

The Network Rail (Cambridge South Infrastructure
Enhancements) Order

Proof of Evidence Sue Brocken (NRE5.2)



NRE 5.2

Proof of Evidence – Drainage

Mrs Sue Brocken

(Inquiries Procedure (England & Wales) Rules 2004)

January 2022

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Contents

Section	Page
acronyms and abbreviations	1
Glossary	3
1 Introduction	5
1.1 Qualifications and Experience	5
1.2 Involvement with the Project	5
1.3 Scope and Structure of Evidence	5
2 The CSIE Project	7
2.1 Overview	7
2.2 The CSIE Project Site	8
2.3 The Study Area and Water Features	9
2.4 Existing Surface Water Drainage Infrastructure	12
3 Flood Risk and Drainage Policy Context	16
3.1 Introduction	16
3.2 National Policy	16
3.3 Local Policy	17
4 Engagement with Stakeholders	21
4.1 Key Stakeholder Involvement	21
5 Summary Flood Risk and Drainage Work Undertaken Pre-Submission	30
5.1 General	30
6 Design Post TWAO application	32
6.1 General	32
6.2 Proposed Track Drainage- South of Station	33
6.3 Proposed Track and Station Drainage- West Side	34
6.4 Proposed Track and Station Drainage- East Side	34
6.5 Interface with Existing Features	36
6.6 AstraZeneca (AZ) Swale and Outfall	37
6.7 Mid Attenuation Basin	40
6.8 CSET route/ Southern Track Drainage Pond Interface	41
6.9 University of Cambridge Swale and Outfall Interface	42
6.10 MRC Swale Interface	44
7 Methodology for the Assessment of Effects on the Water Environment	47
7.1 Assessment Overview	47
7.2 Methodology Overview	47
7.3 CSIE Surface Water Drainage Principles	48
7.4 Significance Assessment Criteria	49
7.5 FRA Methodology	53
8 Flood Risk and Surface Water Drainage Effects During Construction	58
8.2 Construction Approach and Mitigation of Construction Effects	58
8.3 Assessment of Effects	59
9 Flood Risk and Surface Water Drainage Effects During Operation	62

Proof of Evidence Sue Brocken (NRE5.2)

9.2	Scheme Design and Mitigation of Operational Effects	62
9.3	Assessment of Effects	64
9.4	Cumulative Effects	65
9.5	CSET Scheme	65
10	Responses to Objections	67
10.2	Objections	67
11	Conclusions	81
12	Declarations	83
	Appendix A	84

Appendices

Appendix A	Record of Review of Drainage Proposals by Aecom	84
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List of Figures

Figure 2-1 - Proposed location of Cambridge South Station	9
Figure 2-2 - Surface Water Features	10
Figure 2-3 - Hobson's Brook, North and South Ditch (also showing the mapped extents of the Environment Agency's Risk of Flooding from Rivers and the Sea Map)	11
Figure 2-4 - Existing Surface Water Drainage Features (red dash lines indicating swales/ditches)	13
Figure 2-5 - CBC Development Plot Drainage	14
Figure 6-1 - Track Drainage Pond	33
Figure 6-2 - West Side Station Drainage	34
Figure 6-3 – Geocellular Sub Surface Storage Solution	35
Figure 6-4 - East Side Station Drainage	36
Figure 6-5 - Stakeholder Swales	37
Figure 6-6 – AZ Boundary Swale	38
Figure 6-7 – Interface Between AZ Swale and Footbridge Foundation	38
Figure 6-8 – AZ Attenuation Assets (Below Swale)	39
Figure 6-9 - AZ Sub-Surface Tank Attenuation Storage	39
Figure 6-10 - AZ Surface water discharge route diversion	40
Figure 6-11 UoC Temporary Connection to Track Network	43
Figure 6-12 UoC and Track Network Discharge to Pond	43
Figure 6-13 - Existing MRC Swale and Discharge	44
Figure 6-14 – Schematic solution for pipe below NR Authorised Access Point	46
Figure 7-1 - Topography of the North Ditch Catchment	54
Figure 7-2 - Modelled extent of the North Ditch	56

List of Tables

Table 4-1- -Summary of Pre TWAO Submission Consultation.....	21
Table 4-2 - Summary of Post TWAO Submission Consultation	25
Table 6-1- North Ditch Peak Flow Estimate	32
Table 7-1 – Estimated Surface Water Storage Requirements	49
Table 7-2 - Criteria for Estimating the Importance (or Sensitivity) of Water Environment Attributes	50
Table 7-3 - Summary of Value of Water Environment Receptors and their Attributes	50
Table 7-4 - Criteria for Determining the Magnitude of Impact on Water Environment Receptors	52
Table 7-5 - Significance of Effect Matrix.....	53
Table 8-1 - Assessment Summary – Construction Effects	60
Table 9-1 Assessment Summary – Operational Effects	64

ACRONYMS AND ABBREVIATIONS

Acronyms and Abbreviations Description	
AAR	Addenbrookes Access Road
AEP	Annual Exceedance Probability
BGS	British Geological Survey
CBC	Cambridge Biomedical Campus
CBCTS	Cambridge Biomedical Campus Transport Strategy
CCiC	Cambridge City Council
CCoC	Cambridgeshire County Council
CGB	Cambridgeshire Guided Busway
CPCA	Cambridgeshire and Peterborough Combined Authority
CSET	Cambridge South East Transport
CSIE	Cambridge South Infrastructure Enhancements
DfT	Department for Transport
EA	Environment Agency
EIA	Environmental Impact Assessment
ES	Environment Statement
EWR	East West Rail
FRA	Flood Risk Assessment
GCP	Greater Cambridge Partnership
GRIP	Governance of Railway Investment Projects
LLFA	Lead Local Flood Authority
LiDAR	Light Detecting and Ranging
LPA	Local Planning Authority
NPPF	The National Planning Policy Framework
OWC	Ordinary Watercourse Consent
PPG	Planning Policy Guidance

Acronyms and Description Abbreviations	
RBMP	River Basin Management Plan
SCDC	South Cambridgeshire District Council
SuDS	Sustainable Drainage Systems
SPD	Supplementary Planning Document
TWAO	Transport and Works Act Order
UoC	The University of Cambridge
WAML	West Anglia Main Line
WFD	Water Framework Directive

GLOSSARY

Term	Description
Exceedance Flows	Excess flow that appears on the surface once the conveyance capacity of the system (watercourse, waterbody or piped system) is exceeded
Freeboard	The distance between the water level and the top of bank height of a watercourse during a flood event.
LiDAR	Light Detection and Ranging. A remote survey technique using laser to determine the earth's surface.
Q95	The 5 percentile flow: The flow in cubic metres per second which was equalled or exceeded for 95% of the flow record. The Q 95 flow is a significant low flow parameter particularly relevant in the assessment of river water quality consent conditions.
Reach	In practical use, a reach is any length of a stream or river
RBMP	A strategic plan for achieving sustainable use of water and to protect and improve surface waters, groundwater and coastal waters within a river basin district (RBD)
Swale	A vegetated depression which slows the flow of water, stores and treats rainfall run off while draining through the site, and which encourages biodiversity.

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1 Introduction

1.1 Qualifications and Experience

1.1.1 I am Sue Brocken, a Principal Engineer with Arcadis Consulting (UK) Limited. I have been retained by Network Rail to provide specialist advice on flood risk and surface water drainage matters pertaining to the Cambridge South Infrastructure Enhancements (CSIE) Project.

1.1.2 I hold a BEng in Civil Engineering and am a Chartered Member of the Institution of Civil Engineers with 23 years' experience in the rail, highway and water sectors of the construction industry. In particular I have over 10 years' experience as a drainage engineer in the design of surface water drainage systems on various railway schemes.

1.2 Involvement with the Project

1.2.1 My initial involvement in the CSIE Project was in March/ April 2019 when Arcadis were involved in the early optioneering process for the location of the station. My input related to an initial high-level review of areas at risk of flooding along the rail corridor prior to the development of station location options. I had no further involvement until May 2021 at the commencement of outline design. Unfortunately, those who were involved with the design of the proposed system during previous design phases are no longer available. I am responsible for the current and future detailed design phase. Therefore, as part of the team progressing the current phase of drainage design, I have been commissioned to provide evidence to the inquiry.

1.3 Scope and Structure of Evidence

1.3.1 I will provide evidence on all drainage and flood risk matters including:

1. Description of the Project and study area, including water environment and existing surface water drainage features (Section 2);
2. How the proposed scheme will meet the principal objectives of national, regional and local flood risk and drainage policies (Section 3);
3. Details of engagement with stakeholders pre and post TWAO submission (Section 4);
4. Flood risk and drainage design development work undertaken pre TWAO submission (Section 5)
5. Details of design development work undertaken since TWAO submission (Section 6);

Proof of Evidence Sue Brocken (NRE5.2)

6. A summary of the methodology for the flood risk and drainage assessment work (Section 7);
7. The potential flood risk and drainage impacts and effects of the CSIE Project during the construction phase, the mitigation proposed, and any residual effects anticipated (Section 8);
8. The potential flood risk and drainage impacts and effects of the CSIE Project during the operational phase, the mitigation proposed, and any residual effects anticipated (Section 9);
9. Responses to objections to the CSIE Project so far as they relate to flood risk and drainage issues (Section 10); and
10. My conclusions as to the significance of the main residual effects on flood risk and drainage (Section 11).

1.3.2 My evidence will deal with the drainage related issues identified at points 3, 5 and 7 of the Secretary of State's Statement of Matters dated 27 October 2021.

2 The CSIE Project

2.1 Overview

2.1.1 This section provides information on the CSIE Project, briefly describing the components of the Project, and its location and setting. Existing surface watercourses and their catchments are described, and information is presented to characterise the existing drainage infrastructure that serves development neighbouring the CSIE Project site.

2.1.2 A full description of the CSIE Project is set out in the Proof of Evidence of Mr Barnes (NRE1.1). What follows is a summary of the key points relevant to drainage, providing context for my evidence.

2.1.3 The CSIE Project will deliver a new passenger railway station and associated infrastructure required to maintain capacity and train performance. Key elements of this comprise:

1. A new railway station comprising a two-storey station building, ticket office and ticket vending machines with four platform faces including forecourts, pedestrian and cycle access paths, new interchange for taxi and pick up/drop off points, cycle parking spaces, and limited parking for staff/contractors and blue badge holders, together with associated works. The new station will be located between the Cambridge Biomedical Campus (CBC) and Hobson's Park and bordered to the north by the Cambridge Guided Busway.
2. Surface water drainage works consisting of pipework and SuDS features e.g., ponds, swales.
3. Introduction of 2 additional loop lines on the West Anglia Main Line (WAML) for the purpose of enabling trains to access the eastern and western platforms in the area of the new station and associated Overhead Line Equipment and signalling.
4. Track replacement/modification/additional loop line to the WAML.
5. New permanent rail systems compound and associated works to the south-west of Addenbrooke's Road (Nine Wells Bridge);
6. Replacement open space provision.

2.1.4 The station is proposed to be built in phases, whilst maintaining the current live operational railway.

2.2 The CSIE Project Site

- 2.2.1 The application site boundary covers an area of approximately 46.5ha and lies within and adjacent to the existing railway corridor from Hills Road overbridge in the north and Shepreth Branch Junction to the south (see Figure 2-1below). The site is located immediately west of the CBC. The CSIE Project is located in the administrative areas of Cambridge City Council (CCiC) and South Cambridgeshire District Council (SCDC). The southern part of the site is also located within the parish of Great Shelford.
- 2.2.2 The CSIE Project site is generally flat and contains the existing railway line. The eastern portion of the site is bordered by the CBC and is mainly occupied by associated buildings, hard standing areas and car parks. The proposed eastern station forecourt connects to Francis Crick Avenue. To the south of the CBC lies Addenbrooke's Road which forms the junction of Francis Crick Avenue and Dame Mary Archer Way. Within adjacent land, south of Dame Mary Archer Way is Abcam Plc, associated storage yards and car parking. The area further to the south is occupied by arable farmland.
- 2.2.3 The majority of the western portion of the CSIE Project site lies within Hobson's Park which is greenfield in nature and contains Hobson's Park Nature Reserve. Arable farmland lies to the south of Addenbrooke's Road.

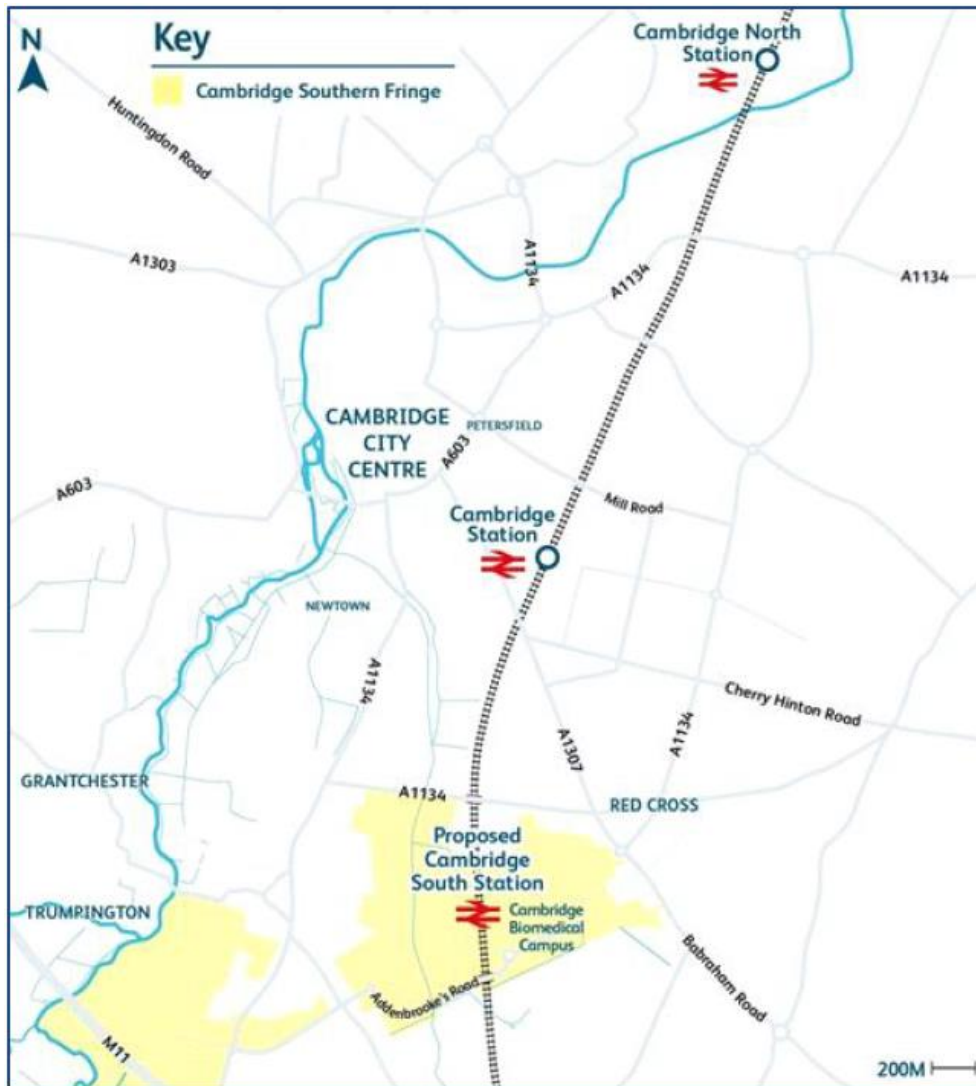


Figure 2-1 - Proposed location of Cambridge South Station

2.3 The Study Area and Water Features

2.3.1 The CSIE Project is located within the Hobson's Brook catchment, which has an area of approximately 12km². Hobson's Brook rises in Nine Wells Spring, a Local Nature Reserve, and flows generally northwards and parallel with the railway line. Downstream of its crossing with Long Road, the watercourse splits into Hobson's Conduit and Vicar's Brook. Hobson's Conduit supplies water to the Cambridge University Botanic Garden and the city of Cambridge further downstream. Vicar's Brook discharges to the River Cam approximately 2km downstream of the Long Road crossing and 4km downstream of Nine Wells. These features are illustrated in Figure 2-2 below.

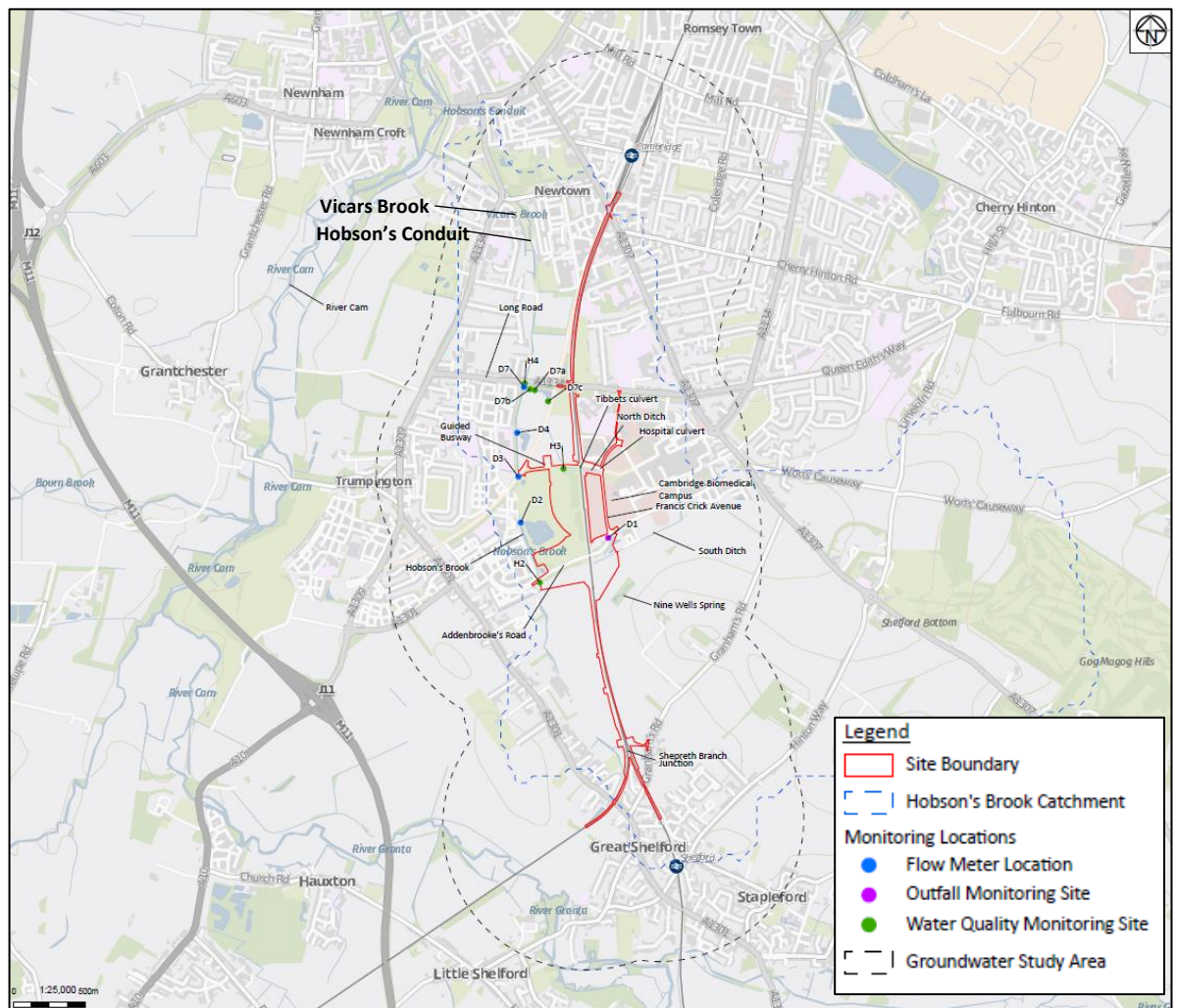


Figure 2-2 - Surface Water Features

2.3.2 As illustrated in Figure 2-3, there are two other key drainage routes within the site boundary, the North Ditch and the South Ditch, both of which discharge to Hobson's Brook, and both comprise culverted and open channel reaches. The local topography directs runoff to these two ditches which also receive attenuated surface water discharges from neighbouring areas of development, including the CBC. The North Ditch drains a large proportion of the existing hospital site, with the extent of its catchment illustrated in Figure 7-1. It falls to the west, is culverted beneath the railway in Tibbets culvert and outfalls to Hobson's Brook approximately 400m downstream and further west.

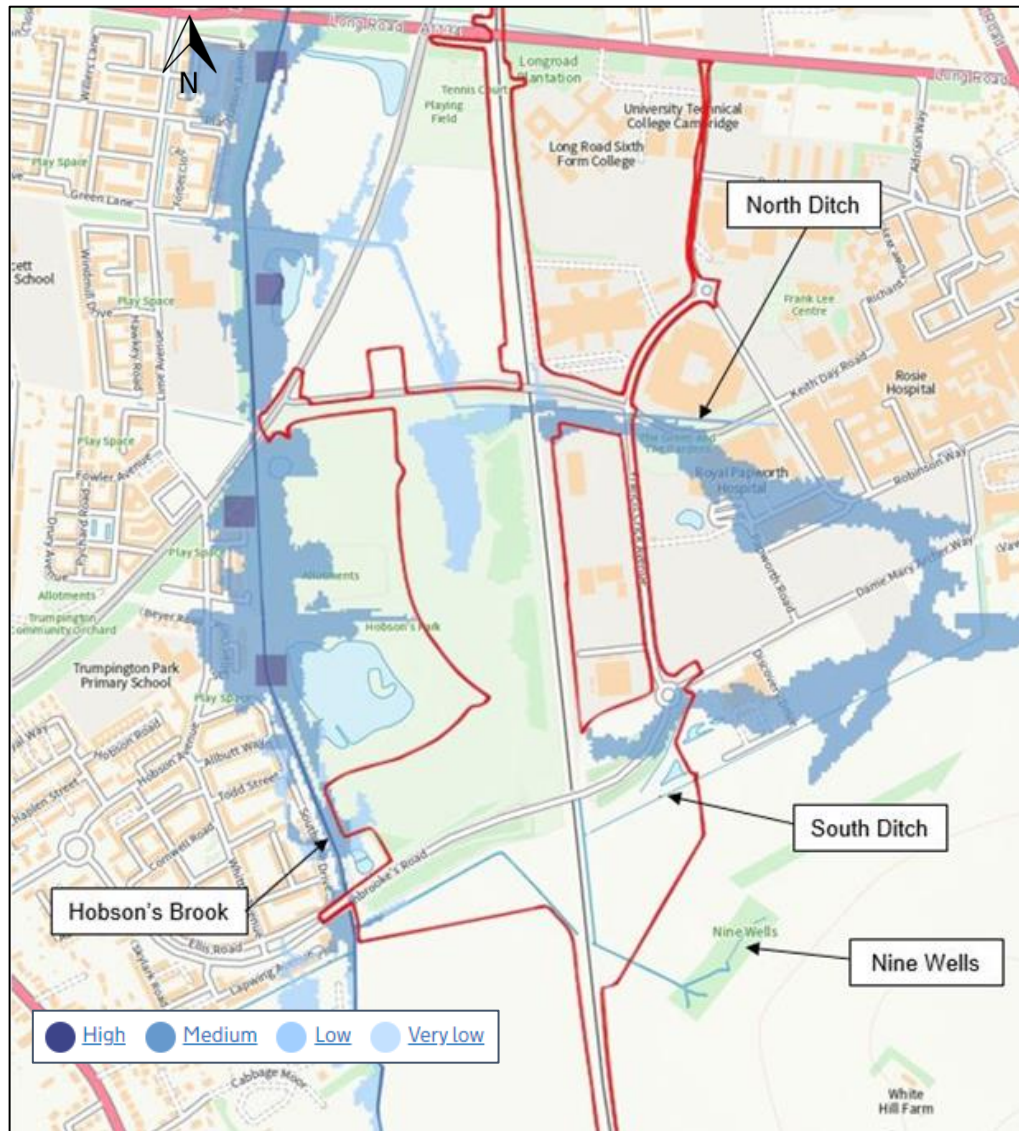


Figure 2-3 - Hobson's Brook, North and South Ditch (also showing the mapped extents of the Environment Agency's Risk of Flooding from Rivers and the Sea Map)

- 2.3.3 The South Ditch also falls to the west and then south to discharge to the Hobson's Brook and receives discharges of attenuated surface water runoff from the CBC, as well as runoff from a small, rural catchment to the south east of the CBC site.
- 2.3.4 Except for the River Cam, which is an Environment Agency (EA) designated main river, the other watercourses are designated as Ordinary/Awarded watercourses and as such are the responsibility of Cambridge City Council (CciC) and the Hobson's Conduit Trust (HCT). Both parties have been consulted regarding new surface water drainage discharges to the Brook, as described in Section 4.

Proof of Evidence Sue Brocken (NRE5.2)

- 2.3.5 The EA Risk of Flooding from Rivers and the Sea map, the outputs from which are illustrated in Figure 2-3, identifies the North Ditch as a potential source of fluvial flood risk. However, consultation with the EA, detailed in Section 4, has confirmed that the mapped Flood Zones in the study area have been derived through a coarse, generalised modelling approach which produces flood mapping that cannot be relied on to inform site-specific flood risk assessments. The work undertaken to address this data limitation and the outputs of the work undertaken are described in Section 7.

2.4 Existing Surface Water Drainage Infrastructure

- 2.4.1 Existing development within the study area is served by a network of surface water drainage infrastructure. Key features are described in this section.
- 2.4.2 The existing drainage network for the CBC is served by a series of Sustainable Drainage Systems (SuDS), ditches and gullies which have been designed to receive and attenuate flows from the wider surface water drainage system of the Campus. Each of the development plots manage surface water locally before discharging to the North or South ditches or one of three attenuation basins. Key features of the existing surface water drainage network are shown in Figure 2-4 below. The attenuation basins (situated north, middle and south) are part of the existing CBC drainage system and have been designed to accommodate runoff generated in the 1% annual chance plus 20% climate change allowance storm event. During more extreme rainstorm events that exceed the storage capacity and freeboard of the systems, landscaped areas which surround the basins have been designed to receive exceedance flows and retain the waters.
- 2.4.3 The drainage ditches and attenuation basins within the existing drainage system are surrounded by swales (vegetated depressions) which encourage infiltration of surface water runoff into the ground before it reaches the ditches and basins. In some parts of the drainage network, such as the AstraZeneca site to the south and east, surface water drainage is attenuated in underground tanks.

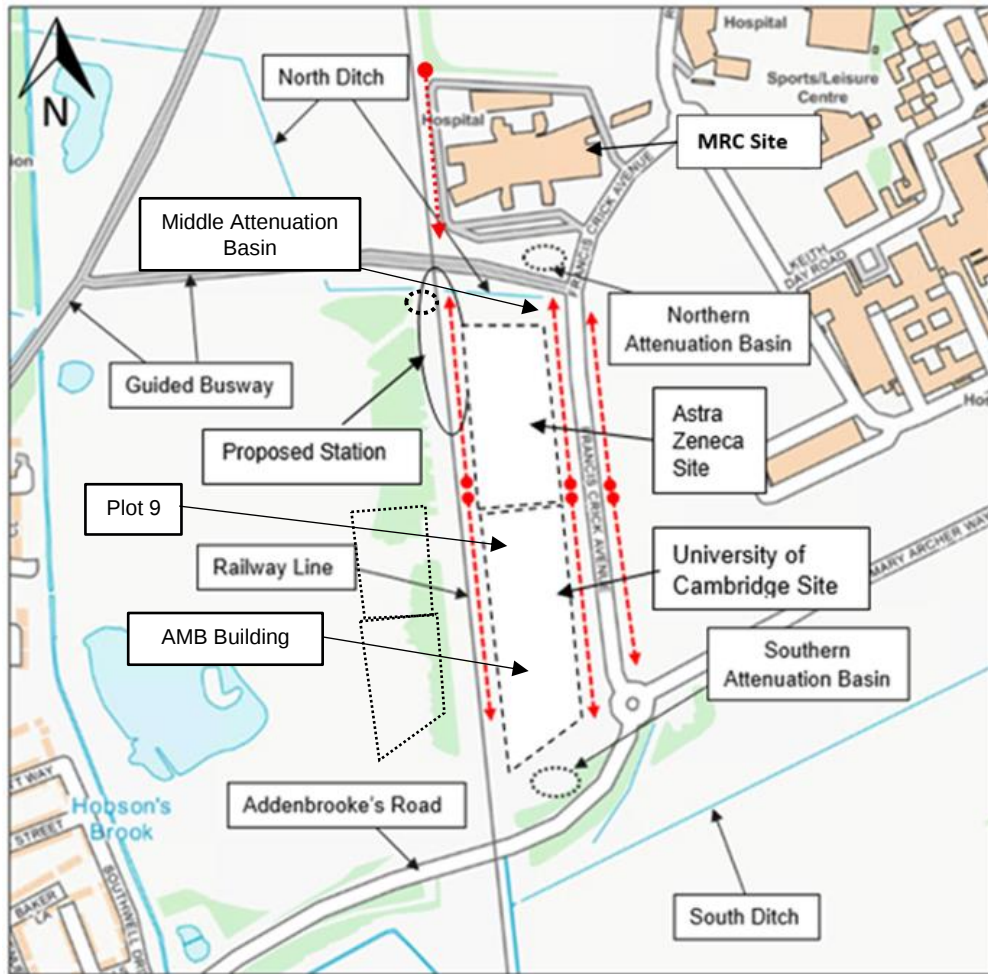


Figure 2-4 - Existing Surface Water Drainage Features (red dash lines indicating swales/ditches)

- 2.4.4 The North and Mid Attenuation Basins receive flows from Francis Crick Avenue, and ultimately discharge, via flow control structures FC1 and FC2, to the North Ditch which conveys flows to Hobson's Brook approximately 600m downstream of these flow control structures. Figure 2-5 shows the location of the flow control structures, which are described in greater detail below. The discharges are permitted under the HCT covenants, which are legal agreements that permit or prevent actions that have potential to impact on flow in the Hobson's Brook (see 3.3.10 for further details), and an Environment Agency discharge consent is held by Cambridge University NHS Foundation Trust.
- 2.4.5 Surface water drainage from the AZ site to the south and east of the proposed station is via a combination of underground tanks and a swale at the western limits of the site alongside the existing railway boundary. A flow control device limits discharge from the AZ site to 2 l/s/ha prior to combining with the outlet from the Mid Attenuation Basin in an additional flow control chamber (FC2) before discharging into the North Ditch. The AZ swale and discharge pipework is a direct

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interface with the CSIE Project proposals Due to the location of the AZ flow control within the AZ site boundary, it is understood that the Mid Attenuation Basin storage is required to provide attenuation for the Francis Crick Avenue catchment only.

2.4.6 Attenuation for runoff from Francis Crick Avenue is based on an allowable discharge rate of 3 l/s/ha based on a 1% annual chance storm event. Runoff from adjacent development plots includes a 20% allowance for climate change and is attenuated to sustain an allowable discharge rate of 2 l/s/ha hectare based on a 1% annual chance storm event.

2.4.7 The south attenuation basin discharges, via a flow control structure, to the South Ditch, which discharges to Hobson's Brook approximately 200m downstream of this flow control structure FC3, as shown in Figure 2-5.

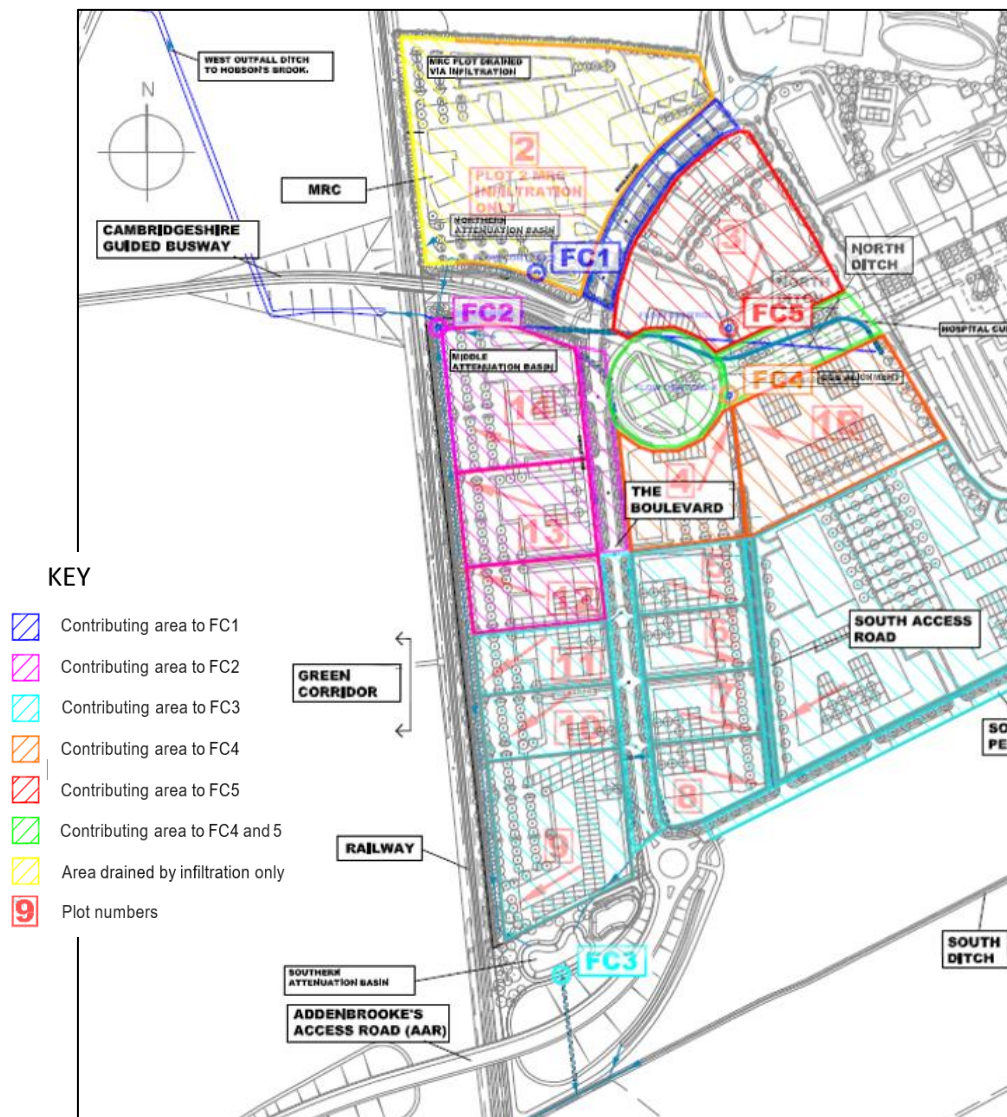


Figure 2-5 - CBC Development Plot Drainage

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- 2.4.8 Other drainage infrastructure is also present. Addenbrooke's Access Road (AAR) was constructed just south of the South Attenuation Basin outfall, see Figure 2-5. I note that plot numbers for areas contributing to FC3 have been amended post CBC development stage. Plot 9 is now UoC AMB site, Plot 10 and 11 are now renumbered as Plot 9. The above figure shows the previous plot numbers. The embankment of the AAR interrupted the natural surface flow paths from the former surrounding arable land. To prevent drainage issues, new filter drains at the base of the embankment were constructed, connecting to the South Ditch, as well as an attenuation basin and outfall pipe under the road.
- 2.4.9 Five hydro brake chambers, FC1 to FC5, act as the primary flow controls to the existing watercourses. Details of these chambers were not available during options development due to the level of design input but will be reviewed where necessary as the design progresses. The location and respective catchment areas are laid out in Figure 2-5.
- 2.4.10 The key interface with the CSIE Project is linked to FC2, with minor interfaces with FC1 and FC3. The northern and Mid Attenuation Basins are located upstream of flow control chambers FC1 and FC2 respectively and receive surface water runoff from the northern half of Francis Crick Avenue. FC2 will also receive future attenuated flow from the AZ site currently under development which shares a boundary with the railway. FC1 and FC2 currently discharge into North Ditch between the Hospital Culvert and Tibbetts Culvert. FC3 controls flow from the South Attenuation Basin which receives surface water from the Southern Access Road, the University of Cambridge site and Plot 9 (currently undeveloped), The University of Cambridge and Plot 9 currently share a boundary with the railway.
- 2.4.11 The South Attenuation Basin receives runoff from the southern section of Francis Crick Avenue and in the future will receive attenuated flows from the southern development plots, the Southern Perimeter Road and its associated spur, known as the Southern Access Road.
- 2.4.12 The MRC site immediately to the north of the station drains mainly by infiltration, demonstrating that ground conditions in the vicinity of the station are suitably permeable to allow for some infiltration within the design. An exceedance swale is present along the boundary with NR land.

3 Flood Risk and Drainage Policy Context

3.1 Introduction

- 3.1.1 The purpose of this section is to identify and summarise the key aims of national and local flood risk and surface water drainage policies relevant to the CSIE Project.
- 3.1.2 Further details of the compliance with these policies can be found in the Proof of Evidence of Mr Pearson (NRE9.2). In summary, however, the CSIE Project has been considered against the relevant national and local, flood risk management policy. Assessed against those policies, as per the Planning Statement (NR14) and Mr Pearson's evidence, it will be seen that the CSIE Project is in accordance with the up-to-date planning framework, both nationally and for the local area, so far as flood risk and drainage matters are concerned.

3.2 National Policy

- 3.2.1 In dealing with matters relating to flood risk and drainage, the Applicant has taken into account and sought to comply with national policy, as set out in the National Planning Policy Framework¹ (NPPF) and its supporting Planning Practice Guidance (PPG) – Flood Risk and Coastal Change². The NPPF sets out Government policy on development and flood risk. Its aims are to ensure that flood risk is considered at all stages of the planning process, to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas of highest risk. Where new development is exceptionally necessary in such areas, policy aims to make it safe, without increasing flood risk elsewhere, and, where possible, reducing flood risk overall.
- 3.2.2 The NPPF was first published in 2012 and most recently updated in 2021. Paragraph 159 of the policy states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, with Paragraph 161 advocating a sequential, risk-based approach so as to avoid, where possible, flood risk to people and property. The PPG provides guidance on the compatibility of different land use types in each of the Flood Zones.
- 3.2.3 When a development site falls partly within multiple Flood Zones, which applies the CSIE Project, the highest risk Flood Zone should be used when assessing development vulnerability.

¹ Ministry of Housing, Communities and Local Government (2021). National Planning Policy Framework.

² Ministry of Housing, Communities and Local Government (2014). National Planning Policy Framework Planning Practice Guidance: Flood Risk and Coastal Change.

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- 3.2.4 NPPF, paragraph 163 states that if it is not possible for development to be located in areas with a lower risk of flooding (taking into account wider sustainable development objectives), the Exception Test may have to be applied. As detailed in Paragraph 164, for the Exception Test to be passed, it should be demonstrated that the development would provide wider sustainability benefits to the community that outweigh flood risk (“the first point”); and the development would be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, reduce flood risk overall (“the second point”).
- 3.2.5 The CSIE project is classified as ‘essential infrastructure’ in accordance with Annex 3 of the NPPF. ‘Essential infrastructure’ is deemed appropriate in Flood Zones 1 and 2 and permissible in Flood Zone 3 subject to satisfaction of the Exception Test.
- 3.2.6 Evidence of the wider sustainability benefits to the community of the CSIE project is provided in Chapter 15 of the Environmental Statement. On balance, the benefits of the Preferred Option for the station, detailed in the Options Report, are considered to outweigh the potential flood risk detriment associated with the partial location of the proposed station in Flood Zone 3, as per the first point of the Exception Test. Evidence to demonstrate satisfaction with the second point of the Exception Test is provided in the Flood Risk Assessment report, further details of which are provided in Section 7 of this document.
- 3.2.7 The NPPF also advocates integration of sustainable drainage systems (SuDS) to manage surface water runoff from major developments. Paragraph 169 of the policy states that sustainable drainage systems should be incorporated, unless there is clear evidence that this would be inappropriate. The policy advocates that the systems used should take account of advice from the LLFA, have appropriate minimum operational standards, have maintenance arrangements in place and where possible, provide multi-functional benefits. As evidenced in Table 4-1, the Project has engaged with the LLFA to agree key drainage principles and appropriate operational standards. Above ground SuDs features would be integrated into the landscape design to deliver wider benefits.

3.3 Local Policy

Cambridge Local Plan (D6)

- 3.3.1 The Cambridge Local Plan (2018) sets out the way in which the development needs of Cambridge will be met during the 2011 to 2031 period. The policies relevant to flood risk and surface water drainage are Policy 31: Integrated water management and the water cycle and Policy 32: Flood risk.

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3.3.2 Policy 31 states that development will be permitted provided that key water management principles are adhered to including managing surface water as close to its source and on the surface where reasonably practicable to do so; giving priority to the use of nature services and ensuring that run-off from all hard surfaces receives an appropriate level of treatment. The supporting text for Policy 31 makes reference to the Surface Water Management Plan³ and Strategic Flood Risk Assessment⁴ for Cambridge which have found there is little or no capacity in the rivers and watercourses that receive surface water runoff from Cambridge and that runoff needs to be adequately managed so that flood risk is not increased elsewhere. Policy 31 states that smaller, more resilient features distributed throughout a development should be used to manage surface water rather than one large management feature. The policy also notes the need to consider climate change and the quality of waterbodies. The policy seeks to ensure all surface water discharged to ground or into rivers, watercourses and sewers has an appropriate level of treatment to reduce the risk of diffuse pollution.

3.3.3 Policy 32 sets out requirements regarding potential flood risk from the development and potential flood risk to the development. The policy states that peak runoff rates and volumes from the development (allowing for climate change) must not exceed those for the undeveloped site and if this cannot be achieved the limiting discharge is 2 litre/s/ha for all events up to the 100-year return period. Development must be designed so that the flooding of property in and adjacent to the development would not occur for a 1 in 100-year event, plus an allowance for climate change and in the event of local drainage system failure. The policy states that discharge locations must have the capacity to receive all foul and surface water flows from the development and that there must be a management and maintenance plan for the lifetime of the development. In regard to flood risk to the development, the policy states that development will be permitted if an assessment of flood risk is undertaken and the findings of this assessment accord with the principles of the NPPF.

South Cambridgeshire Local Plan (D8)

3.3.4 The South Cambridgeshire Local Plan, which covers the area immediately to the south of the Cambridge Biomedical Campus as well as part of the Southern Fringe development area, contains six key objectives. Investment in flood risk mitigation and sustainable surface water management can contribute towards two of these:

1. To protect the character of South Cambridgeshire, including its built and natural heritage, as well as protecting the Cambridge Green Belt. New development should enhance the area, protect and enhance biodiversity.

³ Cambridgeshire County Council (2014). Surface Water Management Plan.

⁴ Cambridge City Council and South Cambridgeshire District Council (2010). Strategic Flood Risk Assessment.

Proof of Evidence Sue Brocken (NRE5.2)

2. To deliver new developments that are high quality and well-designed with distinctive character that reflects their location, and which responds robustly to the challenges of climate change.

3.3.5 The relevant policies to flood risk and surface water drainage in the South Cambridgeshire Local Plan (2018) are the policies within the climate change chapter that address mitigation and adaptation to climate change (CC/1), water efficiency (CC/4), safeguarding water quality (CC/7), sustainable drainage systems (CC/8) and managing flood risk (CC/9). The policies outline requirements for developments regarding protecting the water environment, ensuring development is resilient to climate change, embedding sustainable drainage systems into developments, ensuring flood risk to developments is acceptable and mitigating any potential increase in flood risk elsewhere from the development.

Cambridgeshire Flood and Water Supplementary Planning Document (SPD)

3.3.6 The Cambridgeshire Flood and Water SPD was prepared by Cambridgeshire County Council (CCoC) (the LLFA) in conjunction with the LPA's within Cambridgeshire and other relevant stakeholders (see 1.1.1 of the SPD). The SPD, which was re-adopted by SCDC and CciC in November 2018, provides guidance for developers on how to manage flood risk and the water environment as part of new development proposals.

3.3.7 The SPD is a material consideration when considering planning applications and seeks to expand on and be consistent with existing local plan policies.

3.3.8 Chapter 5 (Managing and mitigating risk) of the SPD provides guidance on how to manage risk through site design to ensure that developments will be safe from flooding. In relations to FRA, the chapter explains that 'Site specific Flood Risk Assessments must detail how a site will be made safe.'

3.3.9 Chapter 6 (Surface water and sustainable drainage systems) sets out key principles in relation to the design and delivery of SuDS.

Other relevant matters: the Hobson's Conduit Trust covenant

3.3.10 The CBC is covered by covenants with the Hobson's Conduit Trust regarding drainage and special arrangements are in place to safeguard and monitor the quality of surface water entering Hobson's Brook and Hobson's Conduit. These covenants govern the right to access, for the purpose of carrying out works, the Hobson's Conduit. Discharge of surface water into Hobson's Conduit, through the North Ditch and/or South Ditch and/or other ditches constructed through the green

Proof of Evidence Sue Brocken (NRE5.2)

corridor between the Cambridge Biomedical Campus and Hobson's Conduit, must also be controlled under the covenant.

- 3.3.11 The evidence of how the CSIE Project complies with these policies and the Hobson Conduit Trust covenants is provided in the responses to the objections raised, which are set out based on key themes.

4 Engagement with Stakeholders

4.1 Key Stakeholder Involvement

4.1.1 Engagement with key stakeholders has been undertaken both prior and subsequent to the making of the CSIE Order application. In terms of flood risk and surface water drainage matters, the key stakeholders have included:

1. Environment Agency (EA)
2. Hobson's Conduit Trust
3. Cambridgeshire County Council (CCoC);
4. Cambridge South East Transport (CSET);
5. Greater Cambridge Shared Planning, including Cambridgeshire County Council in its role as Lead Local Flood Authority (LLFA); and
6. AstraZeneca (represented by Arup)

4.1.2 Table 4-1 provides a summary of stakeholder issues raised prior to the submission of the CSIE Order application with respect to flood risk and surface water drainage and how they were addressed pre-submission. Table 4-2 which follows provides a summary of stakeholder consultation undertaken post the submission of the CSIE Order application.

Table 4-1- -Summary of Pre TWAO Submission Consultation

Consultee/ Contact/ Date	Summary of Consultee Issue	How Addressed?
Greater Cambridge Shared Planning (GCSP) – incorporating Cambridgeshire County Council – Lead Local Flood Authority (LLFA)	The LLFA identified the following considerations for surface water and flood risk management: • Surface water drainage needs to follow the hierarchy of drainage solutions as set out in the National Planning Policy Framework (NPPF) (ES Ref 18.9) and Cambridge Local Plan (2018) (ES Ref 18.11), preferably for infiltration and soakaways, before discharge into local waterways (including Hobson's Brook) is considered.	The surface water and flood risk management measures that have been incorporated are detailed in the FRA (Appendix 18.2 of the ES (Doc Ref. NR16)) Section 8 and Section 9 of this document. These set out how the proposed development will be safe from flooding over its lifetime, including for resilience to climate change, and how surface water runoff will be managed.

Proof of Evidence Sue Brocken (NRE5.2)

Consultee/ Contact/ Date	Summary of Consultee Issue	How Addressed?
Hilary Ellis, Luisa Nunes, Brian Heffernan and Jessica Press Email correspondence, meetings on 14 May 2020, 19 June 2020, 13 August 2020 and 24 February 2021	- Underground floodwater attenuation storage should be avoided where possible. - Any discharges to the Hobson's Brook need to be limited to greenfield rates and, in regard to water quality, the discharge should be treated before it enters existing sensitive watercourses. - Compensatory Sustainable Drainage Systems (SuDS) features should be provided where works affect any existing features. Consideration should be given to access for maintenance and inspection of SuDS. - No detriment should be caused to the functioning of the wider drainage system serving the Cambridge Biomedical Campus. - The LLFA confirmed that the existing drainage features on the Cambridge Biomedical Campus are currently managed by Cambridge Medipark Limited. - When accounting for climate change an allowance of 40% uplift in peak rainfall intensity should be used. The LLFA advised that groundwater levels are high in the vicinity of the proposed Development. The LLFA noted that byelaws cover the maintenance of Hobson's Brook and consideration should be given to future access to the watercourse for maintenance. The LLFA set out requirements for the Surface Water Drainage Strategy as	SuDS have been incorporated into the drainage proposals where appropriate given the restricted space and layout constraints of the proposed development. Flood risk from the North Ditch and Tibbets culvert have been assessed by undertaking hydraulic calculations, as detailed in the FRA. The preliminary drainage design is sympathetic to the functioning on the wider drainage system serving the Biomedical Campus Climate change allowance of 40% uplift in peak rainfall intensity has been applied in the preliminary drainage design. The assessment of effects on groundwater that has been undertaken is reported in Section 18.5 of the ES. Hobson's Conduit Trust have been consulted and a copy of the covenants has been obtained. The requirements for the Surface Water Drainage Strategy were discussed with the LLFA in the meeting on 24 February 2021 and are addressed in the Surface Water Drainage Strategy section of the FRA.

Proof of Evidence Sue Brocken (NRE5.2)

Consultee/ Contact/ Date	Summary of Consultee Issue	How Addressed?
	documented in Table 182 of Chapter 18 of the Environmental Statement, Water Resources and Flood Risk, (Doc Ref. NR16).	
Hobson's Conduit Trust (HCT) John Latham, Email correspondence, 22 June 2020 Steve Boreham, Meeting 25 November 2020	The Trust clarified that <i>"the whole Biomedical Campus is covered by covenants with the Trustees of Hobson's Conduit related to drainage and special arrangements are in place to safeguard and monitor the quality of surface water entering the Brook and Conduit."</i> The Trust's key concern is preserving the quantity and quality of water in Hobson's Brook and Hobson's Conduit. In regard to flood risk, the Trust advised that the main flood risk in the Hobson's Brook catchment arises from changes to the existing surface water drainage regime. The existing regime is not designed to deal with flashy flows and therefore the Trust are keen to ensure flows are suitably attenuated from all developments with a connection to the Hobson's Brook.	The CBC was considered for the development of the drainage design. Appropriate measures regarding the treatment of runoff from the proposed Development during construction and operation are reported in Section 18.4 of the ES, (Doc Ref. NR16). Section 18.4 of the ES summarises the measures secured to minimise the impact of the proposed development on surface water receptors during construction and operation, including both water flows (quantities) and quality. The drainage strategy for the proposed development has been designed to be sympathetic to the existing surface water drainage regime. Details of proposed SuDS and attenuation features are included in the GRIP 3 Options Report and have been designed in accordance with the relevant standards (listed in Section 18.2.5 of the ES). Refer to Section 6 of this document for a summary and confirmation of designs updated since TWAO submission.
Environment Agency (EA) Email correspondence, 3 March 2020	The EA provided comments as part of the Round One Public Consultation. Comments relevant to this topic are summarised below: There are sensitive surface water features in the area including Hobson's Brook, drains and ponds.	The sensitivity of the surface water features has been assessed in Section 18.3 of the ES, (Doc Ref. NR16). Section 18.4 of the ES summarises the measures secured to minimise

Proof of Evidence Sue Brocken (NRE5.2)

Consultee/ Contact/ Date	Summary of Consultee Issue	How Addressed?
and clarification 20 October 2020	- It is important that surface waters are adequately managed and protected throughout the development lifecycle, taking into account potential impacts upon both water quality and water quantity. - Dewatering activities could have an adverse impact upon local wells, water supplies and/or nearby watercourses and environmental interests. Subject to a detailed impact assessment (to be carried out by the Applicant) compensation and/or monitoring measures may be required for the protection of other water users and water features. Discussion with the Groundwater and Contaminated Land team have clarified the scope of works required under the third bullet point above. The EA require a level of assessment commensurate with the project design stage. Any infiltration SuDS would need to meet relevant standards and must not be constructed in contaminated ground.	the impact of the proposed development on surface water features during construction and operation, including both water flows (quantities) and quality. With reference to the third bullet point, the assessment undertaken is reported in Section 18.5 of the ES. Risks to identified water features have been assessed in advance of detailed design information or GI being available. Details of proposed SuDS are included in the FRA and have been designed in accordance with the relevant standards (listed in Section 18.2.6 of the ES). Refer to Section 6 of this document for a summary and confirmation of designs updated since TWAO submission.
GCP for CSET Regular liaison meetings commencing 8 July 2020.	Interface between CSIE and CSET schemes relating to the existing and proposed drainage of Francis Crick Avenue and the impact upon the north, mid and South Attenuation Basins. The key interface issues are summarised below: The station development will require the Mid Attenuation Basin to be relocated. It is likely that this will be a temporary measure as the long-term plan for surface water drainage of Francis Crick Avenue diverts all drainage from the	Ongoing discussions in the regular liaison meetings between CSET and CSIE design teams to integrate projects and minimise impacts during construction. Station entrance re-modelled and Mid attenuation pond relocated within station forecourt area to provide equivalent storage to existing pond. Proposed southern track drainage pond located East of rail corridor and immediately south of Addenbrookes

Proof of Evidence Sue Brocken (NRE5.2)

Consultee/ Contact/ Date	Summary of Consultee Issue	How Addressed?
	Mid Attenuation Basin to the southern basin. The proposed CSET route south of the site utilises land to the south of Addenbrooke's Road which is also proposed for a drainage pond prior to outfall into Hobsons Brook.	Road to avoid the proposed CSET busway alignment this pond has now been relocated to the western side of the rail corridor therefore there is no longer an interface with CSET in this location. Refer to Table 4-2 and Section 6 for more details.
AstraZeneca Regular liaison meetings commencing 14 July 2020	Interface between CSIE and AZ Development. The key interface issues are summarised below: - Land boundary impacts (temporary and permanent) on the AZ attenuation system. - Station location over the existing FC2 chamber requiring the outfall to be diverted to an alternative location into North Ditch.	Ongoing discussions between AZ and CSIE design teams to integrate projects and minimise impacts during construction.

Table 4-2 - Summary of Post TWA0 Submission Consultation

Consultee/ Contact/ Date	Summary of Consultee Issue	How Addressed?
Environment Agency (EA)	The EA undertook a review of the Hydrology and hydraulic model of the North ditch. They requested further information on clarifications on the modelling approach and decisions taken.	Further information was provided to the EA in response to the queries raised. Following review of this information the EA confirmed their satisfaction with the model and conclusions of the Flood Risk Assessment. As a consequence, they were able to withdraw their objection to the Order on 20th September 2021 (Ref OBJ/05-W Environment Agency).
CSET / Mott McDonald	1. The revised CSET route passes through the proposed CSIE filtration/drainage	1. Pond to be removed from eastern side of railway, flows diverted to

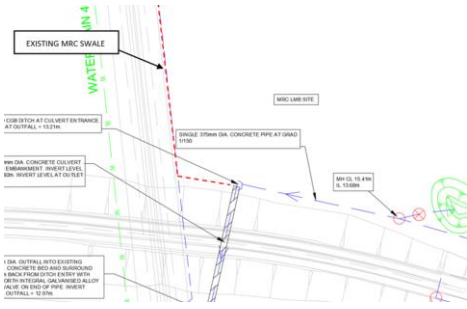
Proof of Evidence Sue Brocken (NRE5.2)

Consultee/ Contact/ Date	Summary of Consultee Issue	How Addressed?
7 September 2021	pond. If both schemes go ahead there is a conflict relating to the location and extent of the drainage pond south of Addenbrookes Road and associated landscaping. The CSET team's preference is to keep the alignment of CSET route with the area east of the rail corridor and west of the CSET route being used for the drainage pond.  Image 1 Updated CSET route and pond location 2. The Mid Attenuation Basin located on this site which discharges into the North Ditch just before it goes under the railway. The basin is purely for existing highway drainage from Francis Crick Avenue. The southern section drains southwards into the South Attenuation Basin at the southern end of Francis Crick Avenue Should the CSET scheme go ahead, all flows from Francis Crick Avenue will discharge to the southern basin and the Mid Attenuation Basin will not be required.	west side via an undertrack crossing. Refer also to Section 6. 2. In relation to the existing Mid Attenuation Basin, The CSET scheme may or may not go ahead, the programme for CSET is behind the CSIE Project. Should the scheme not go ahead, flows from Francis Crick Avenue will continue to enter the station forecourt area post construction of the station and will need to be attenuated as existing to ensure no increase of flows into North Ditch and no detriment to flood risk within the system upstream of the attenuation. Flows will be required to enter the culverted section of North Ditch as per the existing arrangement. Should CSET go ahead, the surface water will be diverted away from the Mid Attenuation Basin and the attenuation will not be required. Note, the Astra Zeneca outfall which currently connects to the shared outfall from the basin will still be required irrespective of the CSET solution/ programme. CSIE to consider two options – - with CSET scheme - without the CSET scheme. Worst case for the CSIE project is to provide alternative attenuation to match the existing basin. The original surface pond is no longer feasible due to the relocated junction into the station forecourt.

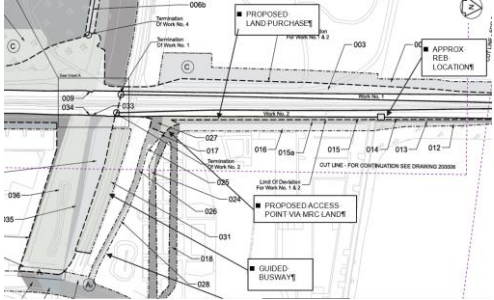
Proof of Evidence Sue Brocken (NRE5.2)

Consultee/ Contact/ Date	Summary of Consultee Issue	How Addressed?
		As the site is congested, a sub-surface geocellular attenuation tank is proposed with storage volume equivalent to the existing pond.
AstraZeneca Regular liaison meetings/ workshops 22 September 2021, 29 September 2021, 5 October 2021	Land boundary review to determine interface with drainage assets	Regular meetings to discuss updates to land boundary. Requirements for permanent and temporary acquisition have been reduced as designs have progressed and contractor involvement has begun. Agreed permanent AZ swales may be made longer and thinner to provide 1m working strip needed for future installation of tanks. Proposed swales in temporary land required for a construction haul road have not been installed to date. These will be constructed post CSIE construction therefore no provision required. Outfall from AZ site to flow control chamber FC2 (from Mid Attenuation Basin) to be diverted around station building and connected
University of Cambridge (UoC) 2 November 2021	Interface between AMB and Plot 9 drainage and the proposed scheme.	Presentation to the UoC representatives to advise how the current stage of design has acknowledged the presence of the existing assets and has incorporated them into the proposed outline design stage. This includes a temporary connection during construction into the track drainage network to compensate for loss of swale/ pond capacity to facilitate the temporary haul road. Further detailed topographical survey will be required to confirm the exact

Proof of Evidence Sue Brocken (NRE5.2)

Consultee/ Contact/ Date	Summary of Consultee Issue	How Addressed?
Medical Research Council – Laboratory of Molecular Biology (MRC)- Telecon- 16/12/21	Existing exceedance/ conveyance swale to East of the MRC site, along the NR boundary is within the land to be acquired permanently by NR. Swale to be relocated Temporary access road from Francis Crick Avenue currently passes over swale/ inlet into the culvert under the guided busway. No restriction of flows from swale to culvert under the busway allowed  Image 2 MRC Swale and culvert outfall to North Ditch	position and depth of the UoC assets in relation to the proposed temporary and permanent boundary fence line at the next stage to fully consider the UoC assets in the design to ensure that there is no negative impact on the network as a result of the NR scheme. Further design development and construction methodology reviews have been undertaken since submission resulting in the reduction of the width of permanent land acquisition required, which previously extended up to the edge of highway. This is now reduced as noted in Image 3. The area beyond the proposed permanent boundary will only be required during construction for infrequent access. This is described in the Proof of Evidence of Mr Andy Barnes (Doc Ref. NRE1.2). Therefore, there will be no impact on any existing highway drainage system. Design intent is to maintain the existing swale parallel to the NR rail boundary in its current position. Where this is not possible, the swale will be reconstructed in between the existing western access road and the new boundary fence. Previous proposal to temporarily install a haul road, between Francis Crick Avenue and the access point to the south of the attenuation pond, refer to Image 3, has now been removed in favour of infrequent access during both construction and for general

Proof of Evidence Sue Brocken (NRE5.2)

Consultee/ Contact/ Date	Summary of Consultee Issue	How Addressed?
	 Image 3 Land purchase proposal	maintenance via the MRC car park area.

5 Summary Flood Risk and Drainage Work Undertaken Pre-Submission

5.1 General

5.1.1 The GRIP 3 Option selection was completed in May 2021 and was used to inform the Environmental Statement (ES) (Doc Ref. NR16) and TWAO submission. This process is described in the Proof of Evidence of Mr Andy Barnes (Doc Ref. NRE1.2), although my Proof of Evidence addresses the salient drainage and flood risk aspects of that body of work.

5.1.2 Flood risk and drainage works developed at this stage included:

1. A review of available information including the EA's online flood maps and information on the existing surface water drainage network for the CBC;
2. Preparation of a Technical Note summarising the existing drainage and attenuation features of the CBC;
3. Contributing key flood risk and drainage information into the option selection process for the location of the proposed station;
4. Assigning a RAG (red, amber, green) rating to each option in regard to flood risk and drainage; and
5. Development of an outline surface water drainage network to drain the station, forecourt and track.

5.1.3 The CSIE Project is supported by detailed assessments of all principal effects, drawn from extensive consultation with relevant stakeholders including Cambridgeshire County Council, Natural England, English Heritage, and the Environment Agency. These are set out in detail in the ES. The scope of the ES was guided by the EIA Scoping Opinion issued by the Department for Transport in January 2021.

5.1.4 Chapter 18 of the ES reports on the environmental impacts of construction and operation of the proposed development with respect to Water Resources, including flood risk and surface water drainage.

5.1.5 A Flood Risk Assessment (FRA) and outline surface water drainage strategy was prepared as an Appendix of the ES (NR16 Environmental Statement: Volume 3 – Appendix 18.2). The FRA describes flood risk to the application site from a range of sources, including rivers, surface water

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and groundwater, and describes the measures proposed to manage flood risk over the Project's lifetime. The report also sets out proposals for the management of surface water runoff from the CSIE Project.

5.1.6 The methodology for, and outputs of, the above mentioned assessments are contained in Section 7 to Section 9 below.

5.1.7 More information relating to the neighbouring stakeholder's assets have now been made available to allow the station design team to review and incorporate modifications as necessary as discussed in Section 6. This work is currently, as of January 2022, is not complete. Interface issues will be discussed with the various stakeholders at a series of regular workshops as the design progresses to ensure that the existing assets are not at increased risk of flooding during or post construction.

6 Design Post TWAO application

6.1 General

- 6.1.1 Post submission of the TWAO, design development has continued building on the GRIP 3 design. The design of the station is progressing towards a 70% complete design including the layout of station building, platforms and forecourt area along with the track alignment.
- 6.1.2 More comprehensive stakeholder drainage information has been received and reviewed to allow outline analysis of existing systems in advance of detailed review/ inspection of as built flow control assets and updated topographical survey at the next and final design stage.
- 6.1.3 Further analysis of the North Ditch catchment has been undertaken to satisfy the EA's comments post TWAO submission. This includes the confirmation of storm flows within the watercourse during storm events up to and including the 1 in 1000 year event. I refer to Table 6-1 below for assessed peak flows.

Table 6-1- North Ditch Peak Flow Estimate

Return Period (year) / AEP	Peak Flow m ³ /sec
1 in 20 year/ 5%	0.039
1 in 100 year/ 1%	0.063
1 in 100 year +20%cc / 1% +20% cc	0.079
1 in 100 year+40%cc / 1% +40% cc	0.097
1 in 1000 year / 0.1%	0.132

- 6.1.4 Following TWAO submission, the development of the station and track layout and the award of the scheme construction to a Contractor have facilitated the refinement of the required boundary fencing during permanent and temporary operation respectively. The confirmation of temporary fencing positions allows a review of the potential impact on existing drainage features. Sections 5 and 6 provide details of the various elements of design relating to the CSIE Project.
- 6.1.5 The drainage information for the Astra Zeneca and the University of Cambridge AMB site, along with details of the proposed Plot 9 drainage system, have been obtained. This information has been used to generate a hydraulic model of the proposed surface water drainage network for the track and station area and the stakeholder drainage networks to review potential flooding during storm events up to and including the 100 year event plus 40% allowance for climate change.

6.2 Proposed Track Drainage- South of Station

- 6.2.1 Initial, pre TWAO design of the track drainage network ignored infiltration and assumed that the surface was 100% impermeable with all flow entering the surface water network. This was a conservative position. Following a review of the initial “off track” geotechnical investigations and British Geological SuDS report, infiltration within the ballasted area is considered to be achievable; this will be confirmed via additional ground investigation to be undertaken at the next design stage. This will include permeability testing. The decision to assume some surface water will be lost naturally into the track bed is also considered to be suitable as there is no track drainage present currently and the track bed appears to be in an acceptable condition. Track drainage is proposed within the station area between Addenbrooke’s Road and the guided busway. To the south of the station, surface water falling in the track area will be directed towards the cess and will be collected via perforated drainage alongside the tracks before discharging to a network of carrier pipes, filter drains and swales.
- 6.2.2 The pond to the east of the railway has been removed to recognise the interface with the CSET busway route. The pond will be replaced by an extended swale/ pond to the west of the railway within the proposed compound area.
- 6.2.3 The surface water collected east side will be diverted under the track to the West via a new under track crossing before discharging into a new 1253m³ attenuation pond within the compound area on the west side south of Addenbrooke’s Road, as shown in Figure 6-1 below. Flows from the pond will pass through a flow control device e.g., Hydrobrake or similar which will restrict flows to the equivalent of 2 l/s/ha, in accordance with Cambridgeshire Local Planning Policy, before discharging into a new outfall into Hobsons Brook.

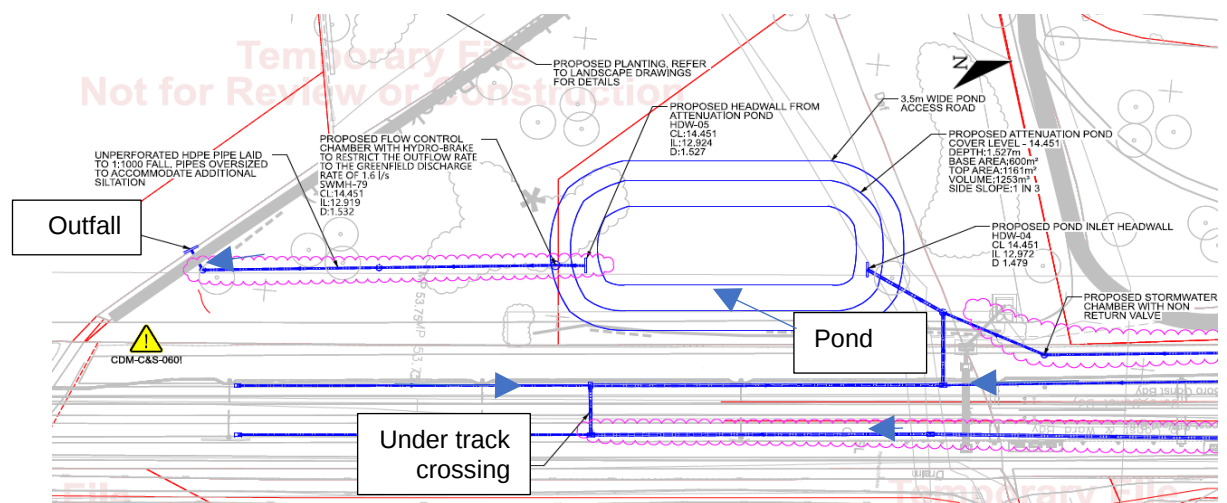


Figure 6-1 - Track Drainage Pond

6.3 Proposed Track and Station Drainage- West Side

- 6.3.1 Track drainage through the station area will be via new collector drainage and linear drainage channels within the platform. The West side surface water is collected and discharged to the Down side surface water network consisting of swales, filter drains and a geocellular, subsurface attenuation tank. Refer to Figure 6-2 below.
- 6.3.2 The outfall from the station Down side drainage network will discharge into the North Ditch, downstream of the diverted Tibbetts Culvert at a discharge rate equivalent to 2 l/s/ha as noted above.
- 6.3.3 Canopies along the platform will be constructed with a green roof. The green roof system will contain surface water falling on the roof until such time that the soil becomes saturated at which point, surface water will enter the network. The green roof system will reduce the amount of surface water entering the system however, once the soil is saturated, surface water will not be attenuated on the roof, therefore, for the purposes of design, the green roof system has been ignored.

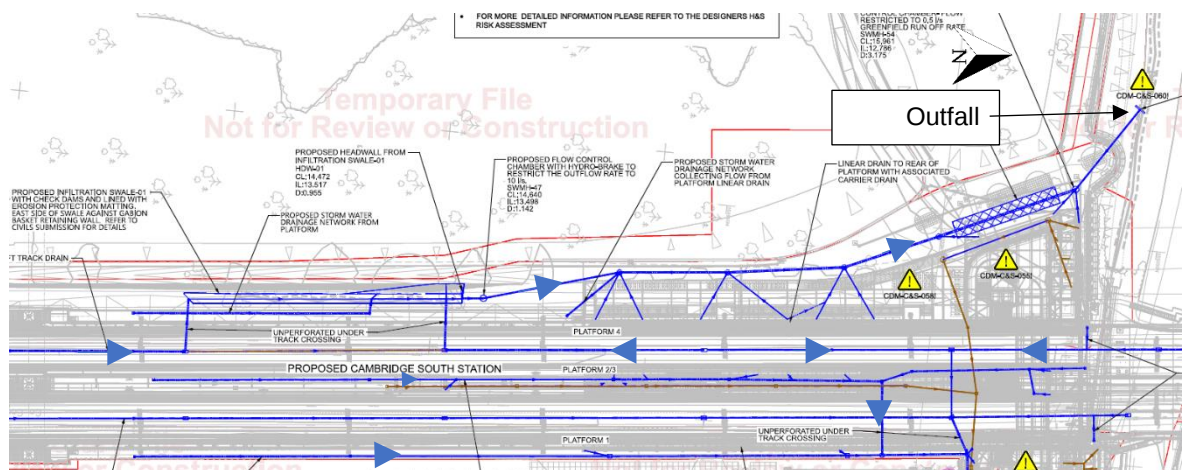


Figure 6-2 - West Side Station Drainage

6.4 Proposed Track and Station Drainage- East Side

- 6.4.1 As noted in Section 6.3 above, track drainage through the station area will be via new collector drainage. Linear drainage channels will also be provided within the platform discharging to the track drainage system.
- 6.4.2 The main station building is situated to the East side. The island platform, Platform 1 linear drainage channels and the main station building will discharge into the East side system.

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- 6.4.3 As noted above, canopies along the platform will be constructed with a green roof system, which will reduce the amount of surface water entering the system. However, for the purposes of design, the green roof system has been ignored.
- 6.4.4 A rainwater harvesting tank will collect surface water from the track and station drainage system for re-use as grey water e.g., toilet flushing etc, within the main station building prior to discharging the overflow from the harvesting tank into a new, subsurface geocellular attenuation tank situated within the station forecourt.
- 6.4.5 Surface water from the East Side station highway, disabled/ staff car park, taxi rank and drop off point will outfall where possible via a permeable paving system into a rain garden which will aid treatment of the surface water potentially contaminated with oils and salts before discharging into sub surface attenuation storage. Since Pre-TWAO design, this storage has been re-configured as a geocellular solution rather than a structural tank. Refer to Figure 6-3.



Figure 6-3 – Geocellular Sub Surface Storage Solution

- 6.4.6 A flow control chamber will be installed on the outlet of the attenuation storage to control discharge flow rate to 2 l/s/a before discharging into the diverted/ culverted section of North Ditch.

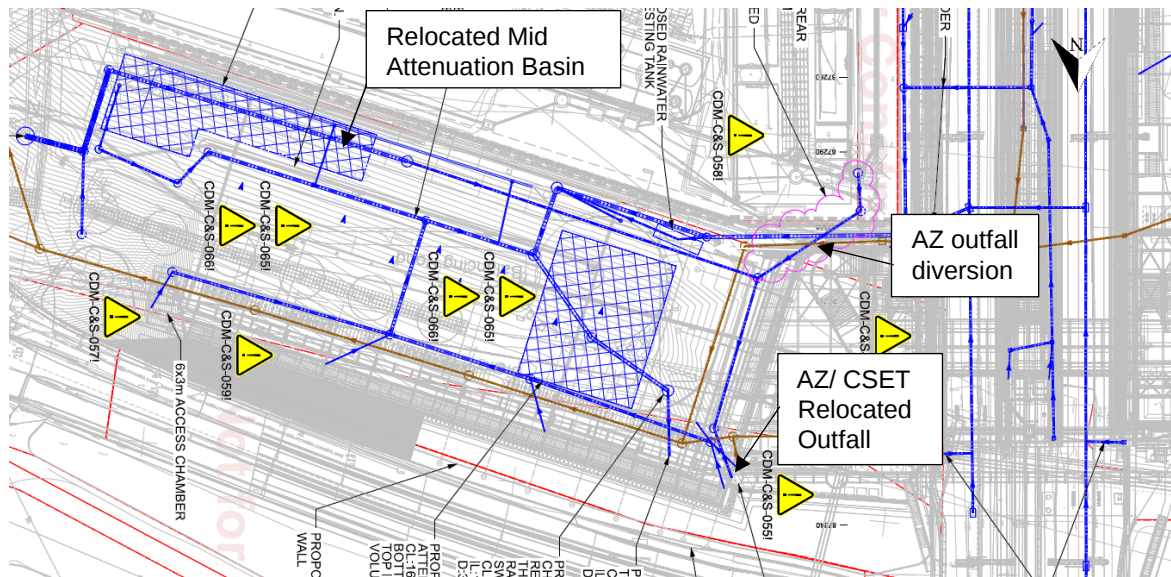


Figure 6-4 - East Side Station Drainage

6.4.7 As noted above, the North Ditch is to be culverted to facilitate the construction of the station building and forecourt. A 1200mm diameter precast concrete culvert is proposed which will connect onto the Hospital Culvert under Francis Crick Avenue and will extend to the west of the rail corridor. The capacity of the 1200mm diameter culvert, based on the proposed gradient of 1m fall in 277 metres is in excess of 2.5 m³/sec which significantly exceeds the assessed North Ditch peak flow estimate in Table 6-1. The use of a larger pipe across the railway has no impact on downstream flows. Incoming flows are flow restricted upstream of the railway crossing.

6.5 Interface with Existing Features

6.5.1 As part of the station development, in addition to the land required for the station building and forecourt, additional land is required to the east and west of the existing railway corridor for maintenance access and, in the case of the station, for emergency access.

6.5.2 In addition to the requirement to interface with existing features due to the revised permanent boundary, a temporary haul road will be required during construction which will run parallel to the boundary fence from south of Addenbrookes Road to the proposed station location. Refer to the proof of Mr Andy Barnes (NRE1.2) for more details of the haul road.

6.5.3 Consideration has been given to the presence of existing water features present on site which are relied upon by local stakeholders for the drainage of their sites. Information regarding stakeholders assets have been transferred to drawings using information provided to date, not from accurate survey data. Assets are to be topographically surveyed prior to the next stage to obtain an accurate understanding of the actual interface with the proposed permanent and temporary boundaries.

- 6.5.4 These requirements impact upon various stakeholders and how they interface with the proposed CSIE Project. Sections 6.6 to 6.10 below provide additional information relating to each of the stakeholders whose assets are affected directly.

6.6 AstraZeneca (AZ) Swale and Outfall

- 6.6.1 Surface water from the AZ site is currently collected via a series of linear channel drainage, gullies, permeable paving, filter drains and is attenuated on site via geocellular attenuation tanks and swales.

- 6.6.2 The extent of swales is shown in Figure 6-5.below

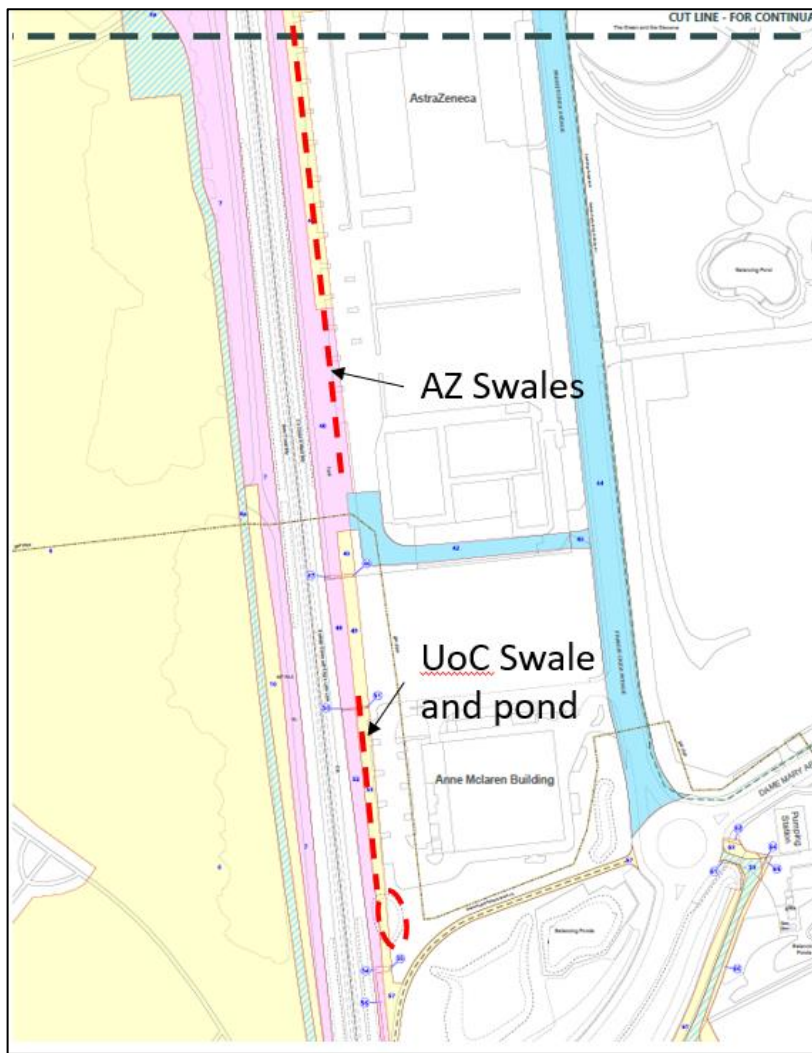


Figure 6-5 - Stakeholder Swales

- 6.6.3 The AZ site is still under development and as a result, not all proposed drainage assets, swales have been constructed to date to facilitate accurate survey. Details of the proposed swale locations

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have been provided to allow them to be considered during the design development of the CSIE Project. The proposed new permanent NR boundary will extend up to the AZ proposed swales allowing them to be maintained in the operational phase of the project.

- 6.6.4 There will be a modest impact on proposed AZ swales. The proposed swales are circled in blue. The proposed permanent boundary line is in red. Refer to Figure 6-6

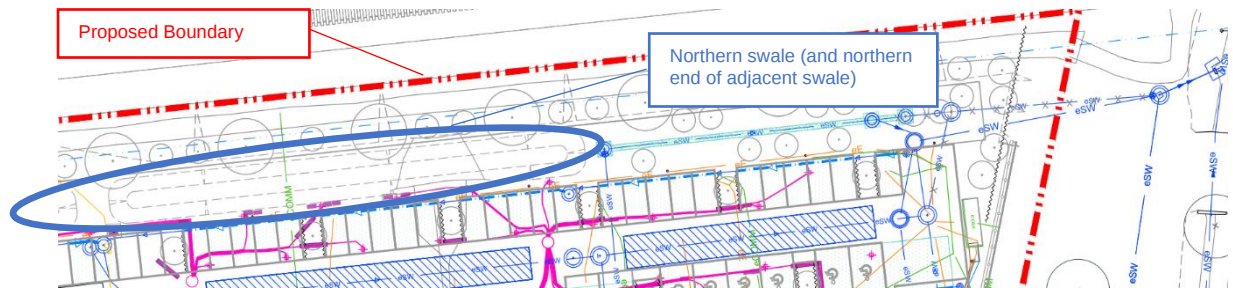


Figure 6-6 – AZ Boundary Swale

- 6.6.5 The proposed swales run along the entirety of the proposed Up Loop platform and mainly outside the proposed boundary. However, the boundary steps into the proposed swale area to accommodate the proposed station footbridge and access ramp and these will extend into the proposed swale locations, reducing the storage capacity of the swales by a corresponding amount. The loss will be a nominal volume in bridge support locations only. Refer to Figure 6-7. On this figure, the proposed boundary line is green.

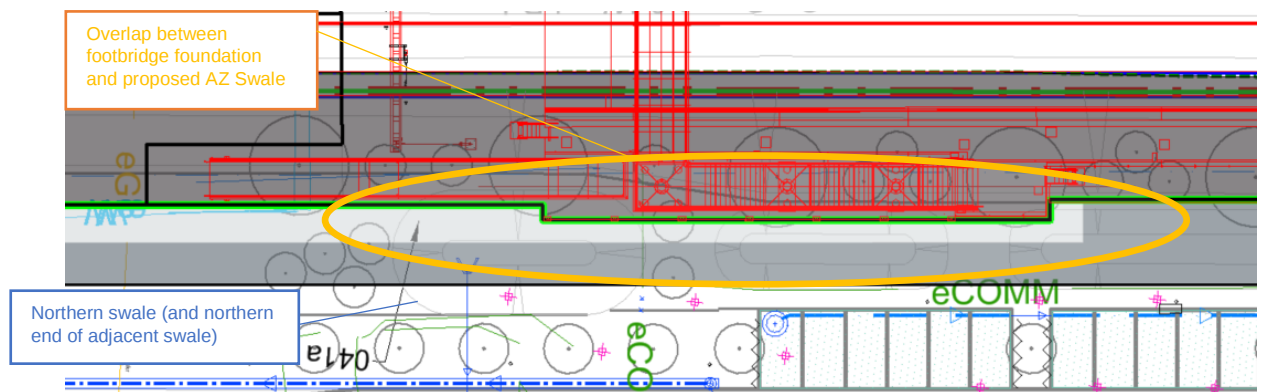


Figure 6-7 – Interface Between AZ Swale and Footbridge Foundation

- 6.6.6 As discussed in stakeholder workshops/ meetings with AZ noted in Table 4-2, swales are to be extended to accommodate the nominal volume loss.
- 6.6.7 Circled in blue in Figure 6-8 is an attenuation asset below the swales which will be installed by AZ once the construction works are completed. The invert level of the storage will be 13.129m AOD,

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and this will be laid upon a 300mm bedding course. Network Rail's design will consider an excavation reaching no deeper than 12.830m AOD.

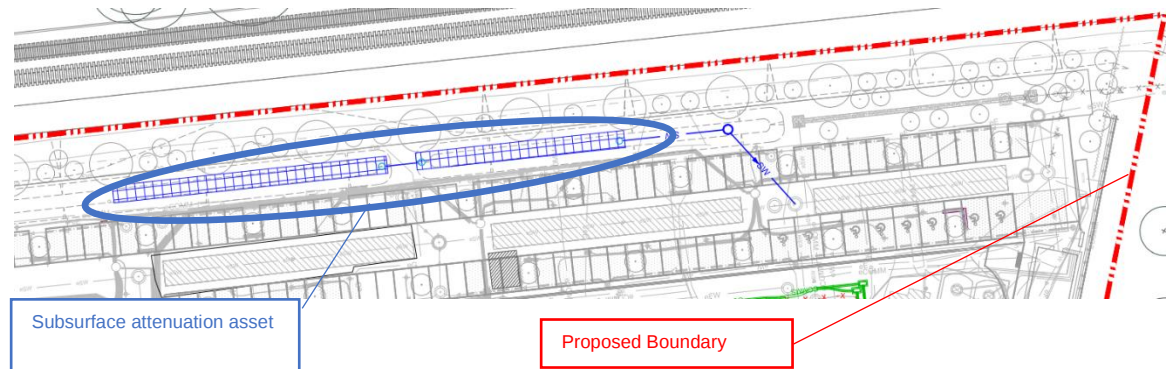


Figure 6-8 – AZ Attenuation Assets (Below Swale)

6.6.8 The existing attenuation tanks are to be maintained *in situ* during construction and protected from any construction traffic. Refer to Figure 6-9. The tanks are hatched in blue. The proposed permanent boundary line is in red.

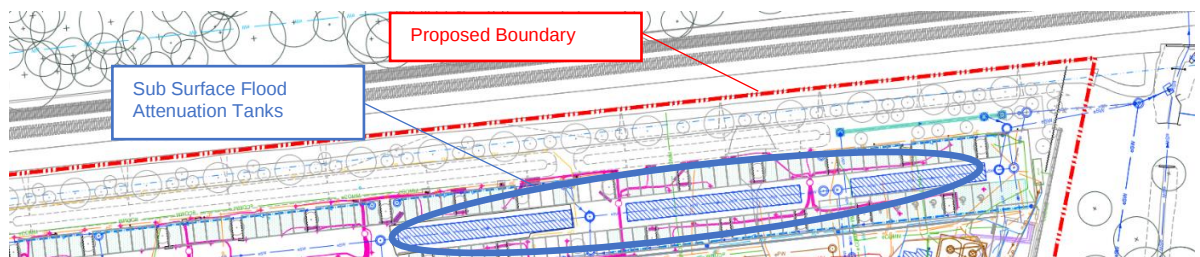


Figure 6-9 - AZ Sub-Surface Tank Attenuation Storage

6.6.9 Whilst the permanent land requirement by Network Rail to accommodate the additional track layout and station will not interfere with existing assets, during construction, a temporary haul road will be installed parallel to the railway which will interface with these. This is haul road HR6. The haul road is to be constructed using a temporary easement from south of Addenbrooke's Road to the proposed station compound to remove construction traffic from the highway. The road will be positioned where AZ had proposed to install additional swales. As the swales are yet to be constructed, no additional works are required to compensate for the loss of storage either in the temporary or permanent case. As agreed during stakeholder workshops, the swales will be installed following removal of the haul road and construction of the new, permanent land boundary fencing. For haul road information, refer to the Proof of Evidence of Mr Andy Barnes NRE1.2.

6.6.10 The outfall from the AZ surface water network currently discharges to FC2, as shown in Figure 2-5, before discharging into the North Ditch. FC2 is to be relocated as it is directly under the proposed station building. The pipework upstream of FC2 is to be diverted to the east of the station building. This will be diverted around the station building and discharged into the culverted

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section of North Ditch. The flow control chamber FC2 will be reconstructed outside of the proposed station building to facilitate access for inspection and maintenance.

6.6.11 The AZ drainage network outfall currently discharges to the North Ditch after combining with the outlet from the Mid Attenuation Basin. The proposed station is situated directly above the convergence of the two systems and the outfall into the North Ditch.

6.6.12 It is proposed to intercept the flow from the existing flow control chamber within the AZ site. Due to the configuration of the existing flow control chamber, a new chamber will be required to suit the new outlet position/ direction. The outlet will be diverted around the proposed station building before discharging into the flow control chamber downstream of the Mid Attenuation Basin before discharging into the diverted/ culverted North Ditch. Refer to Figure 6-10 below.

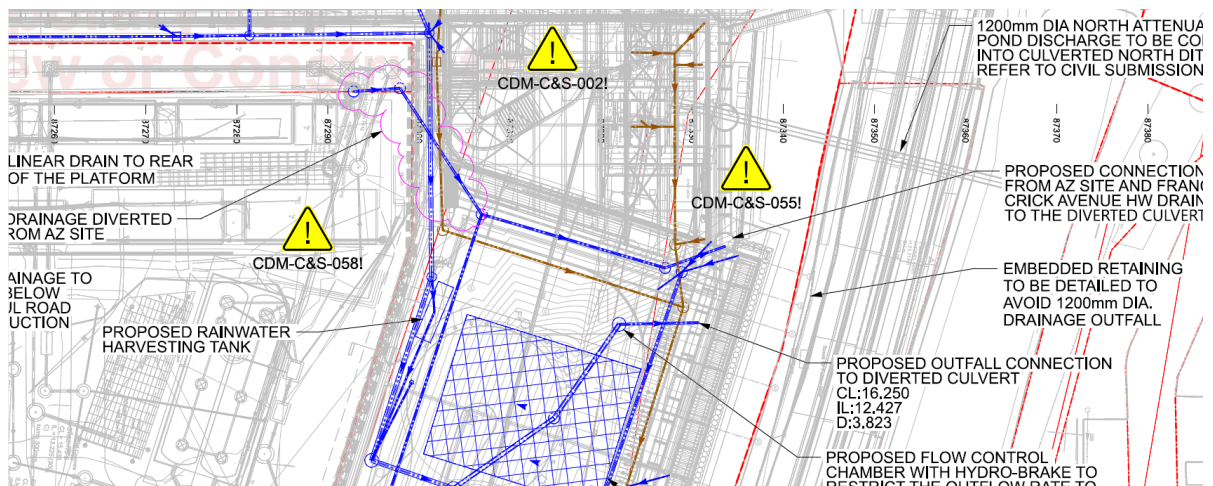


Figure 6-10 - AZ Surface water discharge route diversion

6.6.13 The proposed alterations to piped AZ drainage will have no impact on permanent capacity and amount to an adjustment of pipe routeing. There will be a temporary situation that will be managed by the works contractor at such time that the new pipework is connected to the existing network. Over-pumping between chambers will be required for a short period of time. This is a straightforward activity.

6.7 Mid Attenuation Basin

6.7.1 The main station building and forecourt is to be constructed in land currently occupied by the Mid Attenuation Basin. As noted in section 2.4 above, the Mid Attenuation Basin receives flow from Francis Crick Avenue only.

6.7.2 The proposed design is to relocate the Mid Attenuation Basin within the station forecourt providing equivalent storage to the existing basin.

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- 6.7.3 The outfall from the relocated basin will maintain the current discharge rate based on a 3 l/s/ha into the North Ditch and will be discharged into the section of North Ditch between the Hospital Culvert and Tibbets Culvert which is to be culverted as noted previously.
- 6.7.4 The required volume of the Mid Attenuation Basin to attenuate flows is 274m³.
- 6.7.5 Due to spatial constraints on site and due to the proposed increase in ground levels, it is not possible to replace the existing swale with another swale/ pond within the proposed station land. This is a consequence of the alterations to the station forecourt access to better integrate with the CSET proposals. Therefore, it is proposed replace the existing 274m³ pond with a minimum 274m³ sub-surface geocellular attenuation tank. This is an equivalent solution. The existing swale inlets from the highway and guided busway will be diverted into the new tank.
- 6.7.6 A flow control chamber will be installed downstream of the tank to maintain a discharge rate from the highway to the equivalent of 3 l/s/ha.
- 6.7.7 The current scheme has ignored the potential for the CSET highway drainage diversion to the Southern Basin, as discussed in Table 4-2, and has provided storage to ensure that the current drainage flow path can be maintained until the new system is installed. To reiterate the point, the CSET proposals obviate storage for highway run off from a section of Francis Crick Avenue provided in the Mid Attenuation Basin. However, until such time that the CSET arrangements are in place, CSIE must provide equivalent storage.
- 6.7.8 Construction methodology for the station will be developed to ensure that the attenuation for the highway drainage from Francis Crick Avenue will be adequate during construction.

6.8 CSET route/ Southern Track Drainage Pond Interface

- 6.8.1 The Up side (East) track drainage network proposal was to discharge to a pond south of the South Ditch before discharging to Hobson's Brook.
- 6.8.2 The CSET guided busway is proposed to utilise the same land parcel as the pond as noted in Table 4-1.
- 6.8.3 As noted in Table 4-2, the previously anticipated interaction with the CSET busway/ track drainage pond clash to the east side of the rail corridor has been removed by relocating the pond to the west side of the rail corridor. This provides a clear area for the CSET scheme.

6.9 University of Cambridge Swale and Outfall Interface

- 6.9.1 Details of the existing swale and pond within the University of Cambridge land, (shown in Figure 2-4 and Figure 2-5), were provided on 25th October 2021. A swale and pond are currently present in the AMB site with proposed attenuation/ swales in Plots 9 to be constructed at a later date. As built information for AMB site has been provided with planning stage drawings for Plot 9.
- 6.9.2 The position of the swales within the AMB and Plot 9 sites will be impacted by the temporary and permanent proposed land boundaries. In the absence of verified survey information (to be updated for the next stage of design development) of the constructed swales and ponds, information has been transferred onto site layout drawings from the PDF files provided by UoC to provide an indication of the likely clash between permanent land and temporary land acquisition hence is not sufficiently accurate for analysis of loss of storage volume or clash assessment.
- 6.9.3 The information available for Plot 9 is currently at a preliminary stage for planning. For the purposes of this inquiry, it is assumed that any future drainage design would be undertaken to accommodate the amended boundaries. This is addressed in the Proof of Evidence of Mr. John Pearson, (Doc Ref. NRE9.2).
- 6.9.4 The University of Cambridge site immediately north of Addenbrooke's Road contains a series of swales along its boundary with the Network Rail land which receive surface water and ultimately discharge into the South Ditch. As noted in section 6.5 above, a temporary haul road is required to facilitate construction of the station building to the east of the railway. The temporary haul road will be positioned over the existing swale. The existing swale will be temporarily replaced where necessary with a filter drain which will receive flows from the multiple outlets into the existing swale. A new headwall will discharge into a small area of swale immediately prior to the existing flow control chamber which can be retained. Details of the size and number of filter drains to temporarily replace the existing swale will be determined at the next design stage when the topographical survey is updated and the proposed haul road levels are determined to check for available cover and select suitable pipe material Pipework size and number of pipes (in the event that a manifold of pipes is necessary) will be selected to maximise the available cross sectional area when compared to the current swale.
- 6.9.5 Due to the extended timescales for construction of the station building, and to compensate for the temporary loss of surface water storage required to prevent flooding of their strategically important laboratories contained within the AMB site, alternative temporary storage is to be provided within the proposed track drainage network by increasing the volume of the attenuation pond noted in 6.2.3 above to provide the volume of storage lost due to the haul road. Flows will be directed towards the pond via an overflow pipe constructed within the existing flow control chamber before connecting into the track drainage network. Refer to Figure 6-11 and Figure 6-12 below.

6.10 MRC Swale Interface

6.10.1 Currently, the MRC site is drained via 3 No. soakaways, however, any exceedance flows will flow over land towards a conveyance swale which runs along the boundary between the MRC site and the rail corridor. It is likely that this swale also receives flows from Long Road Sixth Form College fields immediately to the north of the MRC site.

6.10.2 The outfall from the swale discharges into the existing outlet from the highway attenuation pond to the south east corner of the MRC site. The flows from the highway pond (north attenuation basin) are restricted to a rate of 3 l/s/ha at the chamber immediately downstream of the pond. No further flow control or restrictions are present within the system prior to discharge into the North Ditch. Figure 6-13 below shows the existing pond and swale arrangement suggesting the swale immediately upstream of the culvert under the busway is not required for storage.

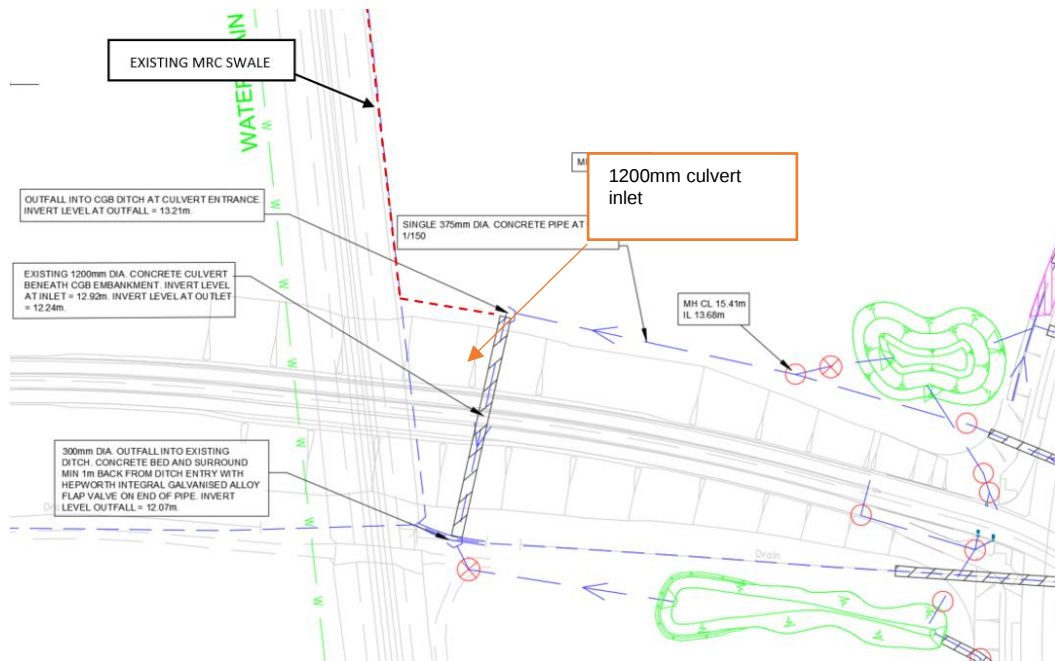


Figure 6-13 - Existing MRC Swale and Discharge

6.10.3 To date, no topographical survey has been undertaken within the MRC site, other than to determine the position of the existing western access road. A LIDAR (aerial) survey has provided some information on general topography although the survey did not identify the invert of the of the existing MRC swale, therefore it is not possible to determine the capacity.

6.10.4 Prior to the next design stage, a detailed topographical survey with de-vegetation as required is to be undertaken to confirm the existing swale arrangement. In addition, a detailed walkover survey will be undertaken. On receipt of the survey, an assessment will be undertaken to assess

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the capacity of the ditch and compare to the potential flows during a 1 in 100-year event plus 40% allowance for climate change.

- 6.10.5 Where possible, any interface with the existing assets will be minimised. Any existing drainage is to be maintained or replaced with an alternative system with equivalent capacity, during and post construction.
- 6.10.6 A further review of the permanent land requisition is to be undertaken at the next design stage with the aim of maintaining the existing swale parallel to the NR rail boundary in its current position. Where this is not possible, the swale will be reconstructed in between the existing western access road and the new boundary fence.
- 6.10.7 Due to the level difference between the road and the swale, and to maintain the existing biodiversity benefits of the swale, rather than replacing the existing swale with a network of filter drains, a nominal retaining wall may be required. The wall would be formed using gabion baskets to the roadside of the relocated swale to maintain the current cross sectional area.
- 6.10.8 To the south west corner of the MRC site, the swale turns towards the culvert under the busway. Refer again to Figure 6-13.
- 6.10.9 Over the last section, the swale deepens to tie in with the culvert levels; this area is not used as an attenuation pond as the pipework through the busway is oversized to comply with CIRIA design guide C786 and the Design Manual for Roads and Bridges HA107/04 (replaced by CD529 March 2020) which requires culverts longer than 12 metres to be 1200mm diameter. As the culvert is significantly oversized, it will not restrict the exceedance flows hence no allowance for attenuation in this area is envisaged.
- 6.10.10 A permanent authorised Network Rail access point with parking spaces on the east side of the railway is proposed immediately to the north of the Guided Busway embankment. Refer to Figure 6-14.

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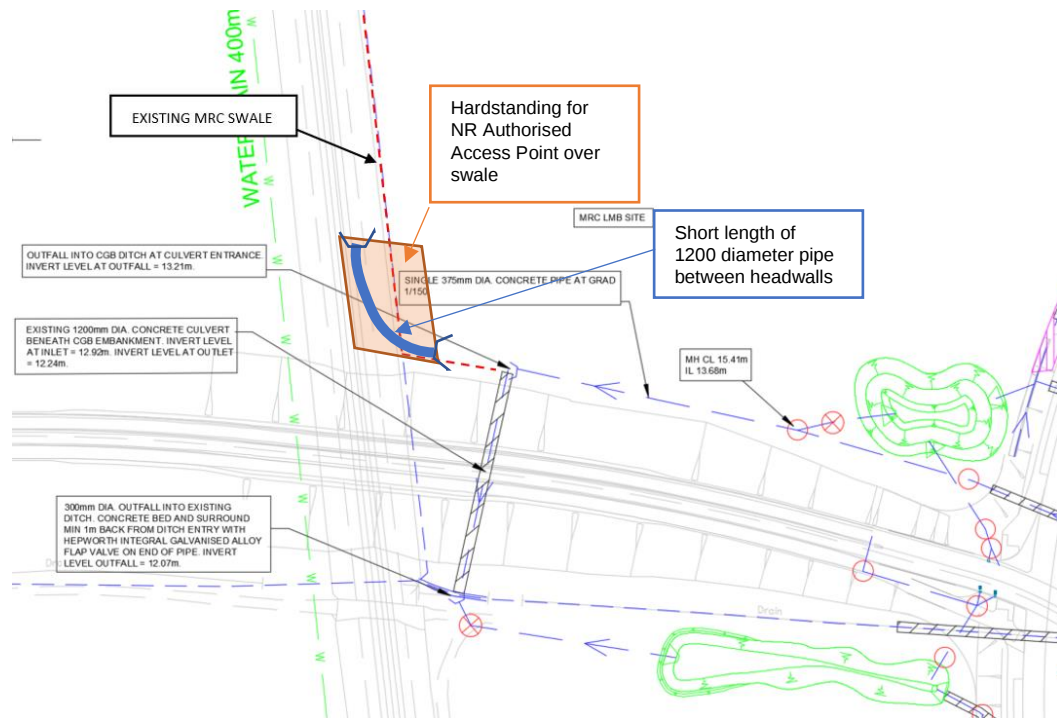


Figure 6-14 – Schematic solution for pipe below NR Authorised Access Point

6.10.11 As the permanent access will be required to pass over the swale in this location, it is proposed that a piped culvert to match the diameter, or equivalent cross-sectional area, of the culvert under the guided busway will be provided under the access to not restrict the flows below the capacity of the downstream network. During the next design phase, the proposed access road levels will be determined and reviewed to confirm the exact details of any culvert.

6.10.12 During construction, access will be required to the east side of the railway and will require temporary infilling of the existing swale along the NR boundary at discrete locations to allow crossing. It is not currently proposed to infill the entire length of swale. This would be achieved with temporary pipe sections that will be sized to convey the flows in the swale.

7 Methodology for the Assessment of Effects on the Water Environment

7.1 Assessment Overview

- 7.1.1 The TWAO submission included, as part of an ES and supporting FRA and Surface Water Drainage Strategy, an assessment of the potential effects of the CSIE Project on the water environment, including flood risk from local watercourses, and effects on the land drainage regime. The assessment also considered the potential for effects on surface and groundwater quality, as well on groundwater levels and flows.
- 7.1.2 The assessment methodology for the ES Water Resources assessment is described in detail in section 18.2 of the ES and is summarised below.

7.2 Methodology Overview

- 7.2.1 For consideration of water environment impacts the Study Area for the CSIE project includes land within the application boundary where there is potential for direct effects on water environment receptors. The potential for indirect effects on flood risk, drainage and water quality has also been assessed at a catchment wide scale (i.e. the Hobson's Brook catchment, see Figure 2-2).
- 7.2.2 A desk study was undertaken to gather and review existing information characterising the water environment within the study areas and the existing (baseline) qualities of water environment receptors. The desk study was informed by data sources published by the British Geological Survey (BGS), the Environment Agency, DEFRA, and the Centre for Ecology and Hydrology. It was supplemented by information supplied by the Hobson's Conduit Trust (Hobson's Brook Surface Water Monitoring Report from July 2020) and in response to data requests to the EA and LLFA.
- 7.2.3 Flow estimation and hydraulic modelling of an ordinary watercourse (OWC), the North Ditch, was also undertaken to determine baseline flood conditions, as described in Section 6. Information on the drainage regime of the neighbouring CBC was collected from a Surface Water Strategy Report supporting proposals for the extension of the campus. The key drainage principles relevant to the CSIE Project are described in Section 7.3 below.
- 7.2.4 Using the understanding of the water environment developed through these studies, values were assigned to receptors and their attributes, using the methodology described in Section 7

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7.2.5 The potential for change (impact) on each receptor was then assessed and other overall significance of effects was assigned according to the methodology set out in the following relevant guidance:

1. The Design Manual for Roads and Bridges (DMRB) LA 104 Environmental Assessment and Monitoring (2019) (LA 104);
2. The DMRB LA 113 Road Drainage and the Water Environment (2020) (LA 113).

7.3 CSIE Surface Water Drainage Principles

7.3.1 Surface water drainage of the proposed station building and accesses will remain separate to any track drainage networks and to any adjacent surface water assets belonging to various stakeholders. During the GRIP 3 stage, design intent was that surface water collected to the east of the railway would discharge to watercourses to the east and water collected to the west would discharge to watercourses to the west via a network of pipes and swales. This would have minimised the depth of drainage networks and resulted in a minimum of four outfalls into the local watercourses from the new development.

7.3.2 Note that in Section 6.2, I have described that this approach was varied to manage interfaces with CSET, such that the pond to the east of the railway north of Hobsons Conduit has been removed and drainage is diverted to the west of the railway.

7.3.3 In accordance with national and local policy and guidance, the proposed surface water drainage strategy utilises SuDs techniques in the form of swales and ponds designed to mimic a greenfield situation. The principles employed in the drainage strategy are to attenuate surface water discharge to within the allowable rates, whilst providing measures to improve the quality of this run off with the use of suitable SuDS source control. The current proposed scheme provides storm water attenuation to reduce surface water discharges to the watercourses to 2 l/s/ha in the 1% annual chance storm event, inclusive of a 40% allowance for climate change. The key principles of the strategy have been discussed and agreed with the LLFA during preparation of the Flood Risk Assessment.

7.3.4 Various storage facilities are proposed consisting of ponds, swales and below ground attenuation tanks. Analysis has been undertaken using industry recognised drainage design software, the Innovyze MicroDrainage, “Quick Storage Estimate” tool to determine likely storage requirements. A more detailed assessment using the Network module of MicroDrainage which integrates the drainage network, storage and online controls within one model to provide accurate results will be undertaken during the next design phase. Approximate storage volume requirements are summarised in Table 7-1.

Table 7-1 – Estimated Surface Water Storage Requirements

Asset	Storage Volume	Storage Type
Station platform forecourt- Up side (east)	665m ³	Below ground tank
Track drainage (beyond station) – Up side (east)	600m ³	Inline storage/ swale/ pond
Station platform- Down side (west)	345m ³	Inline storage / swale
Track drainage (beyond station) -Up side (west)	600m ³	Swale/ pond

- 7.3.5 All outfalls will be controlled using a Hydrobrake or similar flow control device. These will be modelled within the MicroDrainage software tool during the next design stage.
- 7.3.6 It is concluded that, by adopting SuDS suitable to site conditions and constraints that provide for treatment and achieve permissible discharge rates, the drainage proposals comply with the requirements of relevant national, regional and local planning policies and meets with the principal objectives of the key policy documents.
- 7.3.7 In relation to the drainage of the CSIE Project, it has been assumed that the drainage systems would discharge into existing watercourse networks. This assumption was made as site investigation was delayed by the Covid-19 pandemic and no data was available within the required timescales to prove the feasibility of infiltration-based drainage solutions. Additional ground investigation is currently in process, with further investigations within the track area to be undertaken during 2022. This includes permeability tests. A review will then be undertaken to confirm ground conditions with a view to accommodate infiltration-based SuDS, which are higher up the drainage hierarchy, than the currently proposed measures. This is a preferred solution and would also serve to reduce the size of storage later in the design.
- 7.3.8 Key modelling assumptions applied in the hydraulic assessment of the North Ditch are outlined in the FRA (Appendix 18.2) and have been subject to industry standard sensitivity tests. The modelling, and these assumptions, have been reviewed and accepted by the Environment Agency.

7.4 Significance Assessment Criteria

- 7.4.1 The significance of an environmental effect is a function of the value (importance) of the receptor and the magnitude or scale of the impact (change).
- 7.4.2 The significance of the effects of the CSIE project on water resources, including flood risk and the land drainage regime, has been determined from a combination of receptor sensitivity and the magnitude and duration of the impact on receptors. The DMRB (LA 104 and LA113) provides

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advice on typical descriptors of environmental value, magnitude of change, and significance of effects and this has been used to develop appropriate sensitivity criteria.

- 7.4.3 The value (or importance) of receptors and their attributes is assigned based on the quality indicators and measures in Table 3.70 of LA113, which is shown in extract in Table 7-2 below.

Table 7-2 - Criteria for Estimating the Importance (or Sensitivity) of Water Environment Attributes

Importance	Criteria
Very High	Nationally significant attribute of high importance
High	Locally significant attribute of high importance
Medium	Attribute of moderate quality and rarity
Low	Attribute of lower quality

- 7.4.4 The receptors assessed in the ES and the value (importance) assigned to the various attributes of these features is summarised in Table 7-3.

Table 7-3 - Summary of Value of Water Environment Receptors and their Attributes

Receptor	Attribute	Description	Value
Hobson's Brook	Flood flow storage and conveyance	Areas of EA mapped Flood Zone 2 and 3 within the study area, key land feature	High
	Water quality	Watercourse having a WFD classification shown in a River Basin Management Plan (RBMP) and a Q95 flow of less than 1m ³ /s	High
	Water supply and dilution and transport of wastewater	Receives consented discharges including from a non-water company Wastewater Treatment Works. No recorded abstractions	Medium
North Ditch	Flood flow storage and conveyance	Areas of EA mapped Flood Zone 2 and 3 within the proposed Development boundary and serves a locally important land drainage function	Medium*

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Receptor	Attribute	Description	Value
	Water quality	Watercourse does not have a Water Framework Directive (WFD) classification in the RBMP, inferred WFD class of 'Moderate' based on available monitoring data	Medium
	Water supply and dilution and transport of wastewater	Receives consented discharges. No recorded abstractions	Medium
South Ditch	Flood flow storage and conveyance	Areas of Flood Zone 2 and 3 within the proposed Development boundary and serves a locally important land drainage function.	High
	Water quality	Watercourse does not have a WFD classification in the RBMP, inferred WFD class of 'Moderate' based on available monitoring data	Medium
	Water supply and dilution and transport of wastewater	Receives consented discharges. No recorded abstractions	Medium
Small watercourses and land drains	Flood flow storage and conveyance	Medium to high risk of surface water flooding, key to local land drainage regime	Medium
	Water quality	Watercourses do not have a WFD classification in the RBMP, inferred WFD class of 'Moderate' based on available monitoring data	Medium
	Water supply and dilution and transport of wastewater	Watercourses in the vicinity of the Cambridge Biomedical Campus receive consented discharges. No recorded abstractions	Medium
Ponds	Flood flow storage and conveyance	Waterbodies with low probability of flooding	Low
	Water quality	Watercourses do not have a WFD classification in the RBMP, inferred WFD	Medium

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Receptor	Attribute	Description	Value
		class of 'Moderate' based on available monitoring data	
Land drainage regime (including the Cambridge Biomedical Campus surface water drainage network)	Flood flow storage and conveyance	Key to local drainage, Biomedical Campus drainage network designed to attenuate runoff generated in the 1 in 100 year plus 20% climate change allowance storm event	High/Medium

** Hydraulic modelling of the North Ditch, details of which are included in the Flood Risk Assessment (Appendix 18.2 to the ES) shows no out-of-bank flooding for the modelled events and suggests that flood risk from the North Ditch to the proposed Development is lower than indicated by the mapped Flood Zones in the EA Flood Map for Planning. Hence medium importance was assigned.*

7.4.5 The magnitude of change (or impact) on the baseline condition of an attribute of the water environment is assigned considering the scale and extent of change and the nature and duration of the impact. Definitions of magnitude are provided in Table 7-4 below, which were adapted from Table 3.71 of LA113 with reference to the paper Practical Methodology for Determining the Significance of Impacts on the Water Environment⁵.

Table 7-4 - Criteria for Determining the Magnitude of Impact on Water Environment Receptors

Magnitude of Impact	Criteria
Major Adverse	Results in loss of attribute and/or quality and integrity of the attribute
Moderate Adverse	Results in effect on integrity of attribute, or loss of part of attribute
Minor Adverse	Results in some measurable change in attribute quality or vulnerability
Negligible	Results in effect on attribute of insufficient magnitude to affect the use or integrity
No Change	No loss or alteration of characteristics, features or elements; no observable impact in either direction
Minor Beneficial	Results in some beneficial effect on an attribute or a reduced risk of a negative effect occurring

⁵ Mustow, S. E., Burgess, P. F. & Walker, N. (2005). Practical methodology for determining the significance of impacts on the water environment. Water and Environment Journal, 19(2), pp. 100-108.

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Magnitude of Impact	Criteria
Moderate Beneficial	Results in moderate improvement of attribute quality
Major Beneficial	Results in major improvement in attribute quality

7.4.6 The overall significance of an effect is then derived by combining the value (importance) of the receptor with the magnitude of the predicted impact (change), as illustrated in Table 7-5 below. The matrix is based on Table 3.8.1 in LA 104 – Environmental assessment and monitoring (ES Ch 18.7- Ref 18.31).

7.4.7 For the purposes of this assessment, and in line with DMRB LA 104 effects of moderate or greater significance are considered to be significant in EIA terms.

Table 7-5 - Significance of Effect Matrix

Value of Receptor	Magnitude of Impact			
	Major	Moderate	Minor	Negligible
High	Large	Large or Moderate	Slight or moderate	Slight
Medium	Large or Moderate	Moderate	Slight	Neutral or slight
Low	Slight or moderate	Slight	Slight	Neutral or slight
Negligible	Slight	Neutral or slight	Neutral or slight	Neutral

7.4.8 Where more than one level of significance is possible, professional judgement is used to determine which is most appropriate on a case-by-case basis and ensuring regard to the precautionary principle. Effects with an overall significance of moderate, large and very large are considered Significant for the purposes of the relevant EIA regulations.

7.5 FRA Methodology

7.5.1 The FRA has used flood risk data and flood history information collected from a number of strategic reports produced by CCiC and Cambridgeshire County Council (CCoC) including the Strategic Flood Risk Assessment (SFRA) (ES Ch 18.7 -Ref 18.25), Preliminary Flood Risk Assessment (PFRA) (ES Ch18.7-Ref 18.26) and Addendum (ES Ch 18.7-Ref 18.27) and Surface Water Management Plan (ES Ch 18.7-Ref 18.28). The ES is Doc Ref. NR16. The FRA also incorporates calculations/modelling of the North Ditch and Tibbets culvert which was informed by survey data of the channel and culvert.

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7.5.2 A study was undertaken to quantify flood risk to the proposed development from the North Ditch more accurately. The study focussed on the area of the proposed development where the new station would be situated and included hydrological modelling of the North Ditch catchment to derive flood flow estimates and hydraulic modelling of a reach of the watercourse, to define water levels.

7.5.3 To calculate flows, the topographical catchment area of the North Ditch was defined using available data, including EA LiDAR⁶, which is shown in Figure 7-1, and verified using available information about existing surface water drainage networks (described below). In the figure higher topography is represented by the red and orange colours, with the lowest ground levels represented by areas of green and blue.

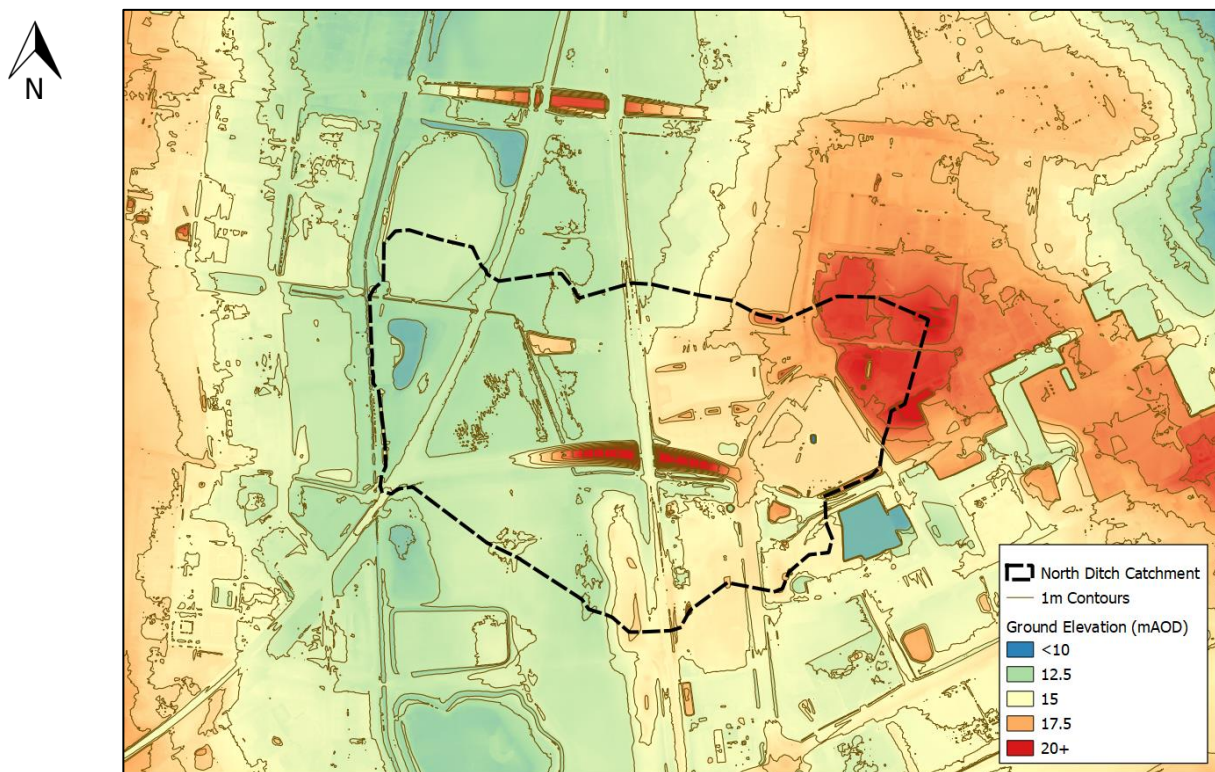


Figure 7-1 - Topography of the North Ditch Catchment

7.5.4 Flows for this catchment area (36 ha) were calculated using recommended methods from the Flood Estimation Handbook (developed by the UK Centre for Ecology and Hydrology). For watercourses where flows are not monitored, like the North Ditch, these methods use data describing factors such as rainfall, the permeability of local soils and geology, the land use and topography.

⁶ LiDAR is Light Detection and Ranging, is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth.

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- 7.5.5 In the flood event with a 1% (1 in 100) annual chance, inclusive of a 20% uplift for climate change, a flow of 79l/s was calculated for the North Ditch catchment to its confluence with Hobson's Brook. This is equivalent to a runoff rate per hectare of 2.2 litres per second per hectare (l/s/ha) which aligns closely to the permissible discharge rate of 2l/s/ha that the development plots within the Biomedical Campus extension have been designed to achieve in this design storm event. The 2l/s/ha discharge rate is adopted to present the greenfield (predevelopment) runoff rate, which is set by the Hobson's Conduit Trust covenants and policies within the SCDC Local Plan and Cambridge Local Plan, details of which have been provided in Section 3 above.
- 7.5.6 This flow was routed through the hydraulic model, which represents the geometry and slope of the North Ditch channel. The model covers the reach of North Brook from the culvert outlet at Francis Crick Avenue (the Hospital culvert) downstream to the ditch's confluence with Hobson's Brook, illustrated in Figure 6-2.
- 7.5.7 The results of the modelling showed that the North Ditch channel has capacity to convey the modelled flows for the 1% annual change flood event plus 40% uplift for climate change (known as the design flood), and no out-of-bank flooding is predicted within the proposed development area. The 40% uplift on flow for climate change is in exceedance of the current guidelines on assessing the effects of climate change, which was updated in July 2021⁷. The new guidelines state that in the Cams and Ely Ouse management catchment, which the CSIE Project is located in, for essential infrastructure developments the higher allowance should be applied, which to the 2080s is equal to 19%.
- 7.5.8 The proposed development therefore complies with the key requirement of the National Planning Policy Framework linked to development and flood risk, by being situated in an area that is not at high risk of flooding, inclusive of a conservative, 40% rather than the 20%, climate change allowance over the development lifetime.

⁷ [Flood risk assessments: climate change allowances - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/flood-risk-assessments-climate-change-allowances)

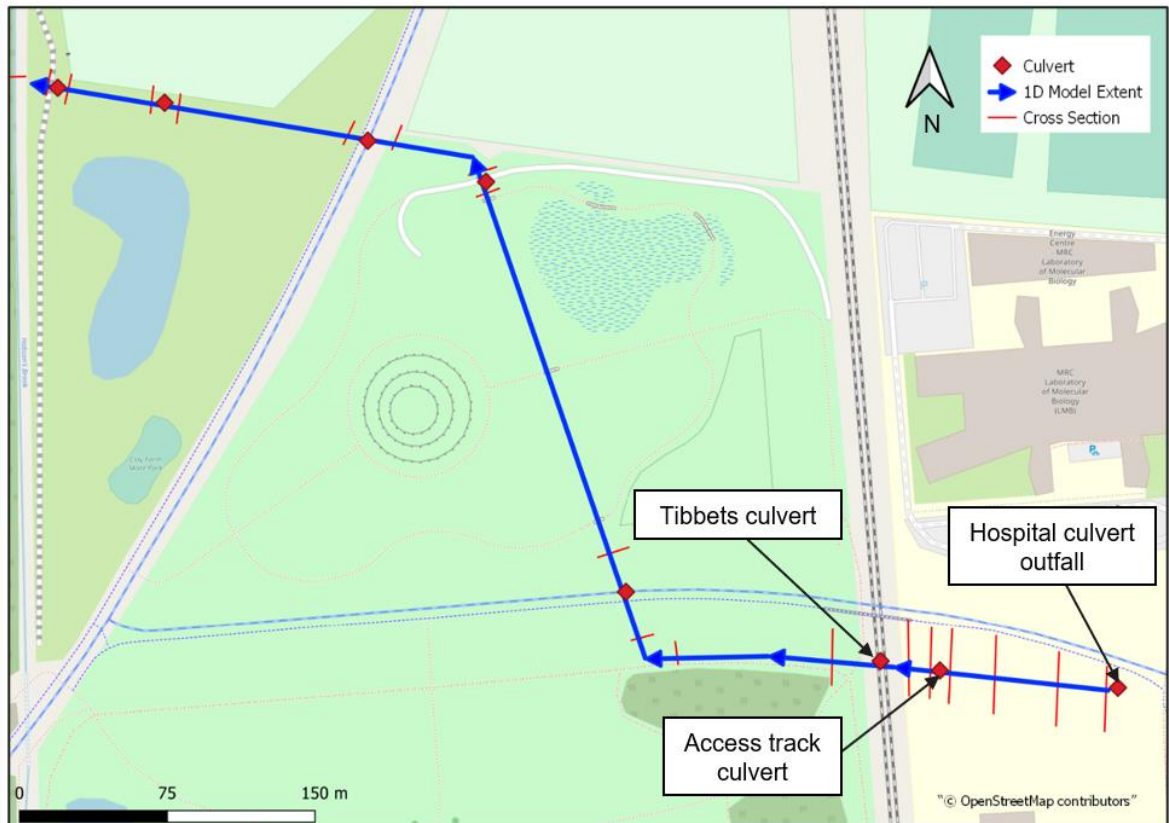


Figure 7-2 - Modelled extent of the North Ditch

- 7.5.9 As part of the proposed development the existing Tibbets culvert will be re-modelled to accommodate the station building and forecourt to the western side of the railway track. The culvert extension works will be designed to ensure no increase in flood risk from the North Ditch to the proposed Development or elsewhere, in accordance with the requirements of the National Planning Policy Framework and the Local Development Plan policies relevant to managing flood risk (see Section 3).
- 7.5.10 The culvert remodelling will involve effectively connecting Tibbets culvert to the Hospital culvert, located under Francis Crick Avenue and continue under the railway line. The new culvert will therefore be approximately 150m in length in total.
- 7.5.11 The existing Tibbets culvert comprises a short 900mm diameter structure below the railway, demonstrated, through the modelling study, to convey the design flood flow without causing out of bank flooding.
- 7.5.12 The re-modelled culvert must be 1200mm diameter to accord with CIRIA design guide C786 and the Design Manual for Roads and Bridges HA107/04 (replaced by CD529 March 2020) which requires culverts longer than 12 metres to be 1200mm diameter. Whilst the proposed culvert is larger than the current Tibbetts Culvert structure, no additional flow will be passed as all

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catchments discharging upstream are subject to flow control. The existing Tibbetts Culvert capacity far exceeds those stated in Table 6-1 consequently, the remodelled culvert will not allow any additional flow to pass downstream therefore downstream flood risk is not increased.

- 7.5.13 The culvert remodelling has been discussed in consultation with the EA and the LLFA, who have both agreed to the principle. The modelling assessment undertaken has also been reviewed and accepted by the EA and their original objection has been withdrawn. (Ref OBJ/05-W Environment Agency).

8 Flood Risk and Surface Water Drainage Effects During Construction

- 8.1.1 This section summarises the potential water environment impacts and effects of the CSIE project during the construction phase, the mitigation proposed, and any residual effects anticipated. For additional details relating to construction methodology, refer to the proof of Mr Andy Barnes, ref NRE1.2.

8.2 Construction Approach and Mitigation of Construction Effects

- 8.2.1 A qualitative assessment of the effects on the water environment resulting from construction of the proposed development has been undertaken. This has considered the types of construction activities involved, the duration of activities and their proximity to water features.

Safeguarding Water Quality During Construction

- 8.2.2 To ensure the quality of the water environment does not deteriorate during construction, an outline Code of Construction Practice (CoCP Part A) has been produced and has been submitted with the CSIE Order application. This documents site management procedures for preventing and reducing the environmental impacts of construction, including a Pollution Control Plan, to safeguard the quality of surface water and groundwater during the construction phase. Industry good practice has been drawn on to inform the CoCP Part A, such as guidance produced by the Construction Industry Research and Information Association (CIRIA) and the EA.
- 8.2.3 To supplement the outline CoCP method statements will be prepared for specific and higher risk activities, for example extension of the Tibbets culvert and drainage outfall construction. Such works would be managed and monitored by the main contractor, in accordance with the method statements that will form part of a detailed CoCP (CoCP Part B).
- 8.2.4 An Emergency Spillage Response Plan would also be included in the CoCP Part B. This would document measures to be implemented to prevent pollutants infiltrating into the soils beneath the site and reaching surface water or groundwater receptors, for example, in the event of an accidental spillage, or in response to an extreme weather event. Appropriate equipment (absorption mats) would be made easily accessible on site to deal with accidental spillages and the Plan would also provide a full list of protocols and communication channels with the Environment Agency in the event of a pollution incident.

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- 8.2.5 By following this approach, which is tried and tested, impacts on the water quality of watercourses in the Hobson's Brook catchment during construction of the CSIE project will be avoided.

Mitigating Flood Risk and Impacts on Water Resources

- 8.2.6 The CoCP Part B will document how construction works with the potential to impact flow conveyance of local watercourses (e.g., works to extend Tibbets culvert) will be carried out to minimise the potential for increased fluvial flood risk from these watercourses during construction.
- 8.2.7 Drainage works will require excavation of new attenuation basins (SuDS) and outfalls prior to the commencement of the main construction works.
- 8.2.8 As a result of the sensitivity of the site in relation to the chalk and the location of Nine Wells, any piling will be undertaken in accordance with the recommendations from a piled foundation risk assessment (to be undertaken during detailed design), reducing the potential risk of creating contamination pathways as a result of piling during construction. This will be submitted for approval as part of CoCP Part B.
- 8.2.9 Excavation for the lift shaft during the construction phase would require dewatering. Depending on the quantities an environmental permit to discharge the water may be required. This will be confirmed during the detailed design stage, informed by ground investigation data. If dewatering activities are proven to be significant enough to fall under the permitting regime, additional assessments in accordance with EA methodologies would be undertaken to inform the consent application.
- 8.2.10 Any consenting requirements would be adhered to by the appointed contractor. This will reduce potential pollution risks to the receiving waterbody, as well as safeguard private supplies, Hobson's Brook and Nine Wells.

8.3 Assessment of Effects

- 8.3.1 Taking into account the proposed construction design and mitigation measures outlined above and potential effects on the identified receptors, the potential magnitude of impact has been established.
- 8.3.2 The potential magnitude of impact has been informed by the fact that potential impacts would be temporary in nature and occur only during the construction phase. The magnitude of impact and significance of effect have been assigned in line with methodology described in Section 7.

Proof of Evidence Sue Brocken (NRE5.2)

8.3.3 Table 8-1 below provides a summary of the construction effects discussed above along with their significance. It can be seen that the temporary effects during the construction phase have been assessed as Not Significant.

Table 8-1 - Assessment Summary – Construction Effects

Receptor	Potential Significant Effect	Mitigation Measure	Residual Effect Significance
Hobson's Brook North Ditch South Ditch	Pollution with fuel, oils, cement or concrete	A CoCP Part B would be produced and implemented. This would document procedures for managing environmental impacts during construction and would include a Pollution Control Plan.	Slight Adverse – Not Significant
Small watercourses and land drains Ponds	Silt pollution	An emergency spillage response plan would also be prepared to document measures to be implemented to prevent pollutants reaching receptors.	Slight Adverse – Not Significant
Cam and Ely Ouse groundwater (Principal Aquifer) River terrace deposits (Secondary A Aquifer)	Piling Excavation and dewatering	Groundwater would be safeguarded through measures secured in the CoCP Part B, including a Pollution Control Plan. Where required, dewatering quantities would be assessed in line with EA methodologies and any permitting requirements would be adhered to.	Slight Adverse – Not Significant
Hobson's Brook North Ditch South Ditch Small watercourses and land drains Land drainage regime	Increase in surface water flood risk – increased surface water runoff from impermeable areas and due to soil compaction/disturbance	Drainage from the proposed Development during construction would be managed appropriately in accordance with best practice measures which will be documented in the CoCP Part B.	Slight Adverse – Not Significant

Proof of Evidence Sue Brocken (NRE5.2)

Receptor	Potential Significant Effect	Mitigation Measure	Residual Effect Significance
Hobson's Brook North Ditch South Ditch Small watercourses and land drains	Increase in fluvial flood risk – construction works to structures within watercourses (e.g. Tibbets culvert)	The footprint of the proposed Development within the floodplain has been minimised and the CoCP Part B would document how the works would be carried out to reduce the potential for increased fluvial flood risk from these watercourses during construction.	Slight Adverse – Not Significant
Cam and Ely Ouse groundwater (Principal Aquifer)	High groundwater levels from increased infiltration due to creation of construction compounds	Measures would be incorporated into the CoCP Part B to minimise the potential for disturbance of topsoil and superficial deposits which could lead to increased infiltration.	Slight Adverse – Not Significant
	Increased water demand for construction activities	A CoCP Part B would be produced and implemented. This would document procedures for using water efficiently and reducing water consumption, as well as for managing foul water during construction.	Neutral – Not Significant
	Foul water generated during construction		

9 Flood Risk and Surface Water Drainage Effects During Operation

9.1.1 This section summarises potential water environment impacts and effects of the CSIE Project during the operational phase, the mitigation proposed, and any residual effects anticipated as reported within the ES.

9.2 Scheme Design and Mitigation of Operational Effects

9.2.1 The FRA provides an overview of flood risk to the proposed development from all sources, with the assessment of fluvial flood risk being informed by a hydraulic assessment of the North Ditch and Tibbets culvert. The hydraulic model of the North Ditch predicts no out-of-bank flooding in all of the modelled events, including those that consider climate change over the development lifetime (currently assumed to be 120 years). The model results suggest that the proposed development is at lower risk of fluvial flooding than indicated by the EA Flood Map for Planning mapped flood zones. Given these findings, measures to mitigate fluvial flood risk during operation are not considered necessary.

9.2.2 The proposed development would result in an increase in impermeable area which could result in an increase in surface water runoff rates and volumes. It is considered that the potential increase in surface water runoff due to an increase in impermeable area can be adequately managed through implementation of the drainage proposals which are described in the following paragraphs. The drainage proposals would therefore mitigate surface water flood risk to the proposed development and the surrounding area.

9.2.3 SuDS would be utilised to manage surface water from the proposed development, in terms of both water quality and quantity. Swales and attenuation basins will be used to receive and attenuate surface water runoff, as described in the FRA. An assessment, using the Simple Index Approach (SIA) detailed in 'The SuDS Manual (C753)', has been undertaken to provide a high-level assessment of water quality pollution risks from the operation of the proposed development and is included in Appendix 18.4 of the ES, (Doc Ref. NR16). The SIA assessment shows that the proposed swales and attenuation basins are sufficient for mitigating total suspended solids and metals, but some additional hydrocarbon mitigation would be required. This additional hydrocarbon mitigation would be accounted for in the detailed drainage design (to be undertaken at subsequent design stages) and may include measures such as installing vortex separators at the outfalls of the attenuation basins. The SIA assessment concludes that subject to their detailed

Proof of Evidence Sue Brocken (NRE5.2)

design, sufficient SuDS measures are included to protect the water quality of receiving watercourses.

9.2.4 The drainage design proposals have adopted a plus 40% allowance for climate change in line with LLFA guidance (see Table 4-1) and will be sympathetic with the existing drainage arrangements that serve the Biomedical Campus. The proposed attenuation ponds have been sized to ensure a discharge rate no greater than 2 litres per second per hectare. The calculations undertaken to determine the attenuation requirements for the proposed development are detailed in the FRA.

9.2.5 Network Rail will be responsible for the maintenance and management of the surface water drainage system for the proposed development. Maintenance will be carried out in accordance with the Network Rail Drainage Systems Manual⁸. The Manual covers general drainage maintenance, maintenance of railway drainage, maintenance of culverts and sets out standards for undertaking drainage inspections and surveys.

9.2.6 Where the proposed development requires works to existing drainage structures or installation of new structures (such as Tibbets culvert), they will be designed and sized appropriately to ensure there is no increased flood risk from this source and no detriment to the local drainage regime. Typically, ordinary watercourse consent would need to be obtained from the LLFA prior to construction works for new culverts or extending culverts under the Land Drainage Act. However, for the proposed development, the TWAO will cover requirements of the Land Drainage Act and demonstrate that:

1. The design of watercourses crossings, culvert extensions and modifications would cause no detriment to the flow regimes of watercourses and no increase in flood risk either upstream or downstream.
 2. Access to the Hobson's Brook and any ordinary watercourses (e.g. the North and South Ditches) for maintenance and future improvement would not be prejudiced.
- [tbc]

9.2.7 Where sewer connections are required as part of the development of the new station, these connections will be sized appropriately and will be undertaken in consultation with Anglian Water. Consent from Anglian Water would be sought for any new sewer connections.

9.2.8 Habitat improvements in the riparian corridor proposed as part of the biodiversity enhancements include minor changes to vegetation and no in-stream works are proposed. Therefore, this is not assessed further in this chapter. For more detail on the proposed biodiversity enhancements reference should be made to Chapter 8 of the ES. Biodiversity, (Doc Ref. NR16).

⁸ Network Rail (2018). Drainage Systems Manual NR/L2/CIV/005.

9.3 Assessment of Effects

- 9.3.1 Taking into account the proposed operational design and mitigation measures outlined above and potential effects on the identified receptors, the potential magnitude of impact has been established.
- 9.3.2 The magnitude of impact and significance of effect have been assigned in line with methodology described in Section 7.
- 9.3.3 Table 9-1 below provides a summary of the operational effects discussed above along with their significance. It can be seen that the effects during the operational phase have been assessed as Not Significant.

Table 9-1 Assessment Summary – Operational Effects

Receptor	Potential Significant Effect	Mitigation Measure	Residual Effect Significance
Hobson's Brook North Ditch South Ditch Small watercourses and land drains Ponds	Pollution from operational surface water runoff and accidental spills in parking/storage areas	SuDS would be used to promote good water quality standards and provide treatment of surface water runoff prior to discharge to local watercourses. Accidental spills in parking/storage areas would be contained in line with standard operational practice.	Slight Adverse – Not Significant
Hobson's Brook North Ditch South Ditch Small watercourses and land drains Land drainage regime	Changes in flow conveyance and/or local hydraulics of watercourses Increase in flood risk – increased surface water runoff from impermeable areas and due to permanent increase	The culvert extensions and modifications would be designed and sized appropriately to ensure there is no increased flood risk and no detriment to the local drainage regime. The footprint of the proposed Development within the floodplain has been minimised. SuDS would be included in the drainage proposals to manage surface water quantity and provide	Slight Adverse – Not Significant

Proof of Evidence Sue Brocken (NRE5.2)

Receptor	Potential Significant Effect	Mitigation Measure	Residual Effect Significance
	in impermeable land cover	attenuation of surface water runoff from the proposed Development.	

9.4 Cumulative Effects

- 9.4.1 The cumulative effects of the proposed Development have been addressed with reference to the development schemes listed in Appendix 2.3 of the ES, (Doc Ref. NR16). The assessment considers those schemes that have been consented within the Greater Cambridge District and that have the potential to have a cumulative impact on the water environment by being situated in the same hydrological catchment as the proposed Development (the Hobson's Brook catchment). Eight schemes have been identified in the catchment, with the following LPA reference numbers 16/0653/REM, 16/1078/OUT, 19/1070/REM, 16/0165/FUL, 16/0176/OUT, S/4279/19/FL and 19/1168/OUT.
- 9.4.2 There is the potential for developments that drain the same hydrological catchment as the proposed development to have a cumulative impact on flood risk, through the generation of increased runoff. However, in line with local policy requirements, described in Section 18.2, it is considered that other developments would also incorporate SuDS (including best practice construction methods) to manage impacts on water quality and runoff quantity during their construction and operation. It is therefore considered that there would be Neutral cumulative effects on these attributes of the surface water environment within the study area, and thus Not Significant effects.
- 9.4.3 Similarly, to achieve policy compliance, other developments would incorporate measures to safeguard the quality of shared underlying groundwater resources. It is also expected that water use efficiency measures would be embedded in these other developments, reducing the potential for cumulative effects on the quantitative status of groundwater resources.

9.5 CSET Scheme

- 9.5.1 Aspects of the construction programme for CSET overlap with the construction programme for the proposed development. For example, the earthworks required for CSET at the junction of the guided busway and Francis Crick Avenue would coincide with the earthworks required to the south of the guided busway for the proposed station. CSET construction activities would be subject to water quality and pollution control measures, aligned to those proposed to manage the effects of

Proof of Evidence Sue Brocken (NRE5.2)

construction of the proposed Development. These controls would be documented in a CoCP or similar, specific to CSET. Compliance with the respective CoCPs and coordination of the construction programmes would ensure no cumulative effects on shared water environment receptors (the North Ditch, Hobson's Brook, the South ditch) during construction.

- 9.5.2 During operation, the aspect with most potential for cumulative effects is the management of surface water runoff, as CSET and the CSIE Project are partially located in the same drainage catchments.
- 9.5.3 The Outline Surface Water Drainage Strategy drawings for the CSET scheme have been reviewed and key interactions are noted at the junction of the guided busway and Francis Crick Avenue (in the vicinity of the proposed station forecourt) and between Addenbrooke's Road and Nine Wells. The CSET surface water drainage proposals for Francis Crick Avenue and its junction with the guided busway are to discharge to the existing CBC north attenuation basin, with no discharges required to the proposed CSIE Mid Attenuation Basin. Between Addenbrooke's Road and Nine Wells the CSET alignment runs parallel to the railway line and drainage proposals include for a CSET new pond to provide the necessary attenuation of surface water runoff.
- 9.5.4 The review has concluded that the surface water drainage proposals for the proposed development and CSET are compatible and complimentary. Where watercourse crossings are required as part of the CSET proposals, these would be designed appropriately to ensure no impact on the flood flow storage and conveyance attributes of local watercourses. Therefore, it is anticipated that there would be Neutral cumulative effects on flood risk and drainage attributes of the surface water environment within the study area during operation, and thus Not Significant effects.
- 9.5.5 The implications of CSET on the need for the proposed Mid Attenuation Basin will be accounted for in the future design stages of the proposed development.
- 9.5.6 SuDS features have been incorporated into the CSET proposals and will provide treatment of surface water runoff. Combined with the proposed development's SuDS features, these will ensure no detriment to surface water and groundwater quality. Therefore, during operation cumulative effects on the water quality attributes of the water environment are anticipated to be Neutral and thus Not Significant.
- 9.5.7 No cumulative effects are anticipated on the potential for surface watercourses within the study area to transport and dilute waste water discharges as no detriment to their water quality is anticipated and no new consumptive water uses are proposed.

10 Responses to Objections

The following parties have objected to the CSIE Project on drainage/ flood risk grounds:

- a. OBJ 03- AstraZeneca
- b. OBJ 06 –Cambridge University Hospitals NHS Foundation Trust (CUH)
- c. OBJ 08 –University of Cambridge
- d. OBJ 09 –Medical Research Council
- e. OBJ 10- CBC Estate Management Company Limited
- f. OBJ 11- Cambridge Medipark Limited
- g. OBJ 15- Pemberton Trustees
- h. OBJ 17- Countryside Cambridge One Limited and Countryside Cambridge Two Limited
- i. OBJ 18- Cambridgeshire County Council and Greater Cambridgeshire Partnership
- j. OBJ 23- Cambridge City Council
- k. OBJ 24-South Cambridgeshire District Council

10.1.1 Although the Environment Agency (OBJ 05) initially objected to the Order, their objection was withdrawn on 20th September 2021 (Ref OBJ/05-W Environment Agency).

10.1.2 In general, the objectors are based upon common themes

- a. Impact on Hobson's Brook, including North and South ditches
- b. Impact on Existing Stakeholder Drainage Networks
 - i. Impact on CSET scheme
 - ii. Astra Zeneca existing drainage systems
 - iii. Impact on University of Cambridge existing drainage systems
 - iv. Impact on Medical Research Council existing drainage systems
- c. Requirements to follow formal consenting process prior to construction.

10.2 Objections

OBJ 03 – Astra Zeneca

10.2.1 Astra Zeneca has raised the following objection related to drainage.

Proof of Evidence Sue Brocken (NRE5.2)

10.2.2 **Issue:** The Order land will prevent the ability to complete the drainage attenuation scheme for the site as detailed in the site Masterplan. Drainage of this site is incredibly complex and has been a major issue in the consenting of the site. We understand Network Rail will also require a drainage strategy for its project and AZ is waiting for confirmation that the TWAO works will create no consequent negative impact on the sites consented drainage scheme. Whilst Network Rail has not completed the design of its drainage scheme AZ is seeking a commitment that it will not do anything to compromise the performance of the South Plot drainage scheme so that the South Plot drainage scheme can be completed in its entirety as consented without impactful alteration.

10.2.3 **Response:** Stakeholder meetings are ongoing during the design development to ensure that the proposed station development is sympathetic to the existing drainage networks within the AZ site. A revised permanent site boundary has removed the potential impact on the consented AZ scheme with the exception of the current outfall to the North Ditch. Following receipt of more detailed information relating to the existing AZ drainage networks and the outfall to North Ditch, an alternative route is proposed, as noted in 6.6, which will maintain a discharge route.

10.2.4 As noted in Section 6, the proposed track and station drainage networks are to remain separate from the AstraZeneca system. Discharges from these proposed NR networks into the north and South Ditches will be restricted to 2 l/s/ha in accordance with the Cambridgeshire planning guidance.

10.2.5 Based on the above, it is envisaged that the interface with the AZ drainage assets can be managed throughout the construction stage and a suitable route for the diversion of the existing outfall around the proposed station building is possible therefore the AZ assets will not be negatively impacted by the proposed station scheme.

OBJ 06 – Cambridge University Hospital

10.2.6 CUH has raised the following objections relevant to drainage.

10.2.7 **Issue:** The drainage designs will need to demonstrate that discharge rates of surface water runoff to existing watercourses are attenuated to acceptable levels to ensure there is no increase flood risk. Based on the level of detail currently provided, it is not possible to confirm whether the sizing of proposed drainage features is adequate.

10.2.8 The proposals will need to make sure there are no significant detrimental impacts upon the route, character, hydrology and biodiversity of Hobson's Brook and its tributaries. Hobson's Brook passes through the proposed Development site, via a network of smaller watercourses and drainage ditches. It is proposed to discharge surface water run-off from the proposed station to the existing North Ditch. The North Ditch is a tributary of the Hobson's Brook.

Proof of Evidence Sue Brocken (NRE5.2)

10.2.9 To enable construction of the new station forecourt, we note it is proposed to relocate an existing attenuation pond serving part of the Cambridge Biomedical Campus. CUH requests that further information is provided and ongoing consultation is provided during detailed drainage design to make sure the proposals are not detrimental to the existing surface water drainage network. Additionally, during the construction phase, the railway station development could potentially impact on the existing water quality by generating polluted runoff to watercourses. Temporary works proposals should ensure that the construction does not cause pollution incidents and we request to review the Construction Environmental Management Plan and specific construction details in advance of the works.

10.2.10 During the operational phase, the main potential for water quality effects is linked to the discharge of surface water runoff from the Station. We note that a Simple Index Approach (SIA) assessment has been undertaken to provide an assessment of water quality pollution risks from the operation of the scheme. The outline information appears satisfactory but we request that CUH is consulted during the detailed design stage to agree how these risks will be managed.

10.2.11 We accept the principles of the proposed runoff rates as stated in the Flood Risk Assessment; however we wish to be consulted further at detailed design stage, particularly around the discharge locations and how the schemes aim to demonstrate that surface water will be managed onsite to ensure there is no flooding off the site up to and including the 1 in 100 year event plus climate change taking account for the future growth within the Campus.

10.2.12 **Response:** Key drainage features include a proposed culvert on the North Ditch, as well as several features that will provide attenuation storage for surface water runoff from the Project. With regard to the adequacy of the sizing of the North Ditch culvert, as noted in Table 4-2 above, the EA were consulted and initially raised an objection (OBJ 05) in relation to the level of detail relating to the modelling of the culverting proposals. Following further consultation and provision of additional modelling data, the EA have subsequently withdrawn their objection (Ref OBJ/05-W Environment Agency), noting their satisfaction with the proposals. With regard to provision of attenuation storage for surface water runoff, the Flood Risk Assessment commits to the principle of achieving greenfield rates of runoff, ensuring that there will be no increase in flood risk.

10.2.13 Potential for the Project to impact on the Hobson's Brook and its tributaries, including its hydrology and water quality, was assessed in Chapter 18 of the ES, and as summarised in Tables 8-1 and 9-1 above, no significant detrimental effects were concluded. The assessment was undertaken in consultation with the Hobsons Conduit Trust, who do not have any objections to the scheme. It is also noted that the scheme, where it involves works to tributaries of Hobson's Brook, will be submitted to the LLFA for consenting prior to construction.

Proof of Evidence Sue Brocken (NRE5.2)

10.2.14 As noted in 2.4, the only contributor to the Mid Attenuation Basin contained within the land to be purchased to accommodate the new station forecourt, is the highway drainage from Francis Crick Avenue. Analysis has been undertaken considering flows up to an including the 1 in 100 year plus 40% climate change. The relocation of the existing attenuation pond within the proposed station forecourt has been modelled and compensatory attenuation is to be provided as noted in 6.7, this will be further refined during the detailed design stage. This attenuation has been altered from a pond to sub surface storage within a re-modelled station access to accommodate CSET proposals. Compensatory habitat for the loss of biodiversity due to replacing the existing basin with a sub-surface tank will be reviewed during the next design phase when an assessment can be undertaken to ensure that as a whole the CSIE Project provides a net gain.

10.2.15 The proposed CSET scheme may render the Mid Attenuation Basin redundant as it is proposed to drain all of Francis Crick Avenue to the South Ditch, However, the timescales of the CSET scheme are such that this may not be in place prior to construction of the proposed station and as a result, alternative attenuation provision has been provided within the CSIE scheme design, to ensure no detriment to the existing drainage network.

10.2.16 During construction of the Project, pollution of the water environment as a result of receipt of contaminated surface water runoff will be avoided by implementing good practice measures detailed in the Construction Environmental Management Plan (CEMP). Protocols and equipment to manage any accidental spillage incidents will also be available on the construction site to prevent pollution arising from any such incidents.

10.2.17 Surface water from the station platforms will be collected and discharged into the track drainage system. Green roof systems will be provided along the platform canopies and a rain garden is proposed within the station forecourt to provide treatment of surface water. These features will provide for treatment of runoff from the Station to safeguard the water quality of the North Ditch. A further assessment will be undertaken at the next phase based on the Simple Index Approach method guidance contained within C753 to determine whether any additional treatment is required. Currently it is envisaged that no additional treatment will be necessary.

10.2.18 Ongoing consultation during the detailed design development stage, including on matters linked to discharge locations and with regard to the CEMP, will be undertaken to ensure all interested parties are fully informed. This will include consultation with CUH.

OBJ 08 University of Cambridge

10.2.19 University of Cambridge has raised the following objections related to drainage.

Proof of Evidence Sue Brocken (NRE5.2)

10.2.20 **Issue:** Any alterations to the drainage arrangements proposed by the Scheme would need to be undertaken in a manner that preserves the normal operation of the AMB facility, both temporarily and permanently. It is currently unclear what impacts there are upon the swale and attenuation pond that exist within the University's Estate, particularly given that the limits of deviation shown on the TWAO application drawings appear to straddle on site drainage infrastructure. Network Rail's Environmental Statement for the proposed Scheme does not obviously assess this. Network Rail has not committed to any mitigation measures which take into consideration the implications of the Scheme on the drainage arrangements for the AMB facility and they are therefore inadequate. As such, the Environmental Statement and the Draft Order and related suite of TWAO application documents are deficient.

10.2.21 The University must also understand the intended implications for the management and maintenance of drainage and landscape features going forward to protect future maintenance and building operations. At present, whilst the submitted Flood Risk Assessment suggests that it is Network Rail's intention to manage features within the Order Limits, there appears to be no further information provided in this regard to clarify which elements are temporary and which are permanent management issues, despite the deposited TWAO plans suggesting that some of the University's existing surface water drainage features fall within land that Network Rail is looking to compulsorily acquire.

10.2.22 Hobsons Conduit: We would highlight that the surface water drainage outlet from AMB and Plot 9 discharges into the balancing ponds to the south of the AMB (within the control of Cambridge Medipark Limited). The University understands that the water from the balancing ponds subsequently feeds into the Hobson's Conduit via the South Ditch further to the south of the AMB and Plot 9, outside of the University's demise. Furthermore, the University has given covenants to the Trust to protect the Hobson's Conduit from damage and contamination.

10.2.23 Given the inter-dependency between the AMB and Plot 9 drainage design and the potential impact upon the Conduit, the University requires suitable mitigation measures to be put in place to ensure the outfall drainage from the AMB and Plot 9 remains unaffected by the Scheme. Whilst we understand that there are protective provisions in place in relation to the Conduit itself, it does not appear to us that Network Rail has committed to any specific mitigation measures to protect the outfall drainage from the AMB and Plot 9. As such, the Environmental Statement and the Draft Order and related suite of TWAO application documents appear to us to be deficient.

10.2.24 I have reviewed the UoC Statement of Case and have not identified any additional points of concern beyond that noted within the initial objection with the key drainage concerns being in relation to the interface with the AMB existing drainage network, the downstream section where it discharges to Hobsons Brook and the proposed Plot 9 drainage.

Proof of Evidence Sue Brocken (NRE5.2)

10.2.25 **Response:** Based on the information provided, Network Rail recognises that its proposals have an impact on the existing drainage assets pond on the AMB site both during construction and, to a lesser extent, following completion of the works. As discussed in Table 4-2 and detailed in Section 6.9, Network Rail propose that a temporary overflow from the existing UoC drainage network into the track drainage network and compensatory flood storage must be provided during construction for the AMB site. The compensatory storage will be provided within the pond to the west of the rail corridor. This will compensate for the loss of storage due to the temporary haul road construction. There will be no increase to the proposed permanent discharge rate of 2 l/s/ha from the proposed track drainage network into Hobsons Conduit to ensure that no additional flows are discharged into the watercourse.

10.2.26 Nominal reprofiling of the existing pond will be required in the permanent case where the proposed NR boundary fencing cannot be relocated sufficiently to avoid interfering with the existing swale. This will become apparent following detailed topographical surveys at the next stage at which point further discussions/ workshops can take place to ensure there is no detrimental effect on the existing surface water drainage system during and post construction. Network Rail will be giving a commitment to this effect in due course. NR has also given commitments to ensure that the works will not put UoC in breach of the contractual drainage flows they are currently required to comply with and to also engage with them on the final drainage design details.

10.2.27 As a result of relocating the attenuation pond from the east of the rail corridor to the west side, the potential interface between the eastern pond and the Hobsons Conduit (via South Ditch) has been removed.

10.2.28 As noted in Table 4-1, the Hobsons Conduit Trust have been consulted throughout the development of the scheme and have not raised any objections. The consultations will continue during the next phase of scheme design.

10.2.29 As noted in Table 4-2 above, the EA have been consulted relating to the culverting of the North Ditch and Hobsons Conduit and initially raised an objection (OBJ 05) in relation to the level of detail relating to the modelling of the existing network and the North Ditch. Following further consultation and provision of additional modelling data, the EA have subsequently withdrawn their objection (Ref OBJ/05-W Environment Agency).

10.2.30 My Proof of Evidence recognises the potential future impact on the currently undeveloped Plot 9. The Proof of Evidence of Mr John Pearson (Doc Ref. NR9.2), also seeks to address this point. This will be addressed via further workshops with UoC and their representatives during the next phase of scheme development.

Proof of Evidence Sue Brocken (NRE5.2)

10.2.31 Based on the above, it is envisaged that the interfaces between the UoC and NR scheme can be managed as the scheme progresses and more information, e.g detailed topographical survey becomes available. Ongoing consultation during the development stage will be undertaken to ensure all interested parties including University of Cambridge are fully informed and that their assets and obligations are not put at risk. This will include discussions on management responsibilities.

10.2.32 I am advised that the adequacy of the ES and application is a legal matter. Future development of the scheme, as noted above, will be discussed with the stakeholder to ensure no negative impact upon the assets.

OBJ 09 –Medical Research Council

10.2.33 The Medical Research Council has raised the following objection related to drainage.

10.2.34 **Issue:** Part of the land to be acquired by Network Rail is a ditch area that is part of the drainage plan for the site and designed to cope with a 1 in 50 year flood event. This would need to be re-provided somewhere else on Site.

10.2.35 There will also need to be appropriate drainage measures put in place with Network Rail providing satisfactory details of the revised drainage and surface water management measures that shall be implemented on the Site.

10.2.36 **Response:** Contrary to that which was proposed within the initial TWAO application, further design development and construction methodology reviews have been undertaken since submission resulting in the reduction of the width of permanent land acquisition required, which previously extended up to the edge of highway. This has now been reduced. The area beyond the proposed permanent boundary will only be required during construction for infrequent access. Therefore, there will be no permanent impact on any existing highway drainage system.

10.2.37 As noted in Section 6.10, a permanent access point may be required to the railway for future operational requirements, a short section of swale will have to be culverted to facilitate access across the swale. Further design will be undertaken following receipt of more detailed topographical survey at the next stage and will be reviewed with MRC at regular workshops.

10.2.38 A further review is to be undertaken at the next design stage to demonstrate with latest survey information that it is possible to maintain the existing swale parallel to the NR rail boundary in its current position. Where this is not possible, the swale will be reconstructed in between the existing western access road and the new boundary fence.

Proof of Evidence Sue Brocken (NRE5.2)

10.2.39 As noted in Table 4-2 above, the EA have been consulted relating to the culverting of the North Ditch and initially raised an objection (OBJ 05) in relation to the level of detail relating to the modelling of the existing network and the North Ditch. Following further consultation and provision of additional modelling data, the EA have subsequently withdrawn their objection (Ref OBJ/05-W Environment Agency).

10.2.40 Network Rail are currently offering commitments in Heads of Terms whereby NR will ensure that they, as a consequence of either accommodation works or permanent works the MRC are not put in a worse position in relation to drainage flows currently utilised. NR has also given commitments to ensure that the works will not put MRC in breach of the contractual drainage flows they are currently required to comply with and to also engage with them on the final drainage design details.

10.2.41 Based on the above, it is envisaged that, via ongoing consultation during the development stage with MRC, the interfaces can be managed to ensure MRC assets and obligations are not put at risk.

OBJ 10- CBC Estate Management Company Limited & OBJ 11- Cambridge Medipark Limited

10.2.42 The CBC Estate Management Company and Cambridge Medipark Limited have raised the following identical objections related to drainage, which I deal with together.

10.2.43 **Issue:** Concerns as to the Scheme's impact on the drainage systems in respect of the Biomedical Campus. On behalf of the objectors AECOM reviewed the Water Resource and Flood Risk chapter of the Environmental Statement together with the Flood Risk Assessment and raised several comments and requests for further information or clarification on flood risk and drainage matters. The review findings were appended to the Statement of Case.

10.2.44 The objectors remain to be satisfied as to whether the Promoter has included appropriate mitigation to offset the interference with the drainage systems in respect of the land and rights it proposes to acquire both permanently and for temporary construction access, and, whether this would put them in breach of their contractual obligations with the Hobson's Conduit Trust.

10.2.45 They also state that they remain to be satisfied as to whether the Promoter's proposals for the Scheme give adequate information about the drainage mitigation proposed. Two drainage ponds situated on the land subject to the Draft Order which appear to need to be relocated or culverted but our client is not yet clear as to how this will be carried out. It is important that our client is consulted on the technical design review and agrees any changes to the drainage systems and that the replacement arrangements are put into place prior to the removal of the drainage pond(s) if they are not to remain in place but be culverted.

Proof of Evidence Sue Brocken (NRE5.2)

10.2.46 The objectors also state that the protective provisions, contained in Parts 3 and 4 of Schedule 2 to the Draft Order, along with a proposed condition in the application for deemed planning permission do not provide adequate protection for the Campus drainage system.

10.2.47 Our client understands that the Promoter intends to install culverting to one of the ditches which is fed by the Addenbrooke's Hospital (Cambridge University Hospitals NHS Foundation Trust). There is a lack of design details within the Scheme as to how drainage will be managed. The Campus has no formal drainage rights and easements have been agreed with the Hobson's Conduit Trust to allow for the site to drain into two ancient ditches. If the flow rate exceed those which have been agreed with the Trust, this will put our client in breach of its obligations and risks causing flooding.

10.2.48 **Response:** Responses to the points raised in the AECOM flood risk and drainage review have been submitted to the objectors, and are provided in this evidence as Appendix A. This document is the subject of ongoing discussions with AECOM and will be reviewed as the design progresses. The key items are summarised below.

10.2.49 In relation to the interference with the existing watercourse referred to as North Ditch (to be culverted), a 1D analysis has confirmed that there is sufficient capacity within the system to not breach during the 1 in 100 year event plus 40% climate change allowance hence providing a system with equal or greater cross sectional area will not impact the surface water drainage network. The culvert extension will be appropriately sized to convey the existing flows as noted in Section 6.4 and 7.5. With no loss of flood storage and identical pass forward flows the post development scenario is considered flood neutral as reported in the FRA.

10.2.50 As noted in Table 4-2 above, the EA have been consulted relating to the culverting of the North Ditch and initially raised an objection (OBJ 05) in relation to the level of detail relating to the modelling of the existing network and the North Ditch. Following further consultation and provision of additional modelling data, the EA have subsequently withdrawn their objection (Ref OBJ/05-W Environment Agency).

10.2.51 Discharge from the proposed development as a whole will be attenuated to greenfield run off rates of 2 l/s/ha which will be agreed with the LLFA within the formal ordinary watercourse consenting process prior to construction.

10.2.52 The proposed development has separate discharges for track and station to reduce the risk to all stakeholders, in addition, there are no direct interfaces between the proposed track/ station drainage networks and the existing networks with the exception of a temporary connection during construction from the UoC site as noted in Section 6.9.

Proof of Evidence Sue Brocken (NRE5.2)

10.2.53 Ongoing consultation during the development stage will be undertaken to ensure all interested parties are fully informed.

10.2.54 Network Rail are currently offering commitments in Heads of Terms whereby NR will ensure that they, as a consequence of either accommodation works or permanent works that CBC/ CML are not put in a worse position in relation to drainage flows currently utilised. NR has also given commitments to ensure that the works will not put CBC/CML in breach of any contractual drainage flows they are currently required to comply with and to also engage with them on the final drainage design details. I am advised that the Heads of Terms have been agreed and therefore I assume that the objectors' concerns have been addressed.

OBJ 15 - Pemberton Trustees

10.2.55 Pemberton Trustees have raised the following objection related to drainage.

10.2.56 **Issue:** Limited detail has been provided on the impact on the existing and proposed infrastructure in the form of roads, drains, services, and green infrastructure within the country park.

10.2.57 Land drainage- The land take includes open drainage ditches and systems that provide storm water drainage from the existing and proposed developments, the country park, and from the surrounding farmland. Limited detail has been provided as to the nature of the works to be undertaken to maintain that drainage. Without such detail it is considered unsatisfactory to replace open ditches with underground culverts of limited capacity.

10.2.58 **Response:** In relation to the interference with the existing watercourse referred to as North Ditch (to be culverted), a 1D analysis has confirmed that there is sufficient capacity within the system to not breach during the 1 in 100 year event plus 40% climate change allowance hence providing a system with equal or greater cross sectional area will not impact the surface water drainage network.

10.2.59 The culvert extension between the Hospital Culvert and Tibbetts Culvert will be appropriately sized to convey the existing flows as noted in Section 6.4 and 7.5. With no loss of flood storage and identical pass forward flows the post development scenario is considered flood neutral as reported in the FRA

10.2.60 As noted in Table 4-2 above, the EA have been consulted relating to the culverting of the North Ditch and initially raised an objection (OBJ 05) in relation to the level of detail relating to the modelling of the existing network and the North Ditch. Following further consultation and provision of additional modelling data, the EA have subsequently withdrawn their objection (Ref OBJ/05-W Environment Agency).

Proof of Evidence Sue Brocken (NRE5.2)

10.2.61 In relation to the short extension of Websters culvert adjacent to the Shepreth Branch, the nominal 2-3m extension is to the downstream end of the culvert hence no impact to the upstream catchment. The extension will be to match the existing culvert diameter therefore no further assessment is proposed. The EA had no objections to this proposal.

10.2.62 The proposal to use culverts is therefore acceptable.

OBJ 17 – Countryside Cambridge One Limited and Countryside Cambridge Two Limited

10.2.63 Countryside Cambridge One and Countryside Cambridge Two Limited have raised the following issues related to drainage.

10.2.64 **Issue:** The local drainage system is highly complex. Countryside Cambridge One and Countryside Cambridge Two remain to be satisfied as to whether the Promoter has included appropriate mitigation to offset the interference with the drainage systems in respect of the land and rights it proposes to acquire both permanently and for temporary construction access, and, whether this would put our clients in breach of their contractual obligations with the Hobson's Conduit Trust

10.2.65 **Appropriate Mitigation:** Our clients remain to be satisfied as to whether the Promoter's proposals for the Scheme give adequate information about the drainage mitigation proposed. Our clients understand that the Promoter intends to carry out culverting of the existing drainage infrastructure, but our clients are not yet clear as to how this will be carried out. It is important that our clients are consulted on the technical design review and agree any changes to the drainage systems prior to any alterations to these drainage systems being carried out.

10.2.66 **Contractual drainage considerations:** Our clients understand that the Promoter intends to install culverting to one of the ditches which is fed by the Addenbrooke's Hospital (Cambridge University Hospitals NHS Foundation Trust). There is a lack of design details within the Scheme as to how drainage will be managed. The Campus has no formal drainage rights and easements have been agreed with the Hobson's Conduit Trust to allow for the site to drain into two ancient ditches. If the flow rate exceeds those which have been agreed with the Trust, this risks causing flooding.

10.2.67 **Response:** In relation to the interference with the existing watercourse referred to as North Ditch (to be culverted), a 1D analysis has confirmed that there is sufficient capacity within the system to not breach during the 1 in 100 year event plus 40% climate change allowance hence providing a system with equal or greater cross sectional area will not impact the surface water drainage network. The culvert extension between the Hospital Culvert and Tibbetts Culvert will be appropriately sized to convey the existing flows as noted in Section 6.4 and 7.5. With no loss of

Proof of Evidence Sue Brocken (NRE5.2)

flood storage and identical pass forward flows the post development scenario is considered flood neutral as reported in the FRA

10.2.68 As noted in Table 4-2 above, the EA have been consulted relating to the culverting of the North Ditch and initially raised an objection (OBJ 05) in relation to the level of detail relating to the modelling of the existing network and the North Ditch. Following further consultation and provision of additional modelling data, the EA have subsequently withdrawn their objection (Ref OBJ/05-W Environment Agency).

10.2.69 Discharge from the proposed development will be attenuated to greenfield run off rates of 2 l/s/ha which will be agreed with the LLFA within the formal ordinary watercourse consenting process prior to construction.

10.2.70 The proposed development has separate discharges for track and station to reduce the risk to all stakeholders, in addition, there are no direct interfaces between the proposed track/ station drainage networks and the existing networks ensuring that the obligations of the existing stakeholders in relation to Hobsons Brook will not be impacted upon.

10.2.71 Network Rail are currently offering commitments in Heads of Terms whereby NR will ensure that they, as a consequence of either accommodation works or permanent works that CC1 & CC2 are not put in a worse position in relation to drainage flows currently utilised. NR has also given commitments to ensure that the works will not put CC1 & CC2 in breach of any contractual drainage flows they are currently required to comply with and to also engage with them on the final drainage design details. I am advised that the Heads of Terms have been agreed and therefore I assume that the objectors' concerns have been addressed.

OBJ 18 – Cambridgeshire County Council

10.2.72 **Issue:** CSET Scheme Interface- Agreement is needed with Network Rail in respect of the provision of the location of attenuation ponds and landscape and drainage requirements for both schemes, and how these can work together and to ensure the correct land take is sought for each scheme.

10.2.73 **Response:** As noted in 6.2, the previously anticipated interaction with the CSET busway/ track drainage pond clash to the east side of the rail corridor in the Nine Wells area has been removed by relocating the pond to the west side of the rail corridor. The original proposals also made separate provision for a drainage outfall into Hobson's Conduit downstream of the railway on the west and there is no identified impact associated with this change.

10.2.74 As noted in 2.4, the Mid Attenuation Basin, contained within the land to be purchased to accommodate the new station forecourt receives highway drainage from Francis Crick Avenue.

Proof of Evidence Sue Brocken (NRE5.2)

Analysis has been undertaken considering flows up to an including the 1 in 100 year plus 40% climate change. Network Rail's original proposals incorporated an attenuation pond to replace the Mid Attenuation Basin. This was identified to clash with CSET's preferred location for the station access and so Network Rail has already revised its proposals. This has meant that the solution has had to be changed to sub surface storage. The relocation of the existing attenuation pond within the proposed station forecourt has been modelled and compensatory attenuation is to be provided as noted in 6.7; this will be further refined during the detailed design stage. Compensatory habitat for the loss of biodiversity due to replacing the existing basin with a sub-surface tank will be reviewed during the next design phase when an assessment can be undertaken to ensure that as a whole the CSIE Project provides a net gain.

10.2.75 Network Rail has liaised and will continue to liaise with CSET in relation to all interfaces between the two schemes. A statement of common ground is being finalised with GCP and this envisages that agreement will be put in place to that will cover, amongst other things, the location of attenuation ponds, and interaction of drainage provision and whether additional land is required within the CSET Scheme.

OBJ 23– Cambridgeshire City Council

10.2.76 **Issue:** CCiC's objection included a risk for further details as requested by its Sustainable Drainage Engineer. It considered that these details were required to be submitted prior to determination in order to demonstrate the proposals comply with Local Plan policy 32 relating to flood risk.

10.2.77 **Response:** Network Rail provided a detailed response in a letter dated 1 October 2021. Officers reviewed this response and confirmed it was acceptable in an email to NR Consents Manager dated 5 October. By a letter dated 7 November 2021 (included as Appendix D to Mr Pearson's Proof of Evidence, **NRE 9.3**) the Council confirmed that this aspect of its objection was resolved.

OBJ 24– Cambridgeshire District Council

10.2.78 **Issue:** The proposed new culvert extension and drainage at Shepreth Branch Junction is located within an awarded watercourse to South Cambridgeshire District Council and any surface water drainage alterations which contribute to change of rate/ volume of flow would require land drainage bye law approval by the Council. The applicant should be advised accordingly via an informative. Appropriate wording is provided as follows: **Informative: New culvert extension and drainage at Shepreth Branch Junction-** The culvert is located within an awarded watercourse to South Cambridgeshire District Council and any surface water drainage alterations which contribute to change of rate/ volume of flow would require land drainage bye law approval by the council.

Proof of Evidence Sue Brocken (NRE5.2)

10.2.79 **Response:** Noted. The culvert extension will maintain the existing cross-sectional area on the downstream side of the watercourse. An application will be made to the LLFA/ council prior to construction.

11 Conclusions

- 11.1.1 In this Proof of Evidence, I have described the existing drainage arrangements across the site and introduced the proposed drainage solutions required for the new Cambridge South Station and associated railway infrastructure.
- 11.1.2 I have summarised interactions with key stakeholders and described current proposals to negate any impact on existing drainage infrastructure both during construction and operation.
- 11.1.3 My Proof of Evidence seeks to address a number of points in the Statement of Matters. This includes Point 3(g) The Effect on Drainage During Construction and Operation. I have also addressed interaction with the CSET scheme and specific drainage arrangements associated with the Mid Attenuation Basin and adjacent to Hobson's Conduit where the two projects seek to closely co-exist. This is relevant to Point 5 in the Statement of Matters. I have also provided some content to justify the adequacy of the Environmental Statement and specifically around drainage which is relevant to Point 7 in the Statement of Matters
- 11.1.4 In Section 2, I have prepared a brief overview of the proposals, the site and its existing drainage characteristics.
- 11.1.5 In Section 3, I have summarised relevant flood risk and drainage policy.
- 11.1.6 In Section 4, I have described interaction with key stakeholders. The drainage design has considered the requirements of the key stakeholders to ensure that the proposed scheme does not cause detriment to existing drainage arrangements and this work continues. I have explained that additional stakeholder meetings will be held throughout the ongoing design development to ensure that due consideration is given to accommodating the existing and proposed drainage networks during the construction phase and for the operation of the new station.
- 11.1.7 In Section 5 and Section 6, I have described a two-stage approach in which drainage designs were initially prepared in support of the option selection process and finessing of a design for the preferred option to inform the Environmental Statement preparation including Water Resources and Flood Risk. This is captured in Section 5. I have also described drainage design developments as dialogue with stakeholders continued and as the design moved forward towards a scheme design level of detail. This is contained in Section 6.

Proof of Evidence Sue Brocken (NRE5.2)

- 11.1.8 In Section 7, I have presented the methodology adopted by the CSIE project to assess the effects of Network Rail's proposals on the water environment.
- 11.1.9 In Section 8, I have provided my assessment of the effect of the CSIE proposals on Surface Water Drainage and Flood Risk during the construction phase of Cambridge South Station and in Section 9, I have provided my assessment following its completion.
- 11.1.10 In Section 10, I have prepared responses to specific objections raised.
- 11.1.11 I have concluded that there are no long term significant, severe or unacceptable impacts of the Project.
- 11.1.12 It is my professional opinion that the land identified in the Application is appropriate to deliver the CSIE Project and the desired outcomes for Water Quality, Surface Water Drainage and Flood Risk. This includes land required on a temporary basis to enable the construction of the works and limit the impacts on site drainage.

12 Declarations

5.1.1 I hereby declare as follows:

- (i) This proof of evidence includes all facts which I regard as being relevant to the opinions that I have expressed and that the Inquiry's attention has been drawn to any matter which would affect the validity of that opinion.
- (ii) I believe the facts that I have stated in this proof of evidence are true and that the opinions expressed are correct.
- (iii) I understand my duty to the Inquiry to help it with matters within my expertise and I have complied with that duty.

Name: Sue Brocken

Signature: ... 

Date: 7 January 2022

Appendix A

A Record of Review of Drainage Proposals by Aecom

Proof of Evidence Sue Brocken (NRE5.2)

85