Environment Agency
NEC4 professional services contract (PSC)
Scope

Project / contract Information

Project name	Integrated Colne Catchment Approach (Colne 2100) Inception Report
Project 1B1S reference	
Contract reference	34954
Date	17/12/2021
Version number	1
Author	[redacted]

Revision history

Revision date	Summary of changes	Version number
17/12/2021	Draft issue	1

This Scope should be read in conjunction with the version of the Minimum Technical Requirements current at the Contract Date. In the event of conflict, this Scope shall prevail. The *services* are to be compliant with the following version of the Minimum Technical Requirements:

Document	Document Title	Version No	Issue date
412_13_SD01	Minimum Technical Requirements	11	May 2021

Details of the works

1 Description of the works:

Objective

The Environment Agency (EA) requires a long-term strategy for mitigating flood risk in the Colne catchment. A high level strategic review of the catchment would improve this understanding and ensure that proposed schemes are compatible with the optimum strategic solution to flood risk management for the Colne catchment, mindful of the present and future water management pressures
The objective of the Inception Report is to provide sufficient detail to understand and assess the current Colne Catchment, to establish where there are gaps in knowledge and data, and potentially identify where it may be appropriate to undertake more detailed assessment in order to make informed decisions on long term flood risk management.

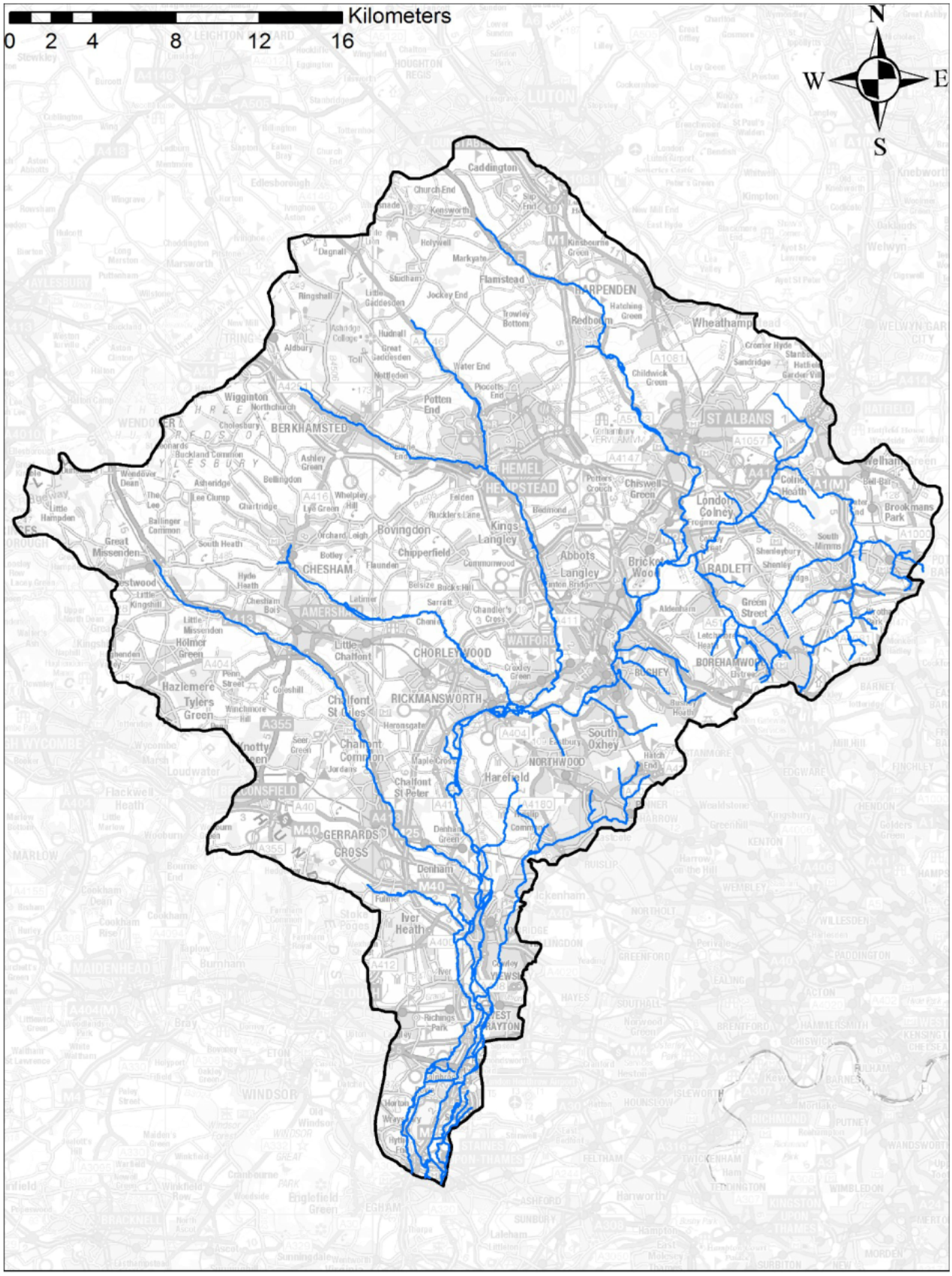
Background

The Colne Catchment is the 2nd largest River Basin in the EA's Hertfordshire and North London Region The catchment varies in shape, topography, land use, hydrological and hydraulic complexity perhaps more so than any other sub-catchment of the River Thames. The catchment covers an area of over 1000km² to the north west of London between Potters Bar, Hertfordshire and Princes Risborough, Buckinghamshire from east to west and from Dunstable, Bedfordshire to Staines-Upon Thames, Spelthorne from north to south. It is a fan shaped catchment, with chalk predominantly outcropping in the upper area whilst London clay underlies gravels in the narrow neck downstream of Watford/Rickmansworth The majority of urban runoff is received in the downstream reaches, creating long flat flood hydrographs not prone to rapid response or flash floods The Colne Catchment contains seven main rivers and their tributaries: the Colne, Ver, Gade, Bulbourne, Chess, Misbourne, and Pinn. These drain in a south-easterly and southerly direction. They are typical chalk streams and their sources are subject to seasonal and annual climatic variations The Colne catchment receives an average annual rainfall of 716 mm

The most at risk areas within the upper reaches of the Colne, commonly impacted by fluvial flooding, are Colney Heath, Watford and London Colney. The most severe flood event from the River Colne occurred in the Winter of 2000/2001 where 20 properties and roads were inundated for several days in Watford Properties in London Colney and Colney Heath were also severely flooded. The Misbourne, Chess & Ver flooded several properties throughout the 2001 winter, due to very high groundwater levels giving rise to exceptionally high river levels demonstrating the important and unique interplay between the rain fall and the groundwater. Historical records show that flooding along River Colne is primarily caused by intense storms and high rainfall in conjunction with the impermeable clay catchment. The lower reaches of the Colne are a much more complex and urban system and is characterised by braided river systems, multiple channels, watercourses, and lakes (where a majority have resulted from the industrial history in the area mainly from gravel extraction) The most at risk areas of flooding within the lower reaches of the Colne are Staines Upon Thames, Uxbridge, West Drayton, and Poyle. The catchment has been subject to a significant number of flood improvement works in the past

In previous studies, the Lower and the Upper Colne reaches have been looked at separately. Most recently the Lower Colne Improvement Scheme Overview (Sep 2019, ATPEC), and in previous years the Upper Colne Flood Risk Management Strategy (Jun 2005, Halcrow), and a Lower Colne Improvement Scheme (Nov 1995). Consequently, there is limited understanding of current river behaviour and flood risk issues across the whole catchment, or potential effects of schemes on other parts of the river system.

Figure 1: River Colne Catchment



Outcome Specification

The *Consultant* shall prepare a report outlining any gaps in the data required for delivery of a strategic appraisal of the Colne Catchment. To achieve this:

The *Consultant* shall review the data sets required to develop a strategy for the catchment, including, but not limited to reviewing existing modelling/environmental data and reports for the catchment at a high level, and consequently what further data will need to be collected, or if further reviews are necessary

The *Consultant* shall present the current understanding of the flood processes operating in the catchment, as well as historic and current flood management, and identify potential gaps current and future

The *Consultant* shall produce a FBC that enables the *Client* to progress with producing the Integrated Colne Catchment strategy

Exclusions

The PSC specifically excludes the following:

a) The *Consultant* will not engage with stakeholders unless agreed with the *Client*.

b) No new survey work to be undertaken unless agreed with the *Client*

2 Drawings, site information or reports already available

There is a large amount of existing information and reports covering the catchment area. A selection of reports is listed in Appendix 2

3. Specifications of standards to be used

a) As specified in the Minimum Technical Requirements.

4 Constraints on how the *Consultant* provides the *services*

a) The overall management of the commission by the *Consultant* shall include for the following for its duration:

- On-going management of project risk and programme reviews to achieve the scope.
- The *Consultant* is to make full use of the *Client's* web based project collaboration tool (currently Asite) Whenever practical all project and contract communications and records are to be distributed and stored using this project collaboration tool.
- Attend and chair regular progress meetings with the *Client*. The *Consultant* will be responsible for producing meeting minutes and distributing them to all the attendees within one week.
- The proposed structure and broad content of all product documents is to be agreed with the *Client* prior to embarking on drafting the main text.
- Assume all product outputs will be reviewed twice by the *Client* (i e an initial review and confirmation of changes). Allow a minimum of two weeks on each occasion for the *Client* to review, collate and return comments.

- Ensure that all the original data sent to the *Consultant* (i e all model and survey information provided by the *Client*, which is classed as commercially sensitive, is returned to the *Client* in an encrypted format using WinZip 128 bit encryption and deleted from the *Consultants* electronic filing systems

- Ensure that project deliverables such as model files, survey data or anything of a personal nature such as questionnaires or address data is returned to the *Client* in an encrypted format using WinZip 128 bit encryption.

- The *Consultant* will lead and write up a lessons learnt workshop at the end of this contract.

b) The data custodian for project deliverables from this commission will be the *Client.* The copyright and intellectual property rights of all reports, data, maps, models and other products in hard copy and digital format produced by the *Consultant* as part of the project shall be owned solely by the *Client.* Copyright of existing data will remain with the data provider.

5. Requirements of the programme

a) The programme to be produced by the *Consultant* using MS Project, complies with the requirement of Clause 31 and also includes alignment and submission of the BEP and Master Information Delivery Plan (MIDP)

b) The programme is to include an indicative timeline from Gateway 0 through to Gateway 6 for delivery of the Colne Catchment Strategy

6. Services and other things provided by the *Client*

a) Access to the Asite project collaboration tool.

b) Access to data or information held by the *Client* that is relevant to the study

Appendices

Appendix 1 BIM Protocol Production and Delivery Table

All *Client* issued information referenced within the Information Delivery Plan requires verifying by the *Consultant* unless it is referenced elsewhere within the Scope.

www.Pow.bim4.info

Appendix 2 Existing Information and Reports

Upper Colne Data

The 2010 report states a reasonable record of flood history in the catchment. Focus was made on the most recent flood events due to data availability As the report was completed in 2010 flood history will need updating to account for the most recent years up to the 2020 water year.

Original in channel survey covered the periods of 1986 2002 and did not include many of the Upper Colne tributaries. In order to develop a comprehensive model new survey was conducted in 2008 to 2010 The oldest survey is for the River Chess taken in January 2008 with the latest for Colney Heath taken in January 2010.

LiDAR varies in resolution from 0 5m to 2m throughout the model, however for such a large area the resolution is good. Dates also vary between 2003 and 2009 (Table 6-1). The *Consultant* is required to check the DEFRA LiDAR data catalogue to find more up to-date LiDAR to better represent the River and surrounding flood plains.

Table 6-1 Lidar coverage of the River Colne

Year	Resolution	Location
2003	1m	River Colne mainstream
2004	1m	Upper reaches of the Colne
2005	2m	Harsbourne and Denham
2007	0 5m	Mimmshall Brook
2008	0.5m	Denham
2009	1m	Watford and Gade

NFCDD and formal defence structures are identified and included in the model as

- Raised walls, including demountable walls
- Flood embankments
- Barriers and barges
- Flood storage areas

Information about the defences is presented and stated to be from the EA with the specifics extracted from the National Flood Defence Database (NFCDD).

Checks will need to be completed on the survey data to make sure that the flood defences are still relevant and up to-date Additional formal flood defences added past 2012 will also need to be included into the hydraulic model.

Available data – To be treated as site information

All datasets supplied for the project must be returned to the *Client* upon project completion Datasets returned should adopt the appropriate security marking, be password protected/encrypted in accordance with the latest government guidelines Data that will be made available to the *Consultant* include:

Location	Station name	Station number	River	Period	Type
2890 Mimshall	Mimshall	2890TH	COLNE		Level gauge
2810 Warrengate	Warrengate	2810TH	COLNE		Level gauge
2814 London Coleny	London Colney	28154TH	COLNE		Leve gauge
2819 Conley St	Colney St	2819TH	COLNE		Flow gauge
2830 Berrygrove	Berrygrove	2830th	COLNE		Flow gauge
2849 Croxley Green	Croxley Green	2849TH	COLNE		Flow gauge
2859 Rickmansworth	Rickmansworth	2859TH	COLNE		Flow gauge
2879 Misbourne	Misbourne	2879TH	MISBOURNE		Flow gauge
2879A Misbourne side channel	Misbourne	2879ATH	MISBOURNE		Flow gauge
2870 Denham	Denham	2870TH	COLNE		Flow gauge
240201 Runley Wood PS	Runley Wood	240201TP			Rain gauge (Tipping bucket)
240350 Wheatham Pstead SW	Wheatham	240350TP			Rain gauge (tipping bucket)
999904TP Stanmore Golf club	Stanmore	999904TP			Rain gauge (Tipping bucket)

Asset data types

Types	Other details
Raised defences – walls/embankments	

Flood history information

Event data	Location	Data type	Other Details	Known data quality issues
January 2000	Upper Colne	Flood extent, Flood report		
October 2000	Upper Colne	Flood extent, Flood report		
February 2001	Upper Colne	Flood extent, Flood report		
January 2002	Upper Colne	Flood extent, Flood report		
December 2002	Upper Colne	Flood extent, Flood report		
January 2003	Upper Colne	Flood extent, Flood report		
February 2009	Upper Colne	Flood extent, Flood report		
December 2009	Upper Colne	Flood extent, Flood report		
January 2011	Upper Colne	Flood extent, Flood report		
April 2012	Upper Colne	Flood extent, Flood report		
June 2012	Upper Colne	Flood extent, Flood report		
January 2014	Upper Colne	Flood extent, Flood report		
February 2018	Upper Colne	Flood extent, Flood report		

Existing model summary – Fluvial hydraulic

Model name	Date	Length of modelled watercourse (km)	Hydraulic model type	Other type	Description	Information only or to be updated
Upper Colne SFRM study. Hydraulic modelling and mapping final technical report	2010		ISIS 3.3/ Tuflow 2009-07-AE			Update

River Pinn Data

The River Pinn has had several recorded floods over the last 40 years, including August 1977 and May 1988, with some minor flooding was observed in February 2014. The area surrounding Kings College playing fields also experiences occasional flooding, mostly likely due to high groundwater levels and ditches being unable to discharge freely into the River Pinn. Flooding can occur at Zodiac Business Park and residential properties at Yiewsley, Uxbridge The hydraulic constraint created by the twin siphons running underneath the Grand Union canal are thought to contribute to flood risk as a result of water 'backing' up behind these structures.

It appears that ground water is having a large effect on flooding in the area The underlying clay will mean that the ground is impermeable and infiltration will be limited.

The River Pinn Modelling and Initial Assessment (2008) study reviewed the available information at the time and specified new survey information (collected in 2006 by Longdin & Browning). This data was quality checked via various means, with the report stating that *during the Inception Phase of the study in 2006, a detailed assessment of existing topographic data was completed. Data gaps and uncertainties in data quality were addressed, and as a result a survey was carried out by Longdin & Browning.* The 2008 report goes on to clarify that each dataset used the datum Ordnance Datum Newlyn and that all the existing survey in the Pinn catchment is based on comparable height systems

A survey conducted by JAB in 2016 highlighted the critical components from the survey that should be added into the model.

Pre 2006 collected survey

Survey	Date	Location	ID	Justification
09023	2006	PINN: HATCH END - UPSTREAM FACE OF RAILWAY CULVERT (SOUTH OF HAROW ARTS CENTRE) TO D/S FACE OF NEW CULVERT SOUTH SIDE OF UXBRIDGE ROAD	SR1h	The 19 no. sections available in this area represent conditions following de-culverting of the watercourse. The current model with therefore not be representative of the current conditions
09034	2006	WOODHALL GATE DITCH: CONFLUENCE WITH WOODRIDINGS STREAM (INSIDE CULVERT) TO PINNERWOOD	SR0b	Implementation of this survey is required to meet the study objective of modelling Woodhall Gate Ditch (not currently modelled)
09040	2006	PINN:SECTIONS AROUND UXBRIDGE RAILWAY BRIDGE (6)	SR1i	An FSA has previously been considered here in options assessment, and may be considered going forward in this study The culvert is likely to influence conveyance of flows both upstream and downstream of the railway line

Pre 2007 collected survey

Survey	Date	Location	ID	Justification
09023	2006	PINN: HATCH END UPSTREAM FACE OF RAILWAY CULVERT (SOUTH OF HAROW ARTS CENTRE) TO D/S FACE OF NEW CULVERT SOUTH SIDE OF UXBRIDGE ROAD	SR1h	The 19 no sections available in this area represent conditions following de-culverting of the watercourse. The current model with therefore not be representative of the current conditions.
09034	2006	WOODHALL GATE DITCH: CONFLUENCE WITH WOODRIDINGS STREAM (INSIDE CULVERT) TO PINNERWOOD	SR0b	Implementation of this survey is required to meet the study objective of modelling Woodhall Gate Ditch (not currently modelled)
09040	2006	PINN: SECTIONS AROUND UXBRIDGE RAILWAY BRIDGE (6)	SR1i	An FSA has previously been considered here in options assessment, and may be considered going forward in this study The culvert is likely to influence conveyance of flows both upstream and downstream of the railway line.

Survey collected post 2006

Survey	Date	Location	ID	Justification
10423	2010	Level of flood defence at Brook Drive	SR0d	Including this defence will mean the model contains the best representation of the defences, which need to be schematised in the 1D-2D approach. This will provide greatest confidence in mapped outputs and derivation of SoP.
10654	2010	OXHEYLANE FARM FSA AS BUILT PHASE 2 AND 3	SR2	Located at the upstream extent of Woodridings Stream, the influence of this FSA on flood risk downstream is noted as being large. The FSA area and feeding channels extends upstream beyond the scope of the current modelling. Accounting for this structure in hydrological modelling would be extremely difficult. Therefore without modelling the FSA, predicted flooding in the area is unlikely to be representative.
11373	2012	WAXWELL LANE FWS (2802)	SR1k	Currently no survey section is implemented within the hydraulic model at the gauging site itself. This will be used to assess model performance and potentially used to inform flood warning and levels etc going forward
11374	2012	AVENUE ROAD FLOOD WARNING SITE (2803)	SR1l	This gauging site will be used to assess model performance and potentially used to inform flood warning and levels etc going forward, so it is important to include the most up to date representation of this site
11375	2012	MOSS CLOSE FLOOD WARNING SITE (2886)	SR1 m	This gauging site will be used to assess model performance and potentially used to inform flood warning and levels etc going forward, so it is important to include the most up to date representation of this site.
11756	2014	George V Reservoir FSA: Level of the wall which acts as a spill implemented within the 2D domain via a Z Line	SR3b	Implementing the level of the wall will provide the most reliable estimates of overtopping of the FSA if this is predicted to occur

11974	2014	CROSS SECTION AND GAUGE BOARD AT EASTCOTE ROAD FWS	SR1o	Modelled and survey discrepancies are large. This gauging site will be used to assess model performance and potentially used to inform flood warning and levels etc going forward
11975	2014	CROSS SECTION AND GAUGE BOARD AT HERCIES ROAD FWS	SR1p	Modelled and survey discrepancies are large This gauging site will be used to assess model performance and potentially used to inform flood warning and levels etc going forward, so it is important to include the most up to date representation of this site
11976	2014	CROSS SECTION AND GAUGE BOARD AT SWAKELEYS ROAD FWS	SR1q	Modelled and survey discrepancies are large at the parapet, which could affect predicted water levels This gauging site will be used to assess model performance and potentially used to inform flood warning and levels etc going forward, so it is important to include the most up to date representation of this site
11977	2014	CROSS SECTION AND GAUGE BOARD AT RUISLIP FWS	SR1r	Modelled and survey discrepancies are large This gauging site will be used to assess model performance and potentially used to inform flood warning and levels etc going forward, so it is important to include the most up to date representation of this site

Third party surveys

Survey	Date	Location	ID	Justification
Ladygate Lane culvert trash screen	2013		SR4a	The new trash screen, and the culvert itself, have been identified as a key items of infrastructures and updates are required to represent the up to date case.
Ladygate Lane / Breakspear Road CCTV survey (Mad Bess Brook)	2014		SR4b	This culvert has been identified as a key item of infrastructure, with an overland flow route from upstream identified Additionally, consideration is to be given to the benefits of an FSA upstream. Updates are required to represent the up to date case.
Ruislip Lido Auxiliary spillway capping details	2012		SR4d	This is a fundamental part of the operation of Ruislip Lido and would need to be included to represent the up to date case

Gade & Bulbourne Data

LIDAR data used to inform ground levels within the study area was flown in 7th March 2005 and is available at a 2m resolution. Developments and changes in ground levels are expected to have occurred since this time, most notably at the new development at Nash Mill (River Gade catchment) and the area between Billet Lane and Park Street in the River Bulbourne catchment.

Locks along the Grand Union Canal were modelled closed and it was assumed there is no leakage through these structures. In reality there will be losses at each loch and they might be operated during flood events, which have not been accounted for

Three gauges maintained by the Environment agency have been highlighted in the Gade and Bulbourne catchment, including Bury Mill, Two Waters and Croxley Green

Future improvements to the flow estimates along the study reach could be made with the provision of additional hydrometric data, particularly on the ungauged tributaries, to improve also the representation of the shape of the hydrographs on these tributaries and the intervening areas across the study area

It was not deemed suitable to use any of the gauges in the catchment for the FEH statistical analysis apart from Bury Mill gauging station, as other sites have lower quality gauged records

It was not possible to utilise all the gauges located within the catchment as a QMED donor, as the other three gauges have lower quality flow records.

Location	Station name	Station number	River	Period	Type
	Bury Mill		River Gade		15 minuet Stage gauge
	Two waters		River Bulbourne		15 minuet Stage gauge
	Croxley gauge		River Gade		15 minuet Stage gauge

Asset data types

Types	Other details
Raised defences – walls/embankments	

Flood history information

Event data	Location	Data type	Other Details	Known data quality issues
October 1993	River Gade	Flood extent, Flood report		
January 1999	River Gade	Flood extent, Flood report		
October 2000	River Gade	Flood extent, Flood report		
February 2009	River Gade	Flood extent, Flood report		
November 2012	River Gade	Flood extent, Flood report		
January 2014	River Gade	Flood extent, Flood report		
February 2014	River Gade	Flood extent, Flood report		
September 2016	River Bulbourne	Flood extent, Flood report		

Existing model summary – Fluvial hydraulic

Model name	Date	Length of modelled watercourse (km)	Hydraulic model type	Other type	Description	Information only or to be updated
Gade and Bulbourne flood modelling study	2016		ISIS 3 7/ Tuflow 2013-12-AD			Update