conditions, information regarding the development and scope of the assessment.

- A description of the site is presented in section 2
- The legislative information is presented in section 3.
- The assessment of flood risk is presented in section 4.
- The conclusions of the assessment are presented in section 5.

² National Planning Policy Framework, Ministry of Housing, Communities and Local Government (2021). [National Planning Policy Framework - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/91227/nppf-2021.pdf)

³ Planning Practise Guidance, Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government (2021). [Planning practice guidance - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/91227/ppg-2021.pdf)

1.4 Data used in this assessment.

The following data sources presented in Table 1.1 have been consulted in this assessment.

Table 1.1: Data sources

Data	Source	Access Date	Comment
BGS Geology Viewer	British Geological Society	September 2023	Used to look at groundwater flood risk.
Environment Agency Open Datasets	Data.gov.uk	September 2023	The following data sets have been used to assess the current flood risk of the site: <ul style="list-style-type: none"> ● Recorded Flood Outlines ● Flood Map for Planning – Flood Zones 2 and 3 ● Flood Warning Areas ● AIMS Spatial Flood Defences ● Risk of flooding from Surface Water ● Reservoir Flood Extents – Dry Day ● Reservoir Flood Extents – Wet Day
Magic Map Viewer	Department for Environment, Food & Rural Affairs (DEFRA)	September 2023	Interactive map showing information about Aquifers and Groundwater.
National Planning Policy Framework and Planning Practise Guidance	Department for Levelling Up, Housing and Communities	September 2023	These reports lay out the guidance for development in areas of flood risk, and list what is allowed to be built in areas of flood risk.
Environment Agency 1D/2D Hydraulic Model	Environment Agency	February 2023	Used to run the baseline and scheme hydraulic model, to see what impact adding the kiosk would have at the WwTW.
Flood risk and coastal change Guidance		September 2023	Provides information regarding defining the Flood Zones.
Flood risk assessments: climate change allowances		September 2023	Used to look at what allowances needed to be used for hydraulic modelling purposes
Peak River Flow Climate Change allowance for the Aire and Calder management catchment		September 2023	Used to inform climate change uplift in hydraulic modelling scenarios
Product Data 4, Flood defences and attributes.		September 2023	Information about the flood defences surrounding the site.
Calder Catchment Strategic Flood Risk Assessment	Kirklees Council	September 2023	Used for information regarding historical flooding and any requirements that FRA need to fulfil.
Kirklees Council Local Flood Risk Management Strategy Consultation Document		September 2023	Outlines what Kirklees Council's strategy is regarding managing local flood risk. Includes information about the current flood risk in the area.

Data	Source	Access Date	Comment
Kiosk Design	Mott MacDonald Bentley	March 2024	Kiosk design with dimensions, used to add the Kiosk to the scheme model.
The Coal Authority Interactive Map	The Coal Authority	September 2023	Deighton is in the Coal Mining Reporting Area, so the map needed to be checked to see if there were any receptors nearby that would impact flood risk at the WwTW.
Deighton STW Desludging Contract	Yorkshire Water	September 2023	This was provided to inform what the proposed development included. Further design information is shown in the Appendices.

Source: As listed.

2 Site description

The WwTW is in the district of Deighton in Huddersfield, West Yorkshire. The WwTW is approximately 3.6km north east of Huddersfield city centre and 3km west of Mirfield. Figure 2.1 shows the site conditions at the time of writing. The WwTW occupies an area of land between the Huddersfield Broad Canal and the River Colne.

2.1 Existing conditions

Primary access to the WwTW is on Ashgrove Road which joins the A62. Two pedestrian bridges cross the River Colne into the WwTW, one to the south and one to the north.

The land use to the east and south of the WwTW is rural; land is used for agricultural purposes to the east, and Dalton Bank Nature Reserve is located to the south. To the north of the site is woodland, and to the west is an industrial estate and business park.

The elevations on the site range between 50mAOD to 52mAOD, with the site being in a steep-sided valley of the River Colne.

Figure 2.1: Site Location



Source: Mott MacDonald, 2024. Contains Ordnance Survey data © Crown copyright and database right 2023

2.2 Proposed development

The indicative development plan outlines the location of the proposed development in the WwTW. This is presented in Appendix A.

The list below defines the proposed development and is consistent with data supplied within “Deighton Sewage Treatment Works (STW) Desludging Contract” by YW⁴:

- New zickert scraper systems are to be installed into the existing six primary settlement tanks.
- Further refurbishment and replacements for infrastructure and equipment relating to the six primary settlement tanks.
- Provide one Motor Control Centre (MCC) within a walk-in kiosk to provide power, control and monitoring of the newly installed equipment. The dimensions of the kiosk are listed below:
 - 10.8m length
 - 4.25m width
 - 3.0m height
- Access paths to be provided to new access points and equipment which are not elevated from the existing ground level.

Drawings and further information regarding the kiosk are shown in Appendix C. The kiosk is the only aspect of the proposed development that requires planning permission and is therefore the focus of this FRA. All other works are replacing existing works and therefore do not need planning permission and are classed as permitted development.

⁴ Deighton STW Desludging Contract (YW.201455.04), Yorkshire Water (2023)

3 Legislation and policy context

The following key legislation and policies relevant to this assessment have been identified:

- National Planning Policy Framework (NPPF)
- Planning Practice Guidance (PPG)
- Local planning policies including:
 - Calder Catchment Strategic Flood Risk Assessment – Volume II
 - Kirklees Council Local Flood Risk Management Strategy Consultation Document

Each of these are summarised in the following subsections.

3.1 National planning policy

3.1.1 National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG)

The NPPF sets out the Government's planning policies for England and defines how these are expected to be applied⁵. The associated PPG⁶ on Flood Risk and Coastal Change provides additional guidance to local planning authorities to ensure the effective implementation of the planning policy set out in the NPPF on developments in areas of flood risk.

As set out in the NPPF, inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at the highest risk. However, where development is necessary, it must be safe without increasing flood risk elsewhere. For the purposes of applying the NPPF:

- 'Areas at risk of flooding' means land within Flood Zones 2 and 3, or land within Flood Zone 1 (defined in Section 3.2.1) which the Environment Agency has notified the local planning authority as having critical drainage problems; and
- 'Flood risk' means a combination of the probability and the potential consequences of flooding from all sources - including from rivers and the sea, directly from rainfall on the ground, surface and rising groundwater, overwhelmed sewers, and drainage systems, and from reservoirs, canals and lakes and other artificial sources.

The stated overall aim of the NPPF is to steer new development to Flood Zone 1. If following the application of the Sequential Test, it is not possible for the development to be in zones with a lower probability of flooding, the Exception Test can be applied if deemed appropriate.

3.1.1.1 The Sequential Test

The NPPF (Section 127) requests that a Sequential Test, risk-based approach be applied to all plans. This should also consider the current and future impacts of climate change. The Sequential Test aims to steer new developments to locations in Flood Zone 1, where flood risk is lowest.

The proposed development is situated in Flood Zone 3, meaning it is at a 'high' risk of fluvial flooding. However, the works are within the category of both 'water compatible development' and 'essential infrastructure'. Hence construction of the proposed development is deemed an

⁵ National Planning Policy Framework, Department for Levelling Up, Housing and Communities (2023) [National Planning Policy Framework - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/115114/nppf-2023.pdf)

⁶ Planning practice guidance, Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government (2021) [Planning practice guidance - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/100000/planning-practice-guidance.pdf)

appropriate use of the land. Further to this, the proposed development is required to be located in the WwTW due to practical reasons, therefore the proposed development cannot be constructed in Flood Zone 1. It is therefore unavoidable that the works would be located within Flood Zone 3.

3.1.1.2 Exception Test

Per Table 2 of the NPPF PPG, an 'Essential Infrastructure Development' must justify the location of the proposed development within Flood Zone 3a and 3b by applying the Exception Test.

The NPPF PPG notes that for the Exception Test to be passed, it should demonstrate that:

- a. The development would provide wider sustainability benefits to the community that outweigh the risks.

The proposed development at Deighton WwTW will allow the continuation of waste water treatment at the site, allowing for the safe removal of waste water from the community. This provides wider sustainable benefits for the community and environment.

- b. The development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible will reduce flood risk overall.

The proposed development will be safe for its lifetime considering the vulnerability of its users by:

- The model results in Section 4.2.2 demonstrate that the addition of the kiosk to the site will not cause a significant increase in fluvial flood risk within the site and elsewhere. The report also shows that the proposed development will not lead to an increase in other forms of flood risk both at the site and elsewhere if mitigation measures outlined in this report are followed during construction and operation.

3.1.2 Allowance for climate change

The NPPF requires that climate change is considered in all FRA's for planning applications. With respect to the application of climate change allowances, the design of the proposed development has been modelled as 1% AEP plus an allowance for climate change.

The Environment Agency have published guidance on peak river flow climate change allowances for FRA's⁷. The WwTW is located within the Aire and Calder Management Catchment, in the Humber river basin district. The peak river flow allowances for this basin are listed below in Table 2.1.

Table 3.1: Peak river flow allowances

Allowance Category	2020s (2015-2039)	2050s (2040s-2069)	2080s (2070-2115)
Central	11%	13%	23%
Higher Central	15%	18%	31%
Upper End	24%	31%	51%

Source: Environment Agency, 2022.

The NPPF Annex 3: Flood risk vulnerability classification⁸ was used to assess the MCC kiosk. The two classifications below have been used to define the proposed development as the works

⁷ Peak river flow climate change allowances by management catchment, Environment Agency (2022) [Peak river flow climate change allowances by management catchment - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/103121/peak_river_flow_climate_change_allowances_by_management_catchment.pdf)

⁸ National Planning Policy Framework, Annex 3: Flood risk vulnerability classification, Department for Levelling Up, Housing and Communities. (2012) [National Planning Policy Framework - Annex 3: Flood risk vulnerability classification - Guidance - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/103121/national_planning_policy_framework_annex_3_flood_risk_vulnerability_classification_guidance.pdf)

for both categories. This allows for a conservative approach to be followed. The two classifications are:

- Essential infrastructure
 - ‘Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including water treatment works that need to remain in operation in times of flood’.
- Water compatible development
 - ‘Sewage transmission infrastructure and pumping stations.’

The Environment Agency advise that the central allowance is used for water compatible developments in Flood Zone 3, and the higher central allowance is used for essential infrastructure⁹. Therefore, for this assessment the following assumptions relating to climate change allowances have been made:

- The proposed development has a design life up to the 2080s epoch.
- The proposed development can be considered as either water compatible or essential infrastructure, therefore both the central and higher central allowances have been used.
 - This means that for the 1% AEP fluvial flood events an uplift in peak flow of 23% and 31% has been assessed for both a “baseline” and “with proposed development” scenario.
 - For this assessment these are either denoted as “1% AEP +CC23% or +CC31%”.

3.2 Local planning policies

The local planning policies relevant to development in Deighton are summarised below and have been used in Section 4 for assessing flood risk wherever applicable. Deighton is in the Kirklees Council local authority area¹⁰.

3.2.1 Strategic flood risk assessment (SFRA)

3.2.1.1 Calder catchment strategic flood risk assessment - Volume II¹¹

The assessment states that Kirklees Council holds very limited historical flood information and most of the records available are incomplete.

3.2.2 Kirklees Council local flood risk management strategy

3.2.2.1 Consultation document, July 2023¹²

A previous Local Flood Risk Management Strategy (LFRMS) was published in 2012¹³ the most recent version of this was submitted for consultation in July 2023. This 2023 document has not been finalised yet, however, because the previous document is 11 years old, this assessment uses the 2023 LFRMS information.

Kirklees flooding responsibilities are as follows:

⁹ Flood risk assessments: climate change allowances, Environment Agency (2022) [Flood risk assessments: climate change allowances - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/103142/flood_risk_assessments_climate_change_allowances.pdf)

¹⁰ Kirklees Council, Kirklees Council (2024) [Kirklees Council | Home Page](https://www.kirklees.gov.uk/)

¹¹ Calder Catchment Strategic Flood Risk Assessment – Vole II, JBA Consulting (2016) [Calder Catchment Strategic Flood Risk Assessment \(SFRA\) – Volume II \(kirklees.gov.uk\)](https://www.kirklees.gov.uk/media/103142/Calder_Catchment_Strategic_Flood_Risk_Assessment_(SFRA)_-_Volume_II.pdf)

¹² Local Flood Risk Management Strategy Consultation Document, Kirklees (2023) [Consultation - Kirklees local flood risk management full strategy](https://www.kirklees.gov.uk/media/103142/Consultation_-_Kirklees_local_flood_risk_management_full_strategy.pdf)

¹³ Kirklees Local Flood Risk Management Strategy, Kirklees Council (2012) [Kirklees Local Flood Risk Management Strategy](https://www.kirklees.gov.uk/media/103142/Kirklees_Local_Flood_Risk_Management_Strategy.pdf)

- Kirklees Council Lead Local Flood Authority (LLFA) – manage flood risk from ordinary watercourses, surface water and groundwater.
- Environment Agency – responsible for main rivers and regulate operation of large, raised reservoirs.
- Highways Authority (Kirklees Council and National Highways) – responsible for providing and managing highway drainage and some roadside ditches/gullies.
- Yorkshire Water – responsible for public water supply and sewerage systems.

4 Assessment of flood risk

The following section outlines the current and potential sources of flood risk in relation to the site.

4.1 Historical flooding

The River Colne is designated as a Main River¹⁴ by the Environment Agency. The Environment Agency's 'Recorded Flood Outline' dataset is illustrated in Figure 4.1 and shows all the records of historical flooding from rivers, sea, groundwater, and surface water¹⁵.

The flood outline shown indicates the maximum extent of the December 2015 Flood Event, in which the channel capacity of the River Colne was exceeded and led to fluvial flooding of the site. This is thought to be the worst flooding event to have occurred at the site.

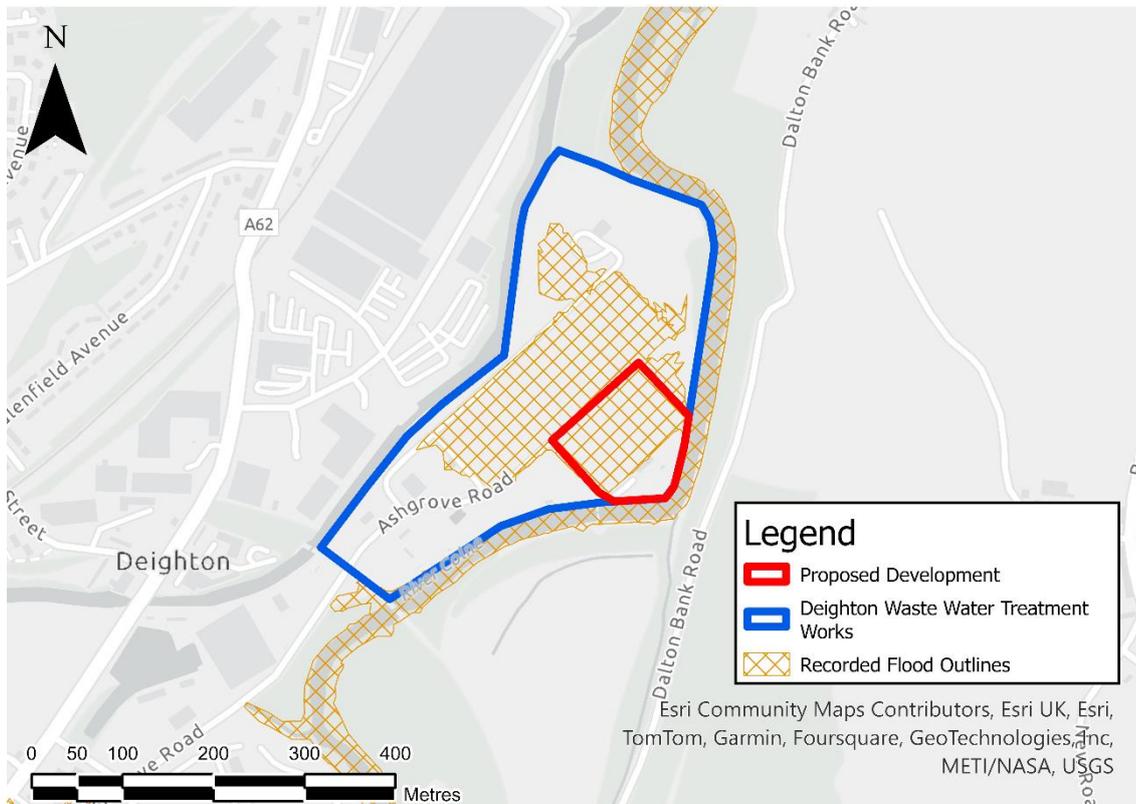
There is no publicly available documented evidence of any other sources of historical flooding apart from fluvial that have impacted the site. Based on the BHS chronology of hydrological events¹⁶ historic flooding other historical flooding events are thought to have occurred within the region, including the River Holme in May 1944 (a tributary of the Colne). However, no specific reference to the site has been identified by this assessment.

¹⁴ Statutory Main River Map, Environment Agency (2024) [Statutory Main River Map - data.gov.uk](https://data.gov.uk)

¹⁵ Recorded Flood Outlines, Environment Agency (2023) [Recorded Flood Outlines - data.gov.uk](https://data.gov.uk)

¹⁶ Chronology of Hydrological Event, British Hydrological Society (2024). [Welcome - Chronology of British Hydrological Events \(CBHE\) \(hydrology.org.uk\)](https://hydrology.org.uk)

Figure 4.1: Recorded flood outlines



Source: Mott MacDonald, 2024. Esri Community Maps, Environment Agency Recorded Flood Outlines, 2023.

4.2 Existing flood risk

4.2.1 Fluvial flood risk

The Environment Agency publishes flood extents for all significant watercourses throughout England. These extents are available on the 'Check the long-term flood risk for an area in England'¹⁷.

Table 4.1 provides definitions of the Flood Zones as stated in the PPG¹⁸. It should be noted that the extents given on the flood map are only indicative and do not necessarily consider any man-made structures which may influence flood extents, such as railway embankments, roads, or flood defences. The Environment Agency Flood Map for Planning does not consider flood defences and therefore represents a worst-case extent of flooding.

¹⁷ Check the long-term flood risk for an area in England, Environment Agency (2023) [Check the long term flood risk for an area in England - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/services/check-the-long-term-flood-risk-for-an-area-in-england)

¹⁸ Flood risk and coastal change. Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government (2022) [Flood risk and coastal change - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/flood-risk-and-coastal-change)

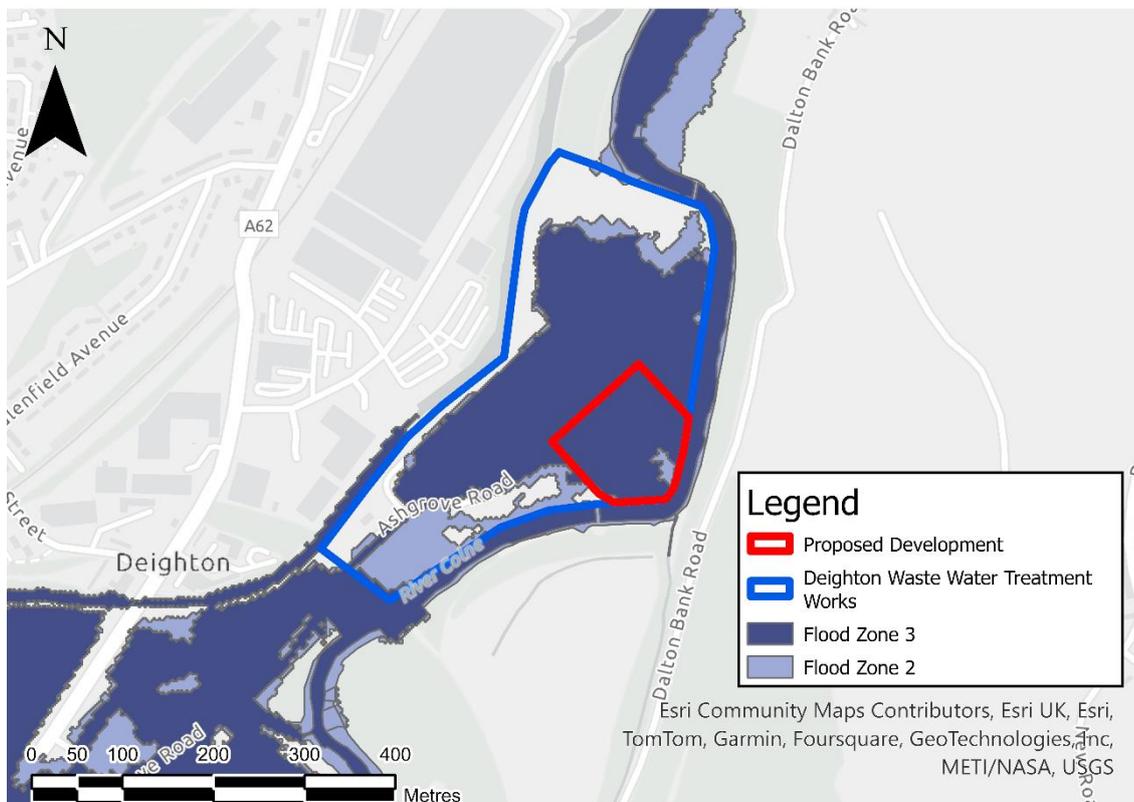
Table 4.1: Flood zone descriptions

Table Flood Zone	Description	Annual Exceedance Probability % (AEP%)
Flood Zone 1 – Low Probability	Land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year	< 0.1% (1 in 1000 year) sea or river flooding
Flood Zone 2 – Medium Probability	Land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding, or between a 1 in 200 and 1 in 1000 annual probability of sea flooding in any year	1% - 0.1% (1 in 100 – 1 in 1000 year) river flooding 0.5%-0.1% (1 in 200 – 1 in 1000 year) sea flooding
Flood Zone 3a – High Probability	Land is assessed as having a 1 in 100 or greater annual probability of river flooding, or a 1 in 200 or greater annual probability of flooding from the sea in any year.	> 1% (greater than 1 in 100 year) river flooding > 0.5% (greater than 1 in 200 year) sea flooding
Flood Zone 3b – The Functional Floodplain	Land where water must flow or be stored.	Identified in the Strategic Flood Risk Assessment

Source: Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government, 2022.

Figure 4.2 shows the Flood Zones that cover the WwTW. The figure shows the majority of the proposed development is in Flood Zone 3, with a small area in the south east being Flood Zone 2. Therefore, the site and proposed development are deemed to be within an area of high fluvial flood risk currently.

Figure 4.2: Flood zones 2 and 3



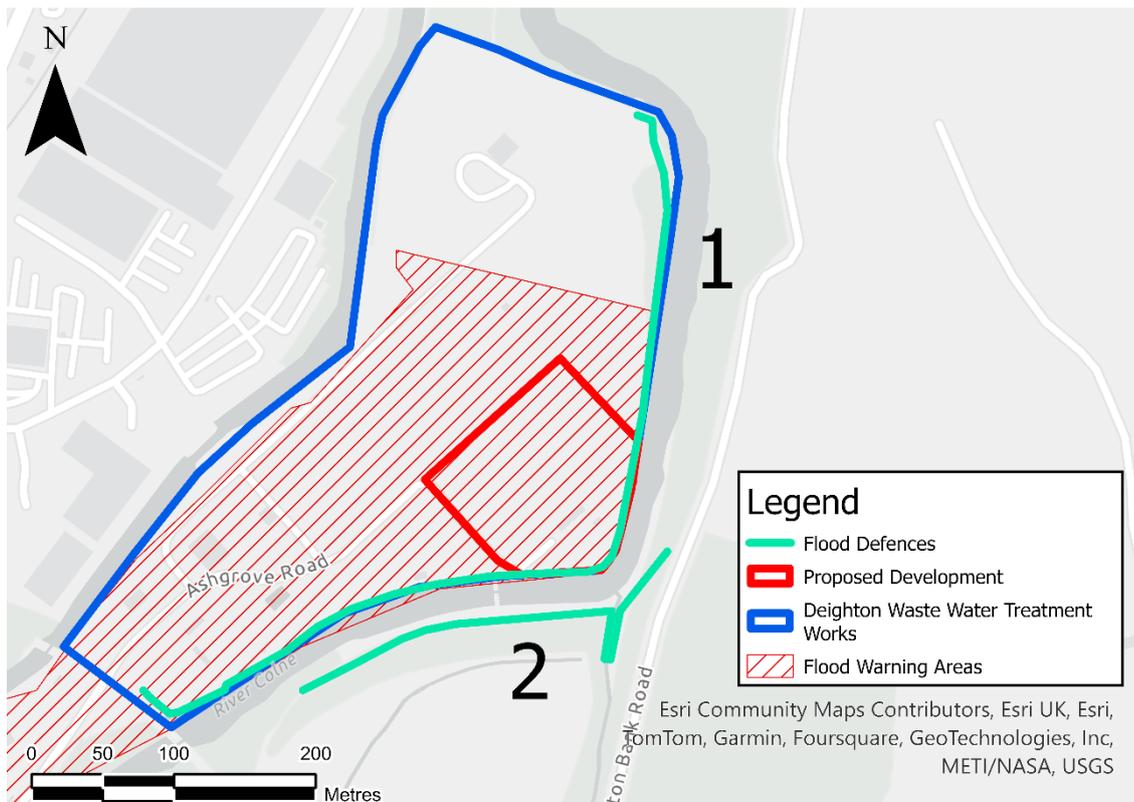
Source: Mott MacDonald, 2024. Esri Community Maps, Environment Agency, 2023.

4.2.1.1 Existing flood defences and flood warning areas

Figure 4.3 shows the existing flood warning area and flood defences relevant to the site. The site is located within the existing “River Colne at Huddersfield” flood warning area. These flood warning areas demonstrate where flooding is expected to occur. These flood warnings are provided by the Environment Agency¹⁹.

The eastern site boundary, adjacent to the left bank of the River Colne is defended by a 690m long wall. These defences were last inspected in July 2023 and rated as ‘Good’ rating²⁰. Further information regarding these defences is presented in Table 4.2. The numbers are shown on Figure 4.3 match with the corresponding source labels in Table 4.2.

Figure 4.3: Flood defences and flood warning areas



Source: Mott MacDonald, 2024. Esri Community Maps, Environment Agency, 2023.

Table 4.2: Flood defences data²¹

Source Label	Asset ID	Asset Type	Standard of Protection (years)	Downstream actual crest level (mAOD)	Upstream actual crest level (mAOD)
1	74426	Wall	20	53.47	57.79
2	27546	Wall	20	60.97	56.13

Source: Environment Agency, 2023.

¹⁹ Flood Warning Area, Environment Agency (2023) [Flood Warning Areas - data.gov.uk](https://data.gov.uk)

²⁰ Asset Management, Environment Agency (2023) [Asset Information and Maintenance Programme \(data.gov.uk\)](https://data.gov.uk)

²¹ Product Data 4, Flood defences and attributes, Environment Agency (2023) Accessed on 21/09/2023.

4.2.2 Hydraulic modelling assessment

Given that the proposed development is in Flood Zone 3 it was necessary to undertake a hydraulic modelling assessment to assess the influence the proposed development may have on fluvial flood risk. An existing model of the River Colne and Holme was provided by the Environment Agency. This existing 1D/2D model was developed for the Colne and Holme Flood Mapping project (2020), carried out by JBA Consulting Ltd.

4.2.2.1 Existing model review

A review of the existing model was undertaken to determine if the model was site-specific enough for our assessment. It was concluded that:

- The WwTW was already sufficiently represented in the 2d model.
- All relevant structures were included in the model and have been checked and reviewed against the most recent available data.
- The hydrology used by JBA Consulting Ltd has been reviewed. The hydrology approach has remained unchanged apart from rerunning new climate change allowances (more detail in Appendix C). This remains unchanged as it is a comparative assessment.
- Model simulations from JBA Consulting Ltd were reviewed and re-run for the 1% and 0.1% AEP events to check the stability of the model. This did not highlight any additional concerns beyond those reported by JBA Consulting Ltd.

4.2.2.2 Modelling scenarios

For this assessment the following scenarios as shown in Table 4.3 have been assessed.

Table 4.3: Summary of modelled scenarios assessed as part of this FRA.

Scenario	Flood Event	
	1% AEP + 23% cc	1% AEP + 31% cc
Baseline Scenario	✓	✓
Proposed Development	✓	✓

Source: Mott MacDonald, 2024.

4.2.3 Modelled flood events

The peak river flow climate change allowances used for the hydraulic modelling are highlighted in Table 3.1. Table 4.4 summarises the results of the hydraulic modelling completed for this assessment with the results of both compared in Figure 4.4 and Figure 4.5.

Table 4.4: Model results

Event	Results
Baseline 1% AEP +CC23%	The results show that depths across the site are predominantly < 1.5m, with higher depths of up to 3m within existing treatment ponds.
Proposed development 1% AEP +CC23%	<ul style="list-style-type: none"> • Modelled flood depths are anticipated to increase by up to 0.06m immediately to the kiosk. • The results show the predominant change in flood depth across the site is <0.01m. • Hydraulic modelling highlights an isolated location immediate to the proposed development with a maximum flood depth increase of 0.06m. <ul style="list-style-type: none"> – This increase is located immediately to the Kiosk and covers an area of <25m². • This is considered to be within the tolerance of the model and does not represent a material change nor a significant impact to flood risk. As a result, level for level compensation is not required.

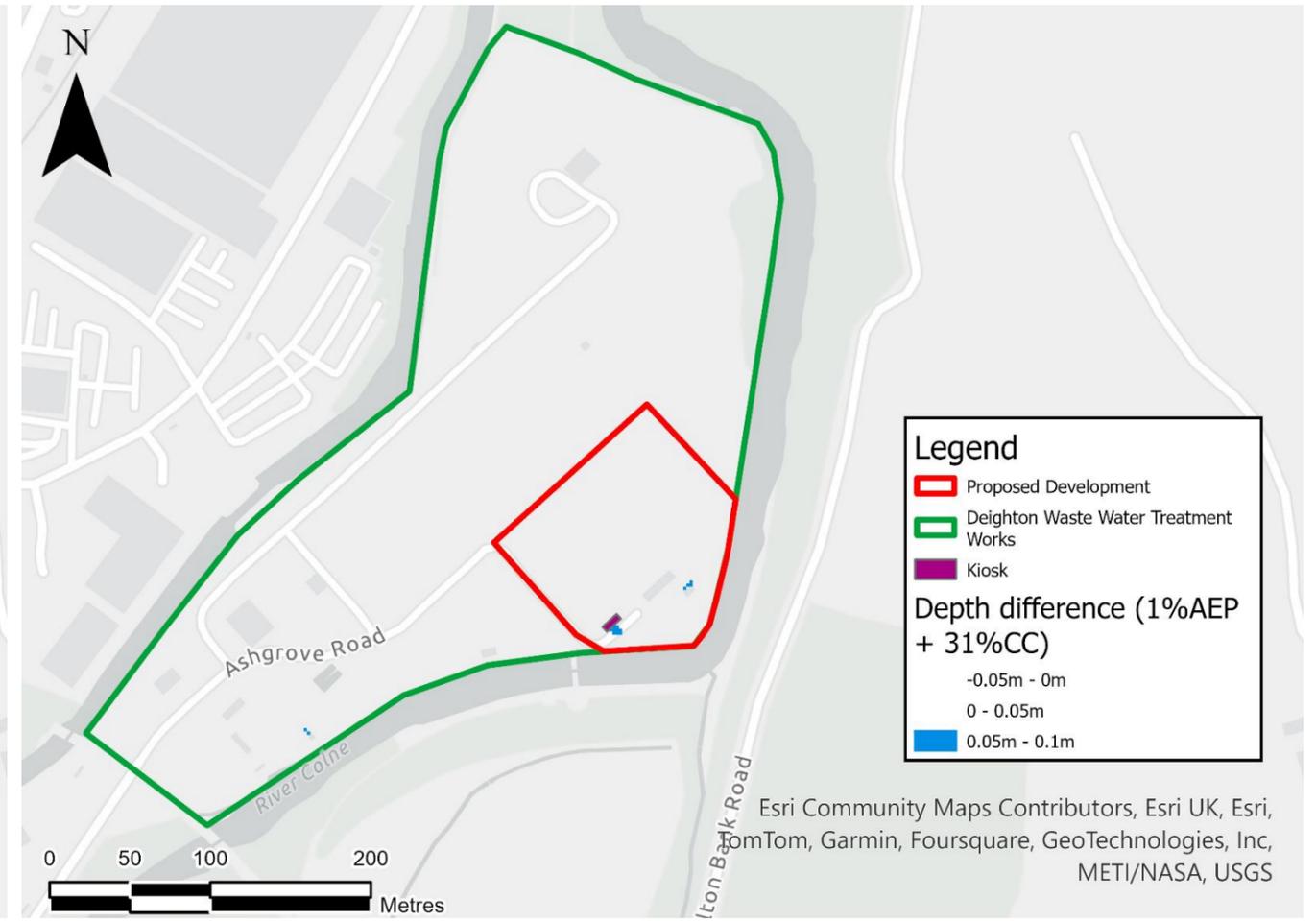
Event	Results
	<ul style="list-style-type: none"> This change is within the boundary of the WwTW and no changes to flood depths are indicated anywhere outside of this location.
Baseline 1% AEP +CC31%	The results show is similar to the 1% AEP + CC31, with an increased depth due to the higher magnitude event. There are very small, isolated depths adjacent to and within existing treatment ponds of up to 3.5m.
Proposed development 1% AEP +CC31%	<ul style="list-style-type: none"> Modelled flood depths are anticipated to increase by up to 0.06m immediately to the kiosk. The results show the predominant change in flood depth across the site is <0.01m. Hydraulic modelling highlights an isolated location immediate to the proposed development with a maximum flood depth increase of 0.1m. <ul style="list-style-type: none"> This increase is located close to the proposed development and covers an area of <5m² and represents a slight model instability caused by the modelling across the underlying transition of a floodplain material. This area represents an outlier and does not reflect the expected conditions in the event of such a flood. Additionally, this alteration affects only a limited zone within the confines of the WwTW and is not considered indicative of a substantial change or suggestive of an adverse effect on the risk of fluvial flooding. As a result, level for level flood compensation is not required.

Source: Mott MacDonald, 2024

Figure 4.4: Flood depth difference between proposed development and baseline - 1%AEP + 23%CC



Figure 4.5: Flood depth difference between proposed development and baseline - 1%AEP + 31%CC



The modelling evidence demonstrates that the addition of the kiosk to the site will not cause a significant increase in fluvial flood risk. However, as the fluvial flood risk will remain unchanged the site remains at a high risk of flooding.

4.2.4 Tidal flood risk

The site does not fall within an estuary or coastal location. Therefore, tidal flooding is not relevant to the proposed development and has not been considered further in this report.

4.2.5 Surface water flood risk

Surface water flood data is available via the Environment Agency as the Risk of Flooding from Surface Water Dataset²². The Environment Agency guidance advises that this data should not be used at the property level and should not be used as sole evidence for assessment of flood risk, as the data is indicative.

The online Environment Agency 'Long-term flood risk' map includes information regarding the risk of flooding from surface water. The mapping indicates areas with a 'High,' 'Medium,' 'Low' and 'Very Low' surface water flood risk and these categories are defined in Table 4.5.

Table 4.5: Surface water flood risk

Flood Risk	Description	Annual Exceedance Probability % (AEP%)
High Risk	Each year the area has a chance of surface water flooding of greater than 3.3%	>3.3% surface water flooding
Medium Risk	Each year the area has a chance of surface water flooding of between 1 and 3.3%	3.3 – 1% surface water flooding
Low Risk	Each year the area has a chance of surface water flooding of between 0.1 and 1%	1% - 0.1% surface water flooding
Very Low Risk	Each year the area has a chance of surface water flooding of less than 0.1%	<0.1% of surface water flooding

Source: Environment Agency, 2023.

Figure 4.6 presents an overview of the mapped surface water flood risk extent in the site.

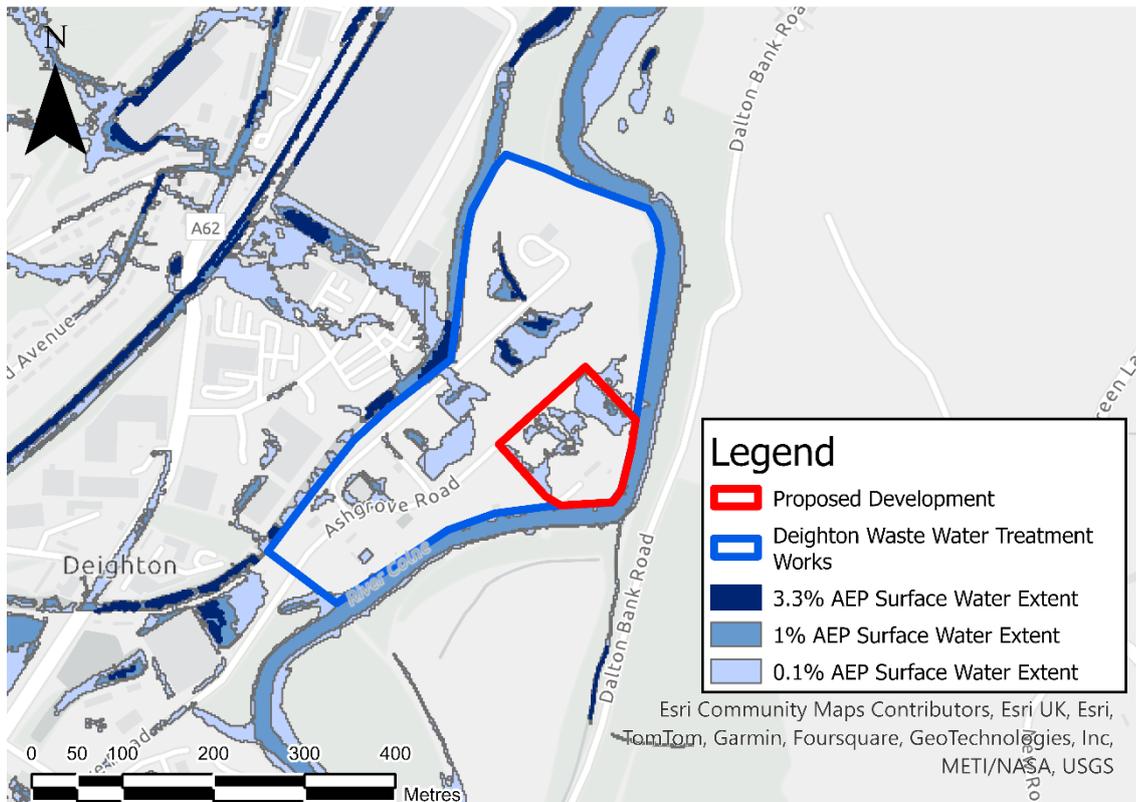
The figure shows that:

- The site has some areas of 0.1% AEP surface water extent.
- The site is at moderate risk from surface water flood risk,
 - Therefore, it is considered that fluvial flood risk will be the greater risk to the site.

As the kiosk is to be located on a platform with a mesh base, the impact on surface water flooding and flow routes will be negligible. Therefore, it is considered that the impact of the proposed development on surface water flood risk would be low.

²² Risk of Flooding from Surface Water, Environment Agency (2024) [Defra Data Services Platform](#)

Figure 4.6: Surface water flood risk extent



Source: Mott MacDonald, 2024. Esri Community Maps, Environment Agency, 2023.

4.2.6 Groundwater flood risk

Groundwater flooding occurs when water levels in the ground rise above surface elevations and is most likely to occur in low-lying areas that are underlain by permeable bedrock (aquifers).

The underlying bedrock of the WwTW is the Pennine Lower Coal Measures Formation, which is a combination of mudstone, siltstone, and sandstone. There are superficial deposits of Alluvium underlying the WwTW, which is a combination of Clay, silt, sand, and gravel²³. The WwTW is situated in a secondary A aquifer²⁴, which is defined by the Environment Agency as 'permeable layers that can support local water supplies and may form an important source of base flow to rivers.'²⁵

The WwTW is in the Coal Authority's coal mining reporting area. The closest abandoned mine is approximately 0.9km to the south west of the WwTW²⁶. With all these factors considered, there is a low risk of groundwater flooding.

²³ BGS Geology Viewer, British Geological Survey (2023). [BGS Geology Viewer \(BETA\)](#)

²⁴ Magic Map Application, Department for Environment, Food and Rural Affairs (2023). [Magic Map Application \(defra.gov.uk\)](#)

²⁵ Protect groundwater and prevent groundwater pollution, Environment Agency (2017). [Protect groundwater and prevent groundwater pollution - GOV.UK \(www.gov.uk\)](#)

²⁶ The Coal Authority Interactive Map, The Coal Authority (2023). [Interactive Map Viewer | Coal Authority \(bgs.ac.uk\)](#)

4.2.7 Sewer flood risk

Flooding from the sewer network mainly occurs when flow entering the system exceeds its available discharge capacity. This results in the system either becoming overwhelmed or its ability to discharge being inhibited by high-water levels in the receiving watercourse.

The water company that serves the administrative area is YW. The July 2016 Strategic Flood Risk Assessment (SFRA) requested details about historic sewer flooding events from YW, however, the requested information was stated as never being supplied.

The Kirklees SFRA states that the sewerage infrastructure of Kirklees is likely to be based on Victorian sewers. Consequently, there is a risk of localised flooding associated with the existing drainage capacity and sewer system. The current capacity and condition of the sewage system on and near the site is unknown.

There have been no reported incidents of sewer flooding at the site. As a result, it can be considered that the site is at a low risk from sewer flooding.

4.2.8 Reservoir, canal, and other artificial sources of flood risk

The Environment Agency 'long term flood risk map' indicates the potential maximum extent of flooding if an uncontrolled release of water from a reservoir were to occur.

Figure 4.7 below shows the wet and dry day dataset.

- The Wet Day scenario is defined as: the individual flood extents for all large, raised reservoirs if they were to fail and release the water held on a "wet day" when local rivers had already overflowed their banks²⁷
- The Dry Day scenario is defined as: the individual flood extents for all large, raised reservoirs if they were to fail and release the water held on a 'dry day' when local rivers are at normal levels²⁸

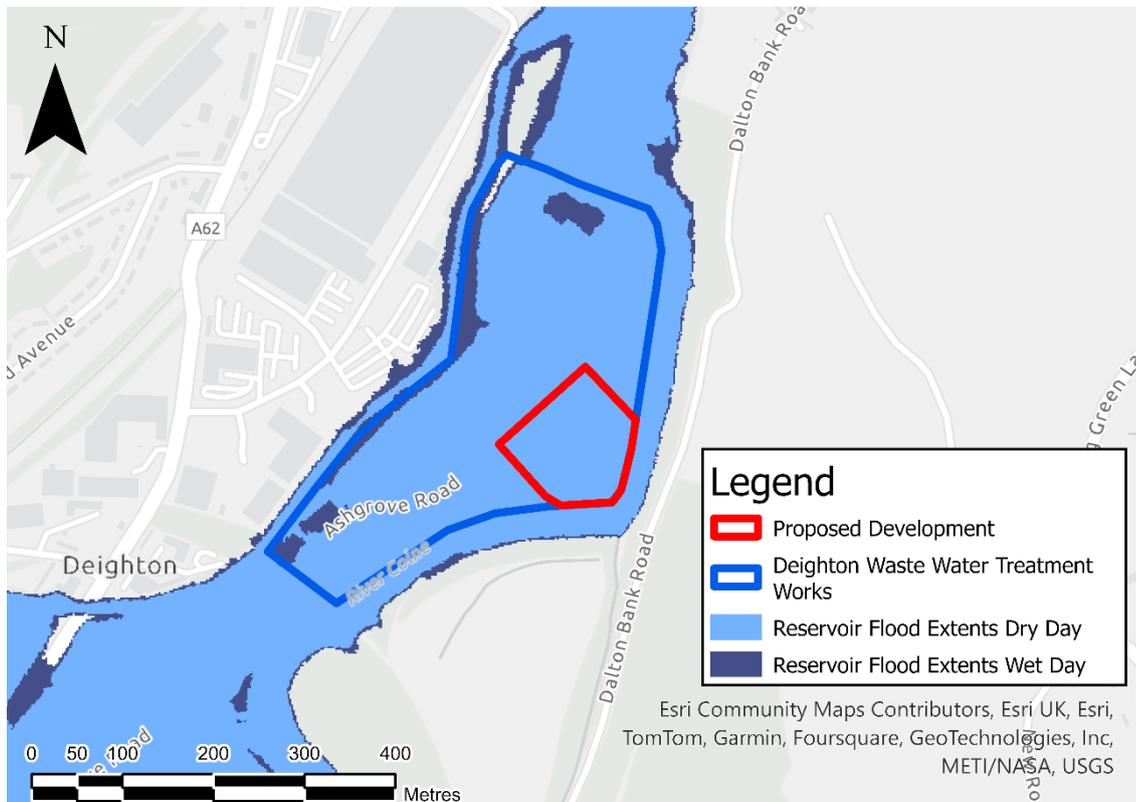
This dataset shows that 43 reservoirs have the possibility to flood the WwTW on a wet day, and 23 reservoirs have the possibility to flood the WwTW on a dry day. The Environment Agency Reservoir Flood Extents datasets should be referred to for more specific details surrounding the reservoirs.

Although the site does fall into an area that is at risk in the event of a reservoir breach, these reservoirs are subject to the requirements of the Reservoirs Act (as amended) 1975. As these reservoirs are subject to a high level of management and stringent regulations, the likelihood that any degradation of the operational performance of a reservoir will be identified and addressed before there is an increased risk of failure. Whilst the consequences of failure are potentially very high, this inspection and maintenance regime means the overall risk of flooding from this source is considered very low and unlikely to change because of the proposed development.

²⁷ Reservoir Flood Extents - Wet Day (National), Environment Agency (2024)

²⁸ Reservoir Flood Extents – Dry Day (National), Environment Agency (2024)

Figure 4.7: Reservoir flood extents wet and dry day



Source: Mott MacDonald, 2024. Esri Community Maps, Environment Agency, 2023.

The Huddersfield Broad Canal passes along the west of the WwTW. The canal network within Kirklees is owned and maintained by the Canal & River Trust.²⁹ The Calder Catchment SFRA has an Appendices section titled ‘Canal & River Trust Asset Database and Historic Canal and Reservoir Overtopping and Breach Incidents’, however it is not available online. Due to the lack of access to this information, we are not able to fully assess the canal flood risk in this FRA.

Due to the assessment above, there is low risk of flooding from artificial flood sources.

4.2.9 Flood risk during construction and operation

There is health, safety and wellbeing concerns when working in areas that are in floodplains or within flood prone areas. As the site is located entirely in a floodplain particular care must be taken when construction and operational personnel are working there.

During the construction and operational phase, the following mitigation measures shall be applied when working on the floodplain:

- The safety of construction and operational personnel on-site is paramount. A Flood Emergency Plan (FEP) showing safe access and escape routes shall be prepared for the construction and during the operation of the proposed development. It shall be distributed to all construction and operational workers before entry onto the site. The plan shall detail how each section of the proposed development can be quickly and safely evacuated before an impending flood event.

²⁹ Calder Catchment Strategic Flood Risk Assessment – Volume II (Kirklees Council), JBA Consulting (2016). [Calder Catchment Strategic Flood Risk Assessment \(SFRA\) – Volume II \(kirklees.gov.uk\)](http://kirklees.gov.uk)

- The plan shall designate a refuge area, which shall be established outside Flood Zone 3 and not on land that could potentially become a disconnected island during a flood event.
 - The refuge area will be located where there is suitable access for emergency vehicles.
- The plan will consider all sources of flooding and make use of the Environment Agency's Flood Warning and Alert Service³⁰ and the Met Office's Weather Warning Service³¹ so that works shall cease in the event of forecast heavy rainfall or potential flooding.
- This should include steps to leave the site in a flood-ready condition.
- A Construction Environment Management Plan (CEMP) shall be prepared to cover the measures proposed to address environmental issues during the construction period. This will include:
 - Measures to mitigate the risks associated with fluvial flooding.
 - Detail procedures on how stockpiled materials, plant, equipment, fuels, oils, or other hazardous substances must be stored outside Flood Zones 2 and 3.
 - Include provisions to minimise the risks of leaks and spills during construction and prevent excessive suspended soils from being released into watercourses.
- All staff and personnel on site shall be made aware of the Flood Warning Service, and if a flood alert or warning were to be issued then materials and equipment should be removed from the area. All personnel should review flood warnings before accessing the site to determine safe access and egress points if required.
- It is also recommended that the kiosk should have water-tight doors and windows to prevent water from getting into the kiosk and damaging the equipment inside.
- Steps shall be taken to ensure that any existing drainage is not compromised because of construction.
- Access pathways to the new MCC kiosk should consider using more permeable materials, such as gravels to allow water to percolate into the soil.

With the above considerations put in place, the flood risk during construction and operation should be effectively mitigated.

4.3 Summary of assessed flood risk

Table 4.6 summarises the flood risk related to the proposed development.

³⁰ Flood Alerts and Warnings, GOV.UK (2024). [Flood alerts and warnings - GOV.UK \(check-for-flooding.service.gov.uk\)](https://www.gov.uk/check-for-flooding.service.gov.uk)

³¹ UK Weather Warnings, Met Office (2024). [UK weather warnings - Met Office](https://www.metoffice.gov.uk/uk-weather-warnings)

Table 4.6: Summary of assessed flood risk using High (H), Moderate (M) and Low (L) scale.

Table Source of flood risk	Current Flood Risk	Construction Flood Risk	Operational Flood Risk	Assess impact of the proposed development and justification
Fluvial	H	H	H	<p>Whilst hydraulic modelling for the 1% AEP + CC23% and CC31% show a very minor increase in flood depth, the change is immediate to the proposed location of the kiosk.</p> <p>Very low flood risk impact</p> <p>The model shows a very minor increase in flood depth within the proposed development, given that:</p> <ul style="list-style-type: none"> • The maximum increase in depth is 0.06m and immediate to the kiosk. • The increase is isolated and within the site. • The model representation of the kiosk is conservative. <p>The site is in Flood Zone 3 and has experienced flooding previously; therefore, whilst the flood risk impact is unchanged, fluvial flood risk is still considered to be at a high risk of flooding.</p>
Tidal	-	-	-	<p>No change in flood risk impact</p> <p>The site is not near the coast or a river that is tidally influenced.</p>
Surface Water	M	M	M	<p>No change in flood risk impact</p> <p>The kiosk is to be built on a platform with stilts and a mesh base reduces the risk of any increase in surface water flood risk.</p>
Groundwater	L	L	L	<p>No change in flood risk impact</p> <p>There is no evidence of groundwater flood risk at the site, therefore it is considered a low risk.</p>
Sewer	L	L	L	<p>No change in flood risk impact</p> <p>There are no reports of sewer flooding at the site, therefore it has been considered a low flood risk.</p>
Artificial Sources	L	L	L	<p>No change in flood risk impact</p> <p>The inspection and maintenance regime of reservoirs means that the overall risk of flooding from this source is considered very low.</p>

Source: Mott MacDonald, 2024

5 Conclusions

Mott MacDonald on behalf of Mott MacDonald Bentley (MMB) has been appointed to undertake a Flood Risk Assessment for Yorkshire Water at Deighton Wastewater Treatment Works, in Huddersfield, West Yorkshire to assess whether improvement works to replace and refurbish infrastructure and move an electrical (MCC) kiosk to a new location will impact flood risk.

The FRA has been successfully undertaken and has assessed the existing and potential impact on flood risk because of the proposed development. This FRA complies with the requirements set out in the NPPF and PPG. It demonstrates that flood risk from all sources has been appropriately considered for the proposed development. The proposed development that is subject to planning permission is in Flood Zone 3. The proposed development has been assessed as both a water compatible development and essential infrastructure, with the internal access track being essential utility infrastructure, therefore the Sequential Test and Exception Test need to be passed. This FRA demonstrates that the proposed development passes both tests.

5.1 Fluvial flood risk

The primary source of flood risk to the site is fluvial flooding from the River Colne, and historic fluvial flood events have occurred at the site. The site is located within Flood Zone 3. Due to these factors, the site is at a high risk of fluvial flooding. During the construction and operation of the site, a flood evacuation plan and regular reviewing of flood warning alerts need to be undertaken to ensure safe access and egress to the site.

5.1.1 Hydraulic modelling study outcomes

Hydraulic modelling was conducted for the 1% AEP with a 23% and 31% uplift for climate change. A comparison of hydraulic modelling results for the baseline and proposed development showed that There is anticipated a very minor increase in flood depth immediately to the kiosk. This is not deemed to be a significant or notable impact to fluvial flood risk given that:

- Hydraulic modelling evidence shows that maximum increase in flood depth is:
 - 0.06m for the 1% AEP +CC23%, for an area of up to 25m² and
 - 0.1m for the 1% AEP + CC31% for an area of <5m²
- The increase is isolated and within the WwTW site; and
- The model representation of the kiosk is conservative, and the actual impact is likely to be less than demonstrated within the hydraulic modelling.

5.2 Surface water flood risk

The Environment Agency surface water flood maps indicate that some areas of the site are in areas of 0.1% AEP surface water flood risk extent. Therefore, the site is at a medium risk of surface water flooding. The kiosk will not change the surface water flood risk, as it will be on a platform with a mesh base.

5.3 Other sources of flood risk

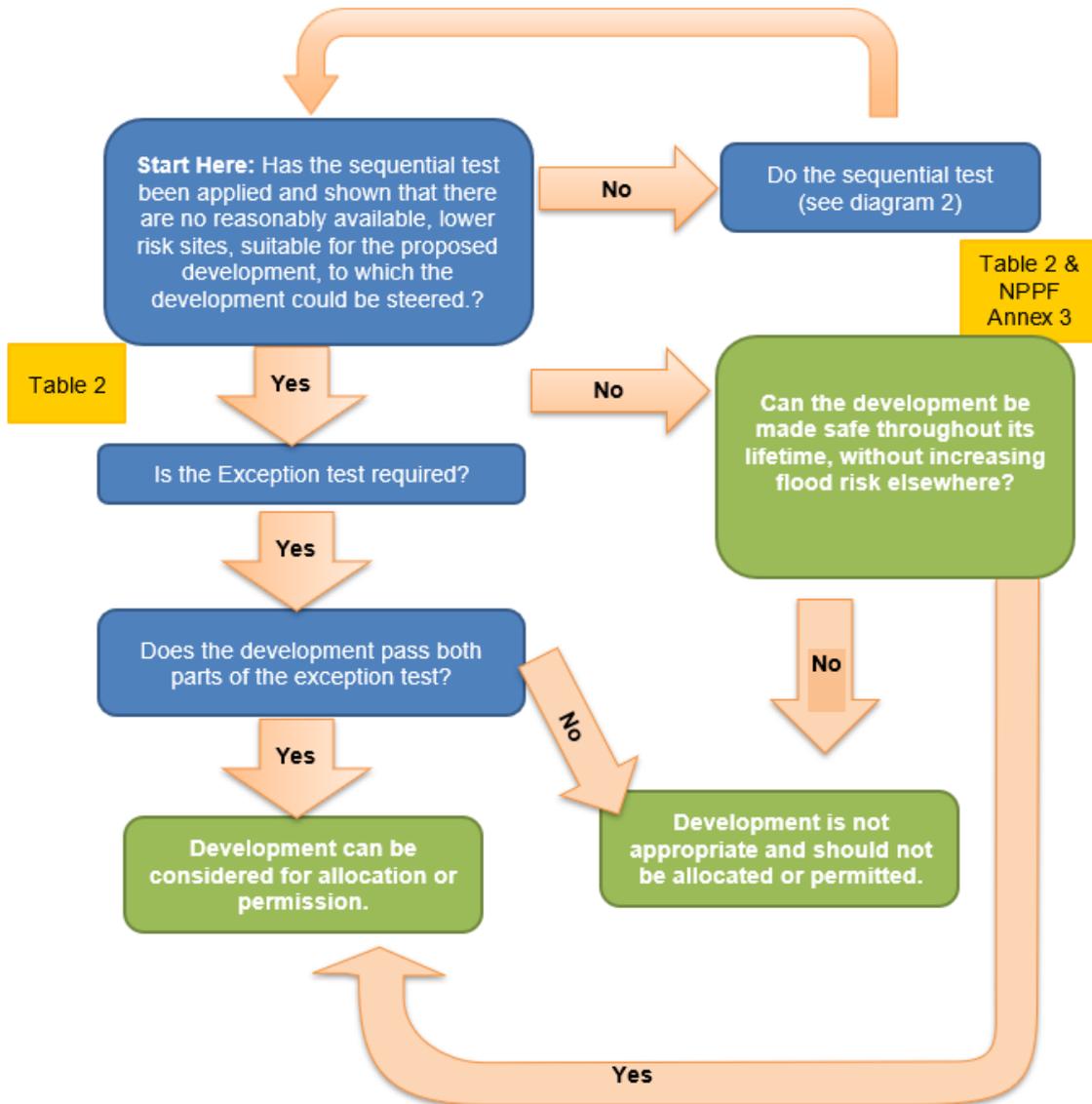
The site is shown to be at no flood risk from tidal flooding, and low flood risk from groundwater flooding, sewer flooding and artificial sources. The proposed development will not increase any of these sources of flood risk.

5.4 Assessed impact of the proposed development on flood risk

This FRA demonstrates that the proposed development will not result in any significant impacts to flood risk. However, the site remains at a high risk of fluvial flooding and should be managed by YW during construction and operation through the development of onsite flood management plans and procedures.

A. Exception Test Flow Chart

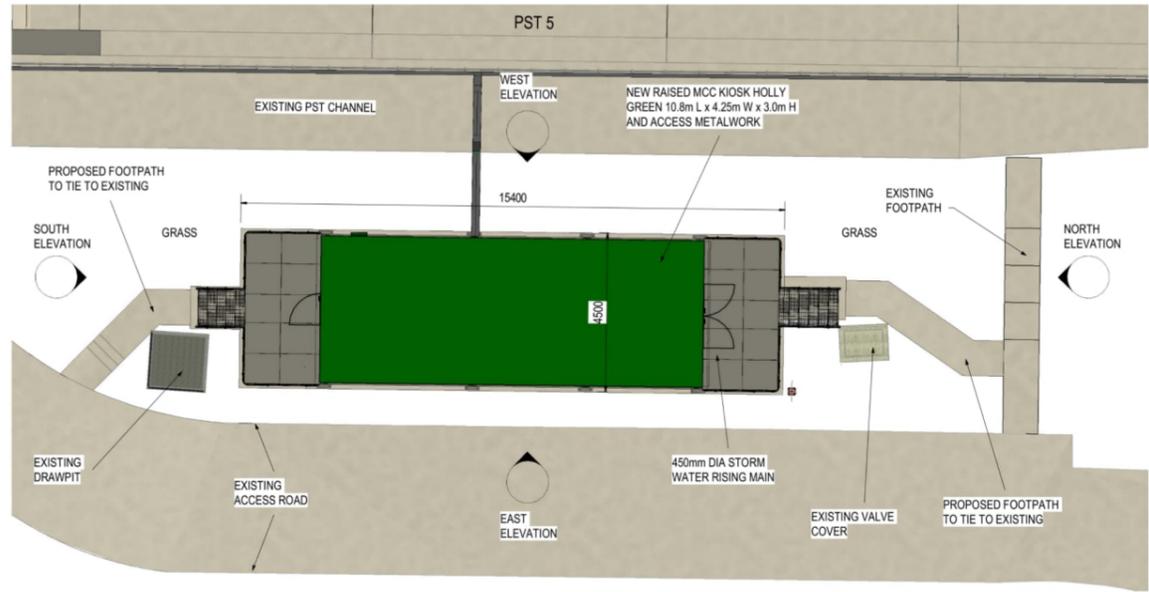
Figure A.1: Exception Test Diagram



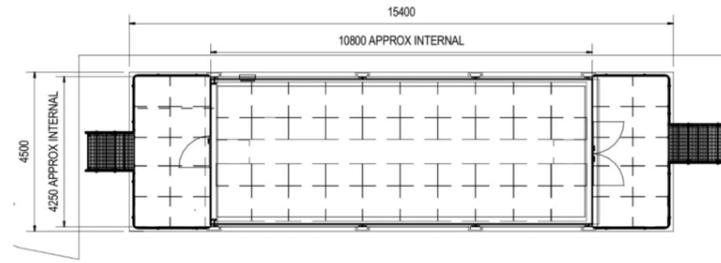
Source: Exception Test Flow Chart, Flood risk and coastal change, Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government. (2022) [Flood risk and coastal change - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/flood-risk-and-coastal-change)

B. Site Location Plan

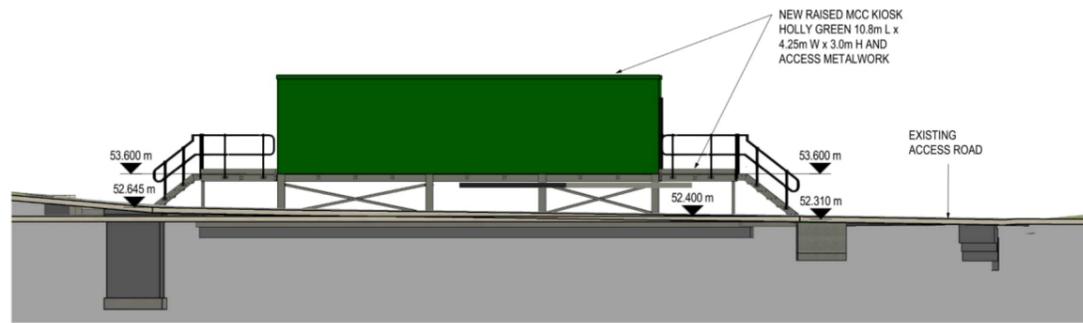
C. Kiosk Design



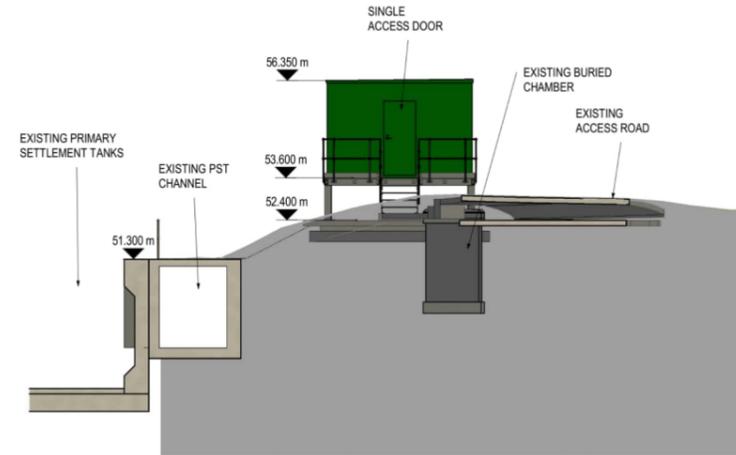
PLANNING - MCC KIOSK PLAN
1:100



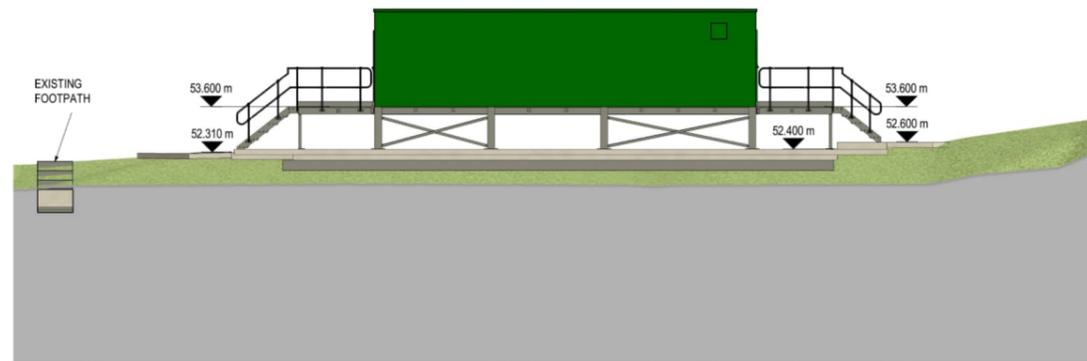
6 PLANNING - MCC KIOSK INTERNAL PLAN
1:100



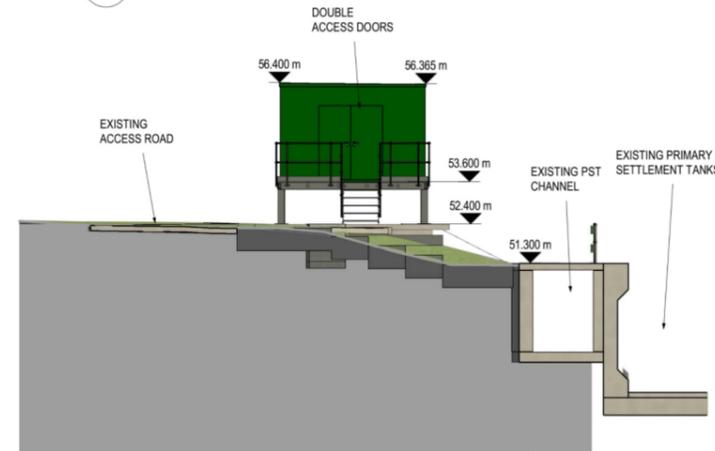
1 EAST ELEVATION
1:100



2 SOUTH ELEVATION
1:100



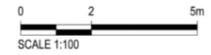
3 WEST ELEVATION
1:100



4 NORTH ELEVATION
1:100

- NOTES**
- THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT DRAWINGS AND TOGETHER WITH THE SPECIFICATIONS.
 - ALL DIMENSIONS ARE SHOWN IN MILLIMETRES (mm), UNLESS NOTED OTHERWISE.
 - ALL LEVELS ARE SHOWN IN METRES (m) AOD, UNLESS NOTED OTHERWISE.
 - NO DIMENSIONS ARE TO BE SCALED FROM THIS DRAWING.

- REFERENCE DRAWINGS**
- HUDE-MMB-WWT-SED-DR-C-0101 PLANNING - SITE LOCATION PLAN
 - HUDE-MMB-WWT-SED-DR-C-0102 PLANNING - EXISTING SITE LAYOUT
 - HUDE-MMB-WWT-SED-DR-C-0103 PLANNING - PROPOSED SITE PLAN



File Location: BIM 360//VU09 - Deighton WwTW PST Investigation/HUDE-MMB-WWT-SED-M3-C-0001.rvt

S1.P01	ISSUED FOR PLANNING	RN	TG	GM	28/09/23
Status/Rev:	Description:	Drawn:	Check:	App'd:	Output Date:
Construction Complete Date: 25/11/2025					

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Framework:	AMP 7	Work Stream:	COMPLEX MEICA
YV Batch ID / Project Code:	YW.201455.04	YV Solution ID:	0
Site:	DEIGHTON STW		
OS Grid Reference:	417092, 419235	DAZ or DMA Reference:	283
Drawing Title: PLANNING - PROPOSED KIOSK PLAN & ELEVATIONS			

Original Design / OEM Reference:	-	Size:	A1	Scale:	1:100
Status Description:	NOT FOR CONSTRUCTION	Status:	S1	Revision:	P01
Drawing Number:	HUDE MMB WWT SED DR C 0104				

D. Hydraulic modelling for fluvial flood assessment

D.1 Hydraulic Model scenarios

D.1.1 Existing baseline model

An existing model of the River Colne and Holme was provided by the Environment Agency as part of the project data requested in September 2023. This existing 1D/2D model built using the Flood Modeller and TUFLOW software was developed for the Colne and Holme Flood Mapping project (2020), carried out by JBA Consulting Ltd.

Prior to carrying out this assessment model simulations were reviewed and re-run for the 1% AEP and 0.1% AEP to check the stability of the model. This did not highlight any additional concerns beyond those reported by JBA Consulting Ltd.

D.1.1.1 Inflow update and IED file creation:

- Two new flood modeller inflow files (IED's) were created to include the CC allowances needed to be run, 23% CC uplift and 31% CC uplift.
- These IED's were created by increasing the hydrograph scaling option.
 - The scaling factor from the original 1% AEP IED file, as supplied by the Environment Agency was universally uplifted by the equivalent climate change allowance (either 23% or 31%)
 - The downstream model boundary was a level vs stage time series (representing the 50% AEP event in the downstream receiving River Calder). As it was not clear what this flow represented, the boundary was maintained and left unchanged.

D.1.2 Proposed development model

The representation of the kiosk was included within the 2D domain of the hydraulic model. Using a TUFLOW 2D GIS Z shape in the 2D domain, the land underneath the footprint of the kiosk was increased to the maximum invert level as cited in the kiosk design. This assumed a full displacement of the flood water to act as a conservative approach.

D.2 Figures of hydraulic modelling results

Flood depth results for the proposed development are presented in Figure D.2 to Figure D.5.

Figure D.2: Baseline flood depths - 1% AEP + 23%CC

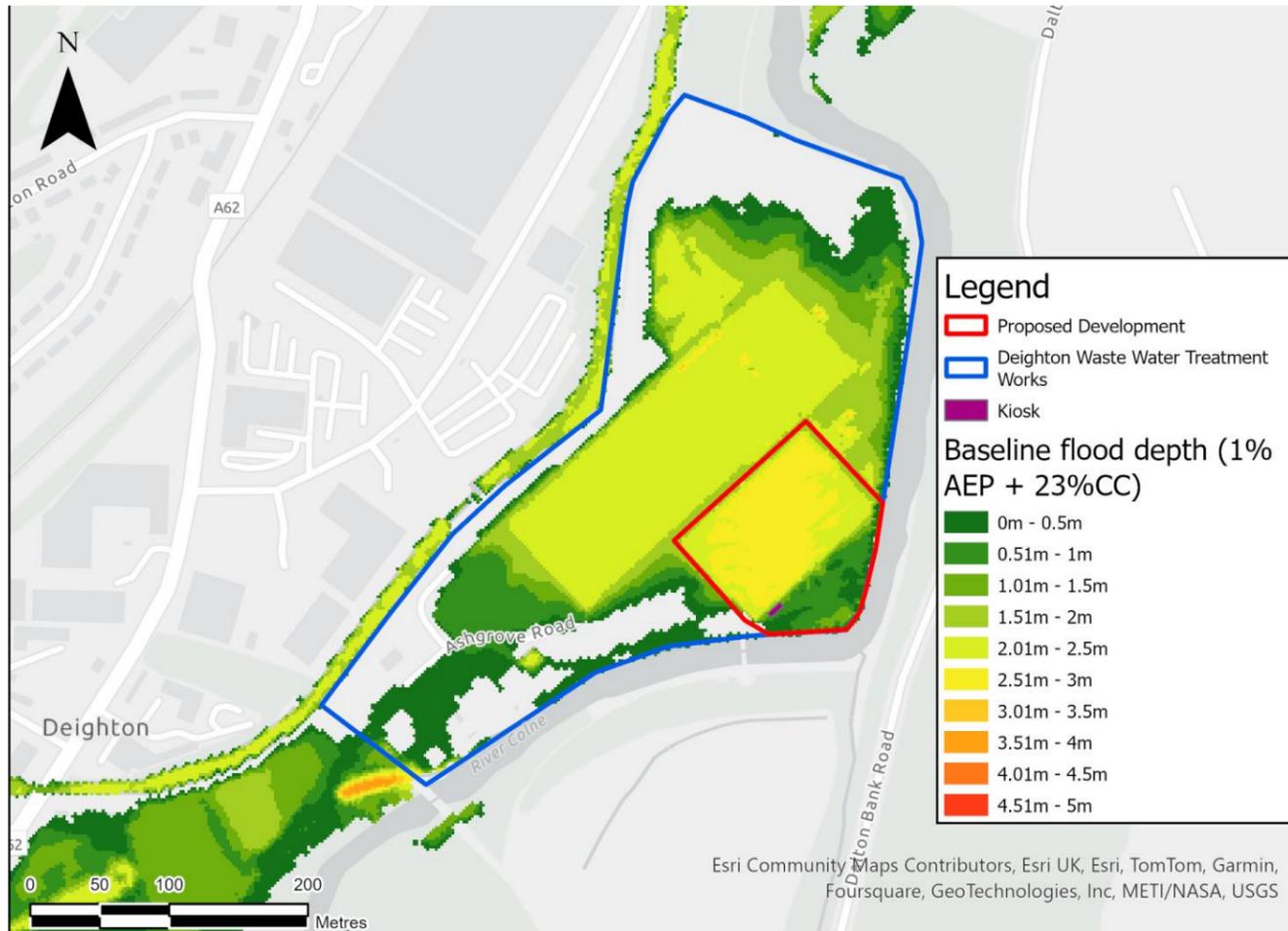


Figure D.3: Proposed development flood depth - 1% AEP + 23%CC

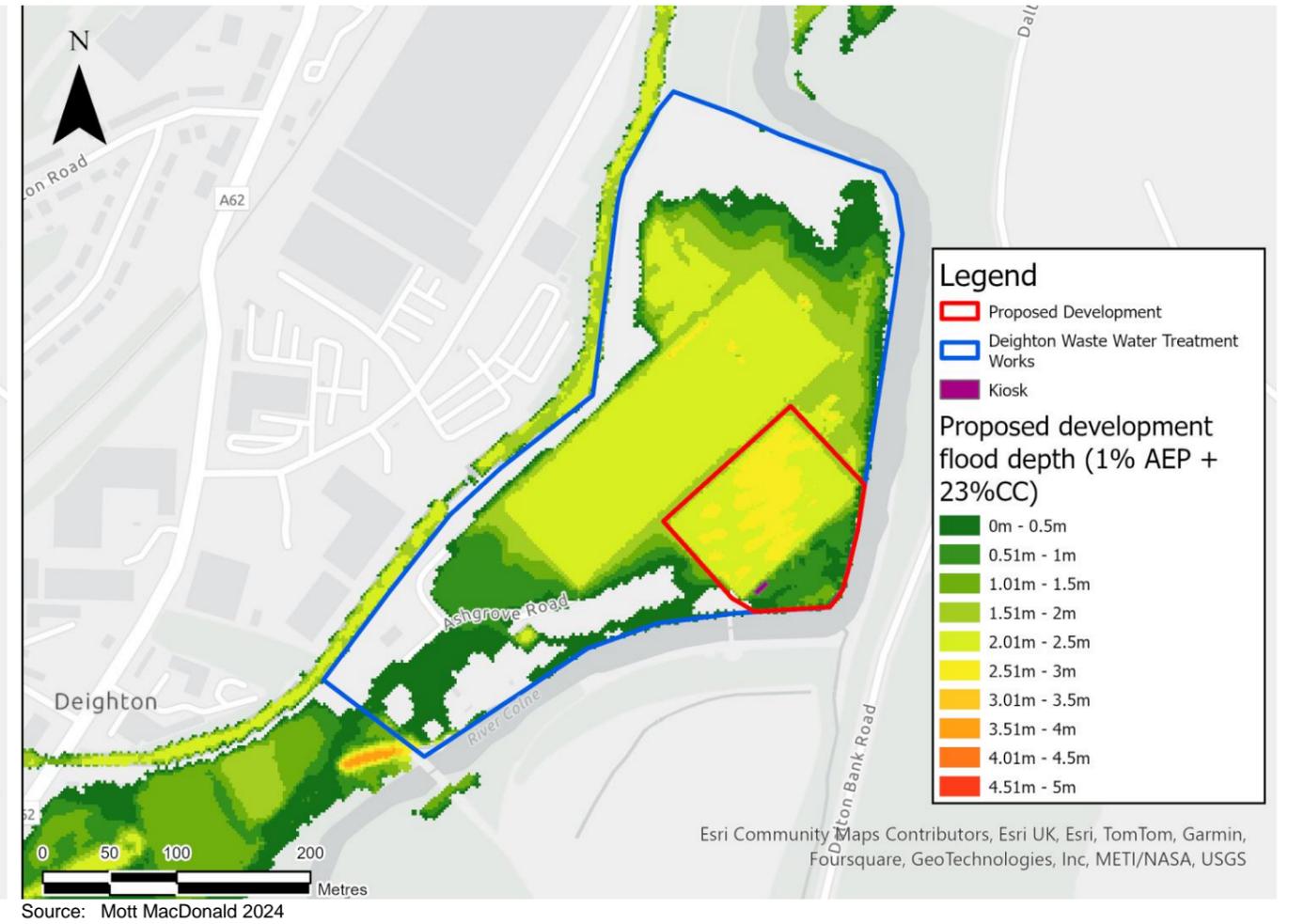


Figure D.4: Baseline flood depth - 1% AEP + 31%CC

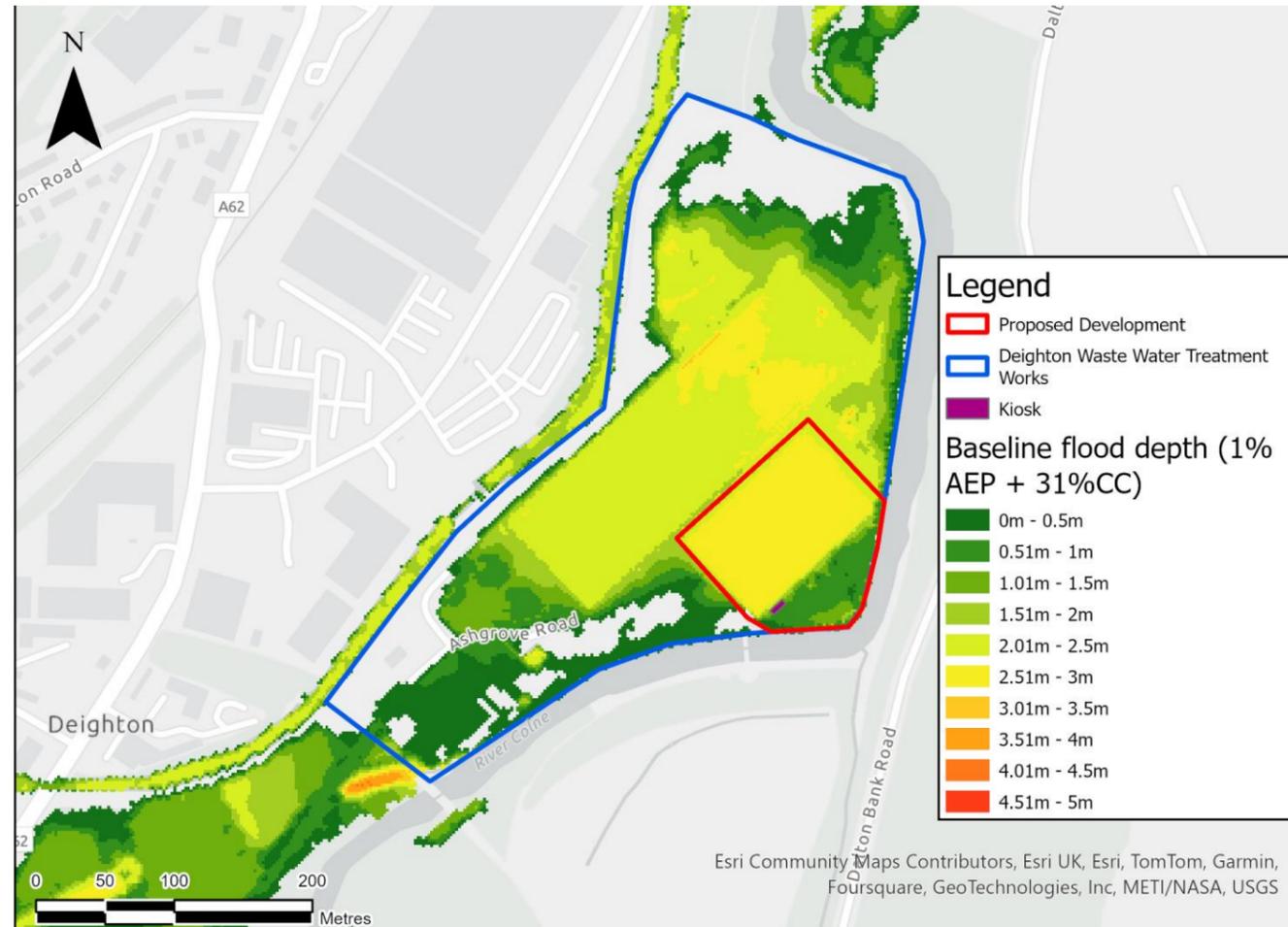


Figure D.5: Proposed development flood depth - 1% AEP + 31%CC

