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South East Strategic Reservoir Option Gate 1 submission – Technical Annex B3

Water Framework Directive Assessment

Thames Water Utilities Ltd

28 June 2021

5201137-008

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Document history

Document title: Water Framework Directive Assessment

Document reference: 5201137-008

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
Rev 1.0	First Draft for Client Review	BH, RT, KS	HG	GW	PMU	19/02/2021
Rev 2.0	Revised draft for comment	BH, RT	KS	PMU	PMU	01/04/2021
Rev 3.0	Issued for assurance and NAU	BH	PM	CB	BA	16/04/2021
Rev 4.0	Revised following assurance review	KS	PMU	LB	BA	07/05/2021
Rev 5.0	Revised following TW review	KS	PMU	LB	BA	14/05/2021
Rev 6.0	Final update following NAU comments	KS BH	PMU	LB	BA	16/06/2021
Rev 7.0	Update following Legal review	KS	PMU	LB	BA	29/06/2021

Client signoff

Client	Thames Water Utilities Ltd
Project	South East Strategic Reservoir Option Gate 1 submission – Technical Annex B3
Job number	5201137
Client signature/date	

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1. Introduction

1.1. Overview

This document presents a project-specific, Water Framework Directive (WFD) screening assessment for the proposed South East Strategic Reservoir Option (SESRO) reservoir. The aims of the document are to provide:

- background information on the proposed scheme and the WFD legislation;
- a high-level baseline understanding of the water bodies that would be affected by the proposed scheme, within the context of the WFD;
- an assessment of the potential for the proposed scheme to cause deterioration in the WFD status of any water body directly or indirectly; and,
- an assessment of the potential impacts on water body improvement measures and the ability to meet WFD objectives.

The assessment builds upon, and furthers, work undertaken by Water Resources South East (WRSE). WRSE undertook a high-level screening assessment of WFD compliance of the SESRO options prior to this stage of the process using the WRSE All Company Working Group (ACWG) methodology (WRSE, 2020). In this exercise, a standardised approach was used as part of wider optioneering to assess a whole range of strategic options. The screening process reviewed the various reservoir concept options and assessed the potential impacts on the various water bodies impacted by the proposed scheme in a simple scoring system. The assessment detailed in this document goes further by examining each of the proposed options in more detail and assessing whether (and where possible, how) individual scheme elements are likely to impact WFD water bodies. The report is a RAPID deliverable and has been undertaken for all six SESRO Strategic Reservoir Options (SRO) as part of Gate 1.

The document is structured as follows:

- Background to WFD (Section 1.2);
- Available guidance (Section 1.3);
- Methodology (Section 2);
- Proposed scheme description (Section 2.1);
- Methodology for Gate 1 (Section 2.2)
- Site baseline (Section 3);
- WFD Level 1 screening (Section 4);
- WFD Level 2 assessment (Section 5);
- Conclusions (Section 6); and
- References (Section 7).

1.2. Legislative Background

The Water Framework Directive (WFD) came into force in 2000 (Directive 2000/60/EC), and was transposed into UK law in 2003 (The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003) and most recently updated in 2017 (The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017). Assessments undertaken to assess compliance with this legislation have been commonly referred to as WFD assessments. In 2021, the UK Government sought to drop reference to any European legislation post BREXIT and thus has started to call the previously named WFD assessments as Water Environment Regulations (WER) assessments. However, as the terminology needs to be consistent across several ongoing assessments linked to SRO projects undertaken across the UK, at the moment, Thames Water has preferred that WFD terminology is retained for this assessment.

The WFD's principal aims are to protect and improve the water environment and promote the sustainable use of water. The headline environmental objectives of the WFD and its daughter directives are to:

- Prevent the deterioration of aquatic ecosystems; and,

- Protect, enhance and restore water bodies to Good Status; which is based on ecology (with its supporting hydromorphological and physico-chemical factors) and chemical factors for surface water, and water quantity and Chemical Status for groundwaters. Where a water body is designated as Heavily Modified, or Artificial, the water body will need to be Good Ecological Potential.

1.2.1. Surface water bodies

The WFD sets a default objective for all rivers, lakes, estuaries, groundwater and coastal water bodies to achieve Good Status by 2027 at the latest. For natural surface water bodies, Good Status is a function of both Good Chemical Status (GCS) and Good Ecological Status (GES). The River Basin Management Plans (RBMPs) outline the actions required to enable natural water bodies to achieve these objectives. Artificial and Heavily Modified Water Bodies (A/HMWBs) are considered unable to attain GES due to the modifications that are necessary to maintain their function for society or their 'human use' as they provide important socio-economic benefits. They are, however, required to achieve Good Ecological Potential (GEP), through the implementation of a series of Mitigation Measures outlined in the RBMP. A/HMWBs still need to attain GCS which, along with GEP will collectively result in Good Status in these water bodies.

New activities and schemes that affect the water environment may adversely impact biological, hydromorphological, physico-chemical and/or chemical quality elements (WFD quality elements) that could lead to a deterioration in water body status. They may also preclude the implementation or effectiveness of the proposed improvement measures, leading to the water body failing to meet its WFD objectives for GES/GEP. Under the WFD, activities and schemes must not cause deterioration in water body status or prevent a water body from meeting GES/GEP by invalidating improvement measures.

The overall ecological status of a water body is primarily based on consideration of its biological quality elements (phytoplankton, macrophytes, phytobenthos, benthic invertebrates and fish) and is determined by the lowest scoring of these elements. These biological elements are 'supported' by the physico-chemical (water quality) and hydromorphological (hydrological or tidal regime, river continuity and morphological conditions (i.e. habitat)) quality elements.

To achieve GCS, a water body must pass a separate chemical status assessment, relating to pass/fail checks on the concentrations of various identified priority/dangerous substances.

1.2.2. Groundwater bodies

For groundwater bodies, good status has a quantitative and a chemical component. Both are measured on a scale of good, moderate or poor, and a confidence rating is assigned to the status assessment of high or low. Together, these provide a single final classification of either good or poor status. There is also a trend objective set for groundwater water bodies where environmentally significant and sustained rising trends in pollutant concentrations need to be identified along with a definition of the starting point (percentage of level or concentration) for trend reversal. Furthermore, the daughter directive of the WFD specifically concerning groundwater (the Groundwater Directive) also requires the prevention of any input of priority substances and limiting (or control) of the input of all other substances to groundwater to prevent the deterioration of status.

1.3. Background to WFD

A summary of key WFD concepts is presented in Figure 1-1. This includes a definition of what a water body is in relation to this assessment.

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WFD Objectives

The WFD is a European Directive, which sets out a strategic planning process for the purposes of managing, protecting and improving the water environment. This directive was transposed into English and Welsh law in the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 and was updated in 2017. The legislation has been retained post BREXIT but now any assessments are to be called WER assessments rather than WFD assessments, unless specified otherwise during the transition period. The main objectives of the original WFD legislation are to:

- Prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters;
- Aim to achieve at least 'Good Status' for all waters by 2015 (2021 or 2027) where fully justified within an extended deadline under Article 4.4;
- Promote sustainable use of water;
- Conserve habitats and species that depend directly on water;
- Progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment;
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants; and
- Help reduce the effects of floods and droughts.

The Environment Agency is the Government's 'competent authority' for implementing the WFD; it monitors, advises and manages many aspects of the water environment though regulating discharges, abstractions and processing environmental permits and licenses. The Environment Agency is committed to implementing environmental improvements that would result in the achievement of the objectives of the WFD.

WFD Classification

The WFD classification for a defined water body is produced by the assessment of a wide variety of different 'elements' which includes:

- '*biological elements'* such as phytoplankton, macrophytes, phytobenthos, benthic invertebrates and fish;
- '*supporting elements*' that include chemical measurements such as ammonia, dissolved oxygen, pH, phosphate, copper, zinc and temperature; and
- '*supporting conditions*' (sometimes referred to as hydromorphology) that assess the physical attributes of the water body such as 'river continuity', 'quantity and dynamics of flow' and 'morphology'.

The assessment given for each element is also accompanied by a measure of certainty in the result. The status classification is published in the RBMP and provides a baseline condition against which compliance and future improvements can be measured.

Figure 1-1 - Background to the WFD

2. Methodology

2.1. Proposed scheme description

Thames Water's South East Strategic Reservoir Option (SESRO) proposed scheme includes the design and delivery of a large reservoir located west of Abingdon, Oxfordshire. SESRO has been identified as one of the Strategic Resource Options (SROs) in Ofwat's PR19 Final Determination. The SESRO design is based on the abstraction of water from the River Thames at Culham, to be stored in a non-impounding reservoir during wetter months (when the reservoir is not already full). This water would then be released back into the River Thames, at Culham, so that it would be available for abstraction downstream.

The proposed scheme is part of a gated process which is administered by The Regulators Alliance for Progressing Infrastructure Development (RAPID) which was formed to help accelerate the development of new water infrastructure and design future regulatory frameworks. The proposed scheme is currently at the Gate 1 stage, a conceptual, multi-option decision making stage, and there are still six different design options being considered. Details for the six different design options are outlined in the Conceptual Design Report (CDR) 2021 (Technical Annex A). Four of the reservoir options have a similar form, a single phase construction, but are at different scales from 75Mm³ to 150Mm³ (Figure 2-1 to Figure 2-4). An additional two options are dual phase construction options (30+100 Mm³ and 80+42 Mm³ respectively) (Figure 2-5 and Figure 2-6).

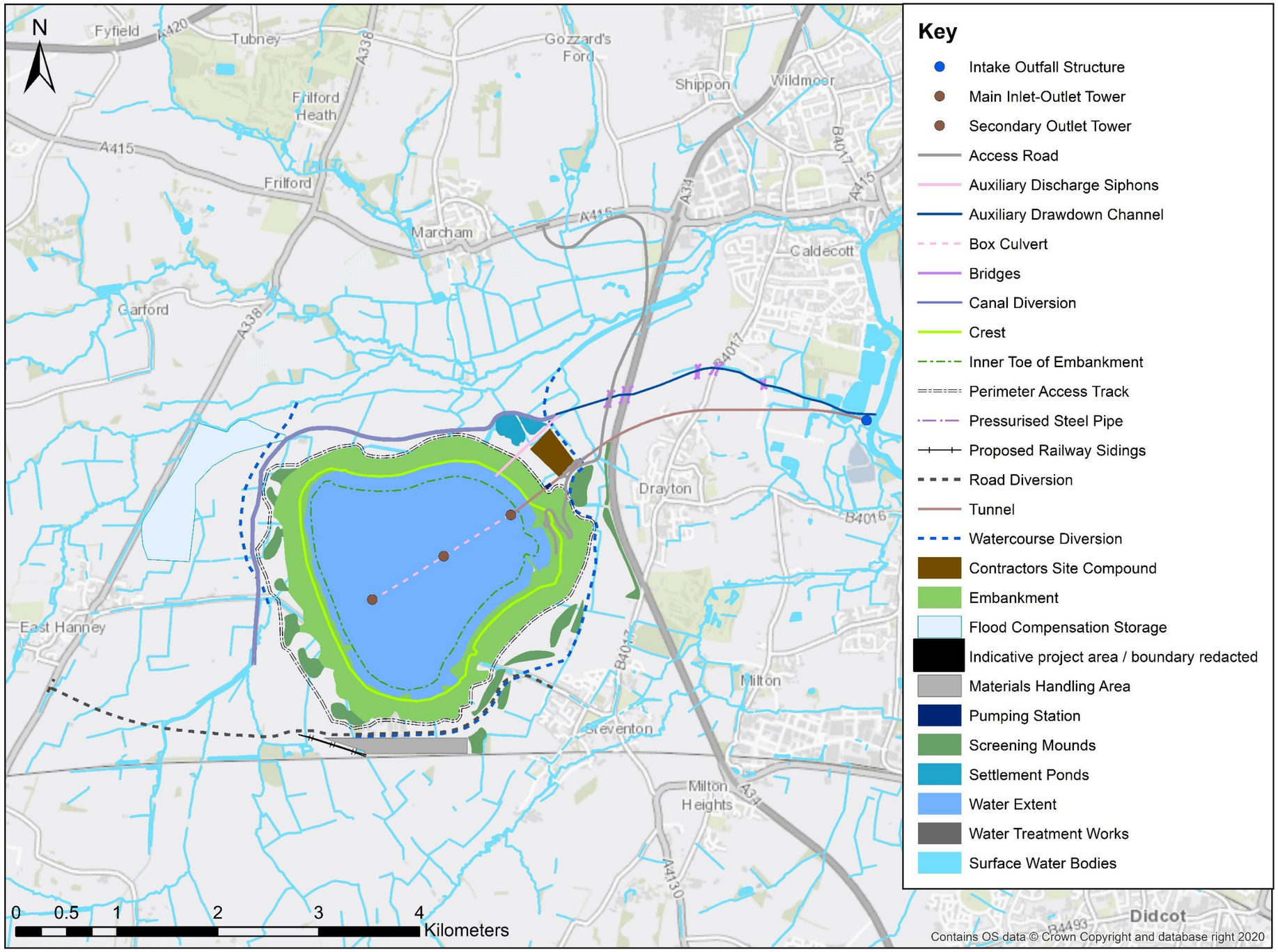

Figure 2-1 – 75Mm³ reservoir alternative option layout

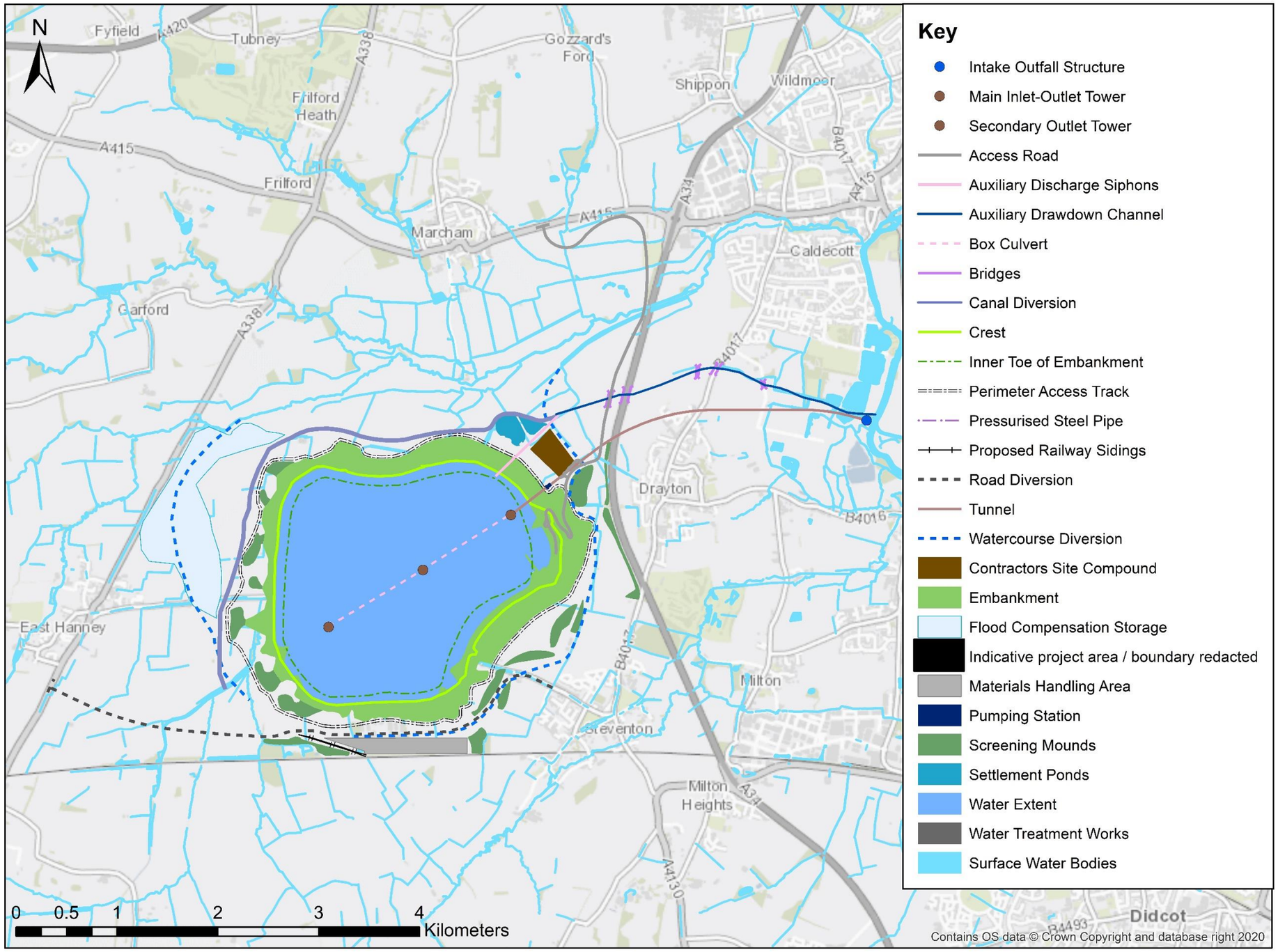

Figure 2-2 – 100Mm³ reservoir alternative option layout

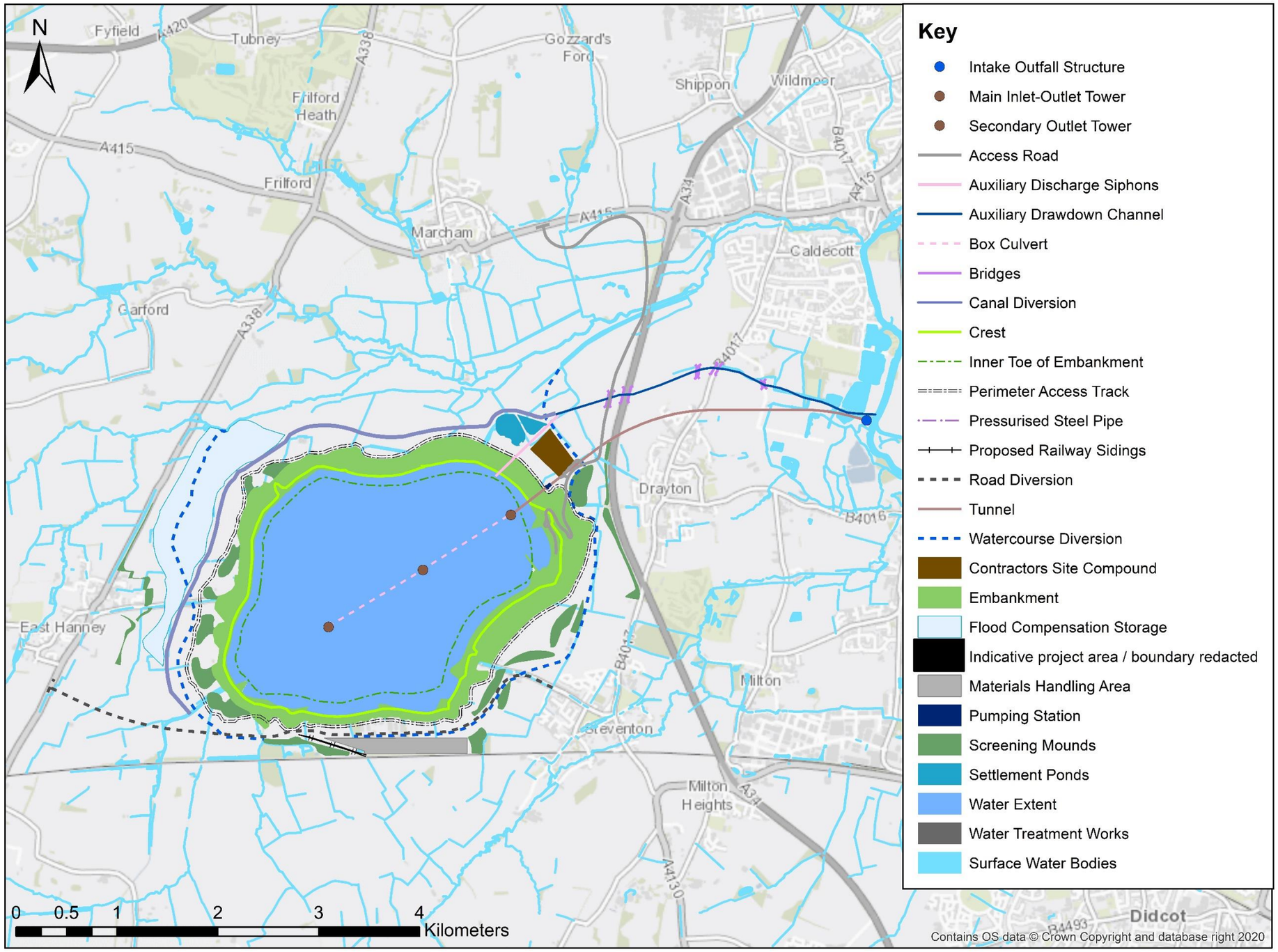

Figure 2-3 - 125Mm³ reservoir alternative option layout

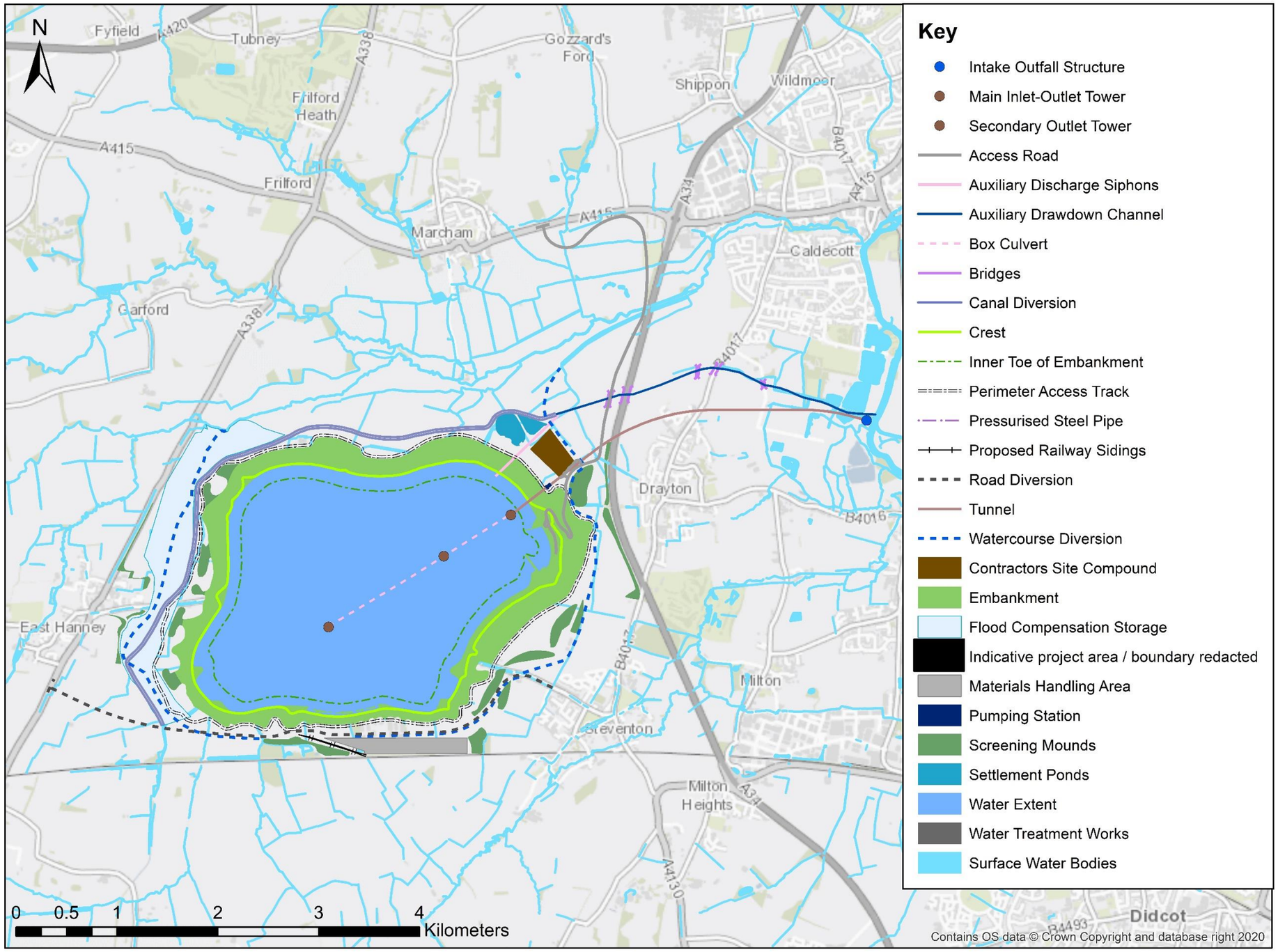

Figure 2-4 - 150Mm³ reservoir proposed scheme layout

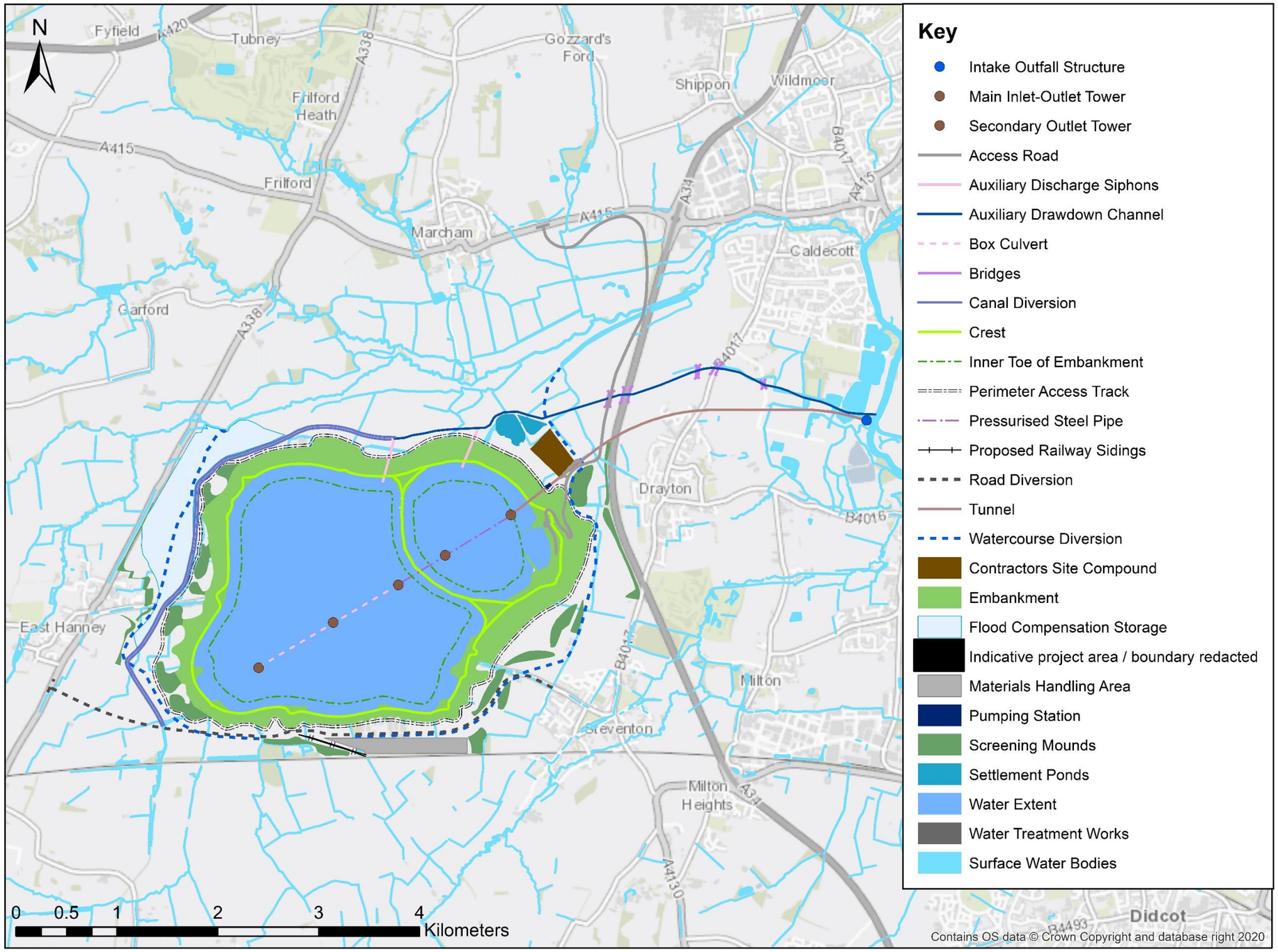

Figure 2-5 - 100+30Mm³ reservoir alternative option layout

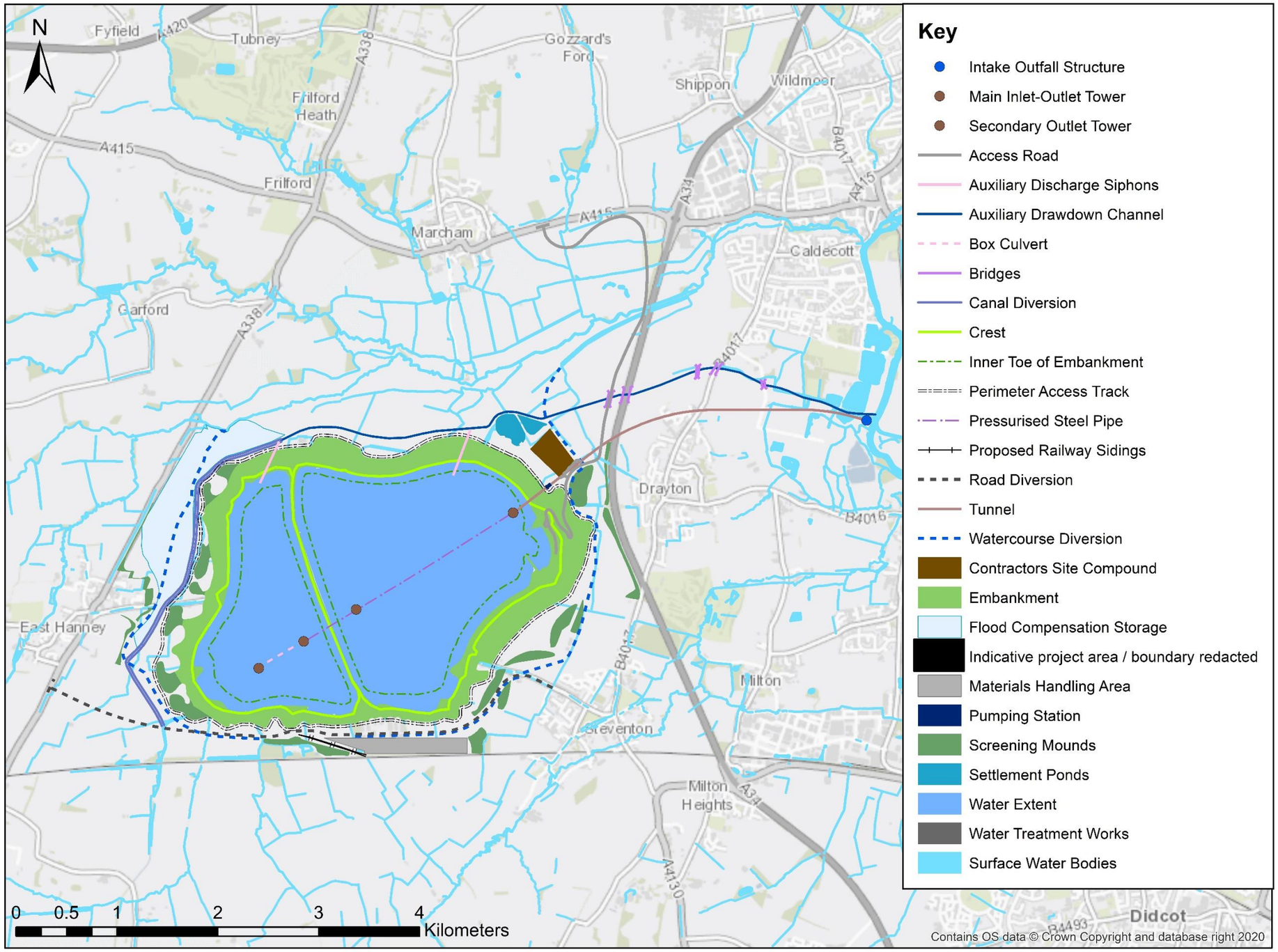

Figure 2-6 - 80+42Mm³ reservoir alternative option layout

2.2. Methodology for Gate 1

2.2.1. Overall approach

The ACWG guidelines set out an assessment approach and accompanying reporting spreadsheet for undertaking the constraint test of WFD compliance that is required for SRO. The ACWG guidelines identify three WFD objectives for assessing WFD constraints. These are established from Regulation 13 of the original European WFD legislation as follows:

Objective 1 To prevent deterioration of any WFD element of any water body.- in line with Regulation 13(2)a and 13(5)a;

Objective 2 To prevent the introduction of impediments to the attainment of 'Good' WFD status or potential for any water body. It is accepted that for some water bodies achievement of Good status or potential is currently technically infeasible or disproportionately costly. Where this is the case, the test is applied to the currently agreed objectives for that water body rather than against Good status/potential - in line with Regulation 13(2)b and 13(5)c; and,

Objective 3 To ensure that the legally binding planned programme of water body measures in the second cycle of River Basin Management Planning (RBMP2) to protect and enhance the status of water bodies are not compromised.

The three WFD compliance objectives that have been tested for constraint for all six SESRO size options:

- 75 Mm^3
- 100 Mm^3
- 125 Mm^3
- 150 Mm^3
- 100 + 30 Mm^3
- 80 + 42 Mm^3

The ACWG methodology template in Appendix A has been filled out for the largest option, i.e. the 150 Mm^3 size. The Level 1 basic screening of the six SESRO options is summarised in Section 4. The Level 2 assessment of the six SESRO options is summarised in Section 5.

As the project could be designated as a Nationally Significant Infrastructure Project (NSIP) it would go through a Development Consent Order (DCO) process. As a result, ultimately the WFD Assessment would need to follow guidance produced by The Planning Inspectorate in advice note 18 on WFD in June 2017 (PINS, 2017) which was developed specifically designed for projects that fall within this process. The guidance suggests that a WFD assessment be comprised of three key components:

i) Screening assessment – to determine what activities associated with the proposed development require further consideration and what activities can be screened out at this stage of the process:

ii) Scoping assessment – to identify risks of the proposed development activities to receptors based on relevant water bodies and their quality elements, and;

iii) Impact assessment – a detailed impact assessment of the water bodies and their quality elements that are considered to be likely affected by the proposed development. Any potential issue for non-compliance would be highlighted at this stage along with consideration to mitigation measures and enhancements that would contribute to WFD objectives.

The first stage of this assessment is the WFD screening assessment. This is somewhat covered through the ACWG methodology but has been furthered in this report thorough an examination of each of the proposed options in more detail and assessing whether (and where possible, how) individual scheme elements are likely to impact WFD water bodies. The ACWG works slightly differently from the methodology outlined in the PINS guidance on WFD as it screens out water bodies that have an impact of 1 (low) or lower at this stage of the process. In contrast, the PINS methodology screens in water bodies if they have the potential to be impacted only ruling them out once evidence can be provided that no impact would occur. The next phases of the WFD assessment as outlined in the PINS guidance are the Scoping and Impact Assessment which will be undertaken in future stages of the project. During these phases the assessment will need to be developed and refined as the proposed scheme progresses towards a final design option, and the associated applications for consent.

2.2.2. Specific commentary on completion of the ACWG template

The ACWG excel based template has been completed once, i.e. for the latest size option (150 Mm^3) as this has the largest overall footprint. The WFD compliance assessment includes the Level 1 screening, the selection of Level 2 activities and the Level 2 assessment. The summary worksheets are auto-generated in the template for consistency in summary across different SROs. In each case the assessment is of all the elements in the group together, rather than an element-based assessment. This enables a WFD compliance assessment for the 150 Mm^3 scheme as a whole.

2.2.2.1. Level 1 WFD screening

The Level 1 screening has been completed for all construction works and the combined operating effects of the scheme. For construction activities this includes the reservoir itself as well as the combined intake/discharge structure on the River Thames. Operational activities are primarily focused on the main River Thames, using assessment findings from historic Thames Water hydrological modelling work (Thames Water, 2007) as set out in Section 5 (Hydrology) in Technical Annex B1 (Environmental Assessment Report).

2.2.2.2. Level 2 WFD assessment

Within the ACWG template, we note the following style guide to how we have documented the WFD assessment:

- Assessment has been undertaken against published RBMP2 (2015) status, RBMP2 mitigation measures, and RBMP3 published status targets. The embedded data in the ACWG template also includes status in other years, but these are not applicable and have not been assessed against.
- The ACWG template includes the objective “Assists attainment of water body objectives”. That objective is outside the ACWG guidelines and has not been used in the assessment of SESRO.
- For WFD status elements, in the upper section of the worksheet, the relevant WFD objectives that have been assessed against are “Deterioration between status classes” (Objective 1) and “Impediments to GES/GEP” (Objective 2).
- Where RBMP2 (2015) reported status is High or Good, Objective 2 is not applicable and has not been assessed against.
- For RBMP2 mitigation measures, in the lower section of the worksheet, the relevant WFD objective that has been assessed against is “Compromise WB objectives” (Objective 3). The relevant WFD status elements for assessment of Objective 1 and Objective 2 in river water bodies[1] are those in the WFD Regulations, as listed in Table below. It is noted that the ACWG template includes hydro-morphological supporting elements and these are not applicable and have not been assessed against.
- The ACWG template includes data from the Environment Agency “Reasons for Not Achieving Good” [status] database. These are not applicable to Objectives 1, 2, or 3 and have not been assessed against.
- For proportionality of assessment, the ACWG template “potential impacts of asset” have been collated for each “activity” with one consolidated assessment undertaken for each WFD status element.
- All assessments have been undertaken using the mitigation measures designed into the SESRO scheme, as documented in Technical Annex A (Conceptual Design Report). Furthermore, this includes the assumptions/ mitigations as set out in the ACWG template which recognise compliance with regulations and good design practice. As such, there is no difference between the “impact” and “post mitigation impact” in the Level 2 assessment worksheet. Where there is potential for WFD objective non-compliance, additional mitigation actions that may reduce this potential and lead to WFD compliance is indicated in the narrative summary in Section 5 below, but not included in the WFD compliance assessment as it is not currently committed to or costed into SESRO design.

[1] It is noted that only river water bodies have been passed forward to the Level 2 WFD assessment for SESRO – see Section 3.1.

Table 2-1 : Relevant WFD status elements from which to assess compliance in river water bodies

Ecological status			
Biological status elements	Fish Invertebrates Macrophytes & phytobenthos combined		
Physio-chemical	Water temperature pH Dissolved oxygen Ammonia Reactive phosphorus (orthophosphate)		
Specific pollutants	2,4-dichlorophenol 2,4-dichlorophenoxyacetic acid 3,4 dichloroaniline Arsenic Benzyl butyl phthalate Carbendazim Chlorothalonil Chromium (III) (VI) Chlorine	Copper Cyanide Cypermethrin Diazinon Dimethoate Glyphosate Iron Linuron Manganese	Mecoprop Methiocarb Pendimethalin Permethrin Phenol Tetrachloroethane Toluene Triclosan Zinc
Chemical status			
Priority Substances, Priority Hazardous Substances and Other pollutants contributing to chemical status	Alachlor Anthracene Atrazine Benzene Benzo(a)-pyrene (BaP) Benzo(b)-fluor-anthene Benzo(k)-fluor-anthene Benzo(g,h,i)-perylene Brominated diphenylether Cadmium and its compounds Carbon tetrachloride Chlorfenvinphos C10-13 chloroalkanes Chlorpyrifos Cyclodiene pesticides isodrin DDT total Para-para-DDT 1,2-dichloro-ethane Dichloro-methane Di(2-ethylhexyl)-phthalate (DEHP) Diuron Endosulphan	Fluoranthene Hexachloro-benzene Hexachloro-butadiene Hexachloro-cyclohexane Indeno(1,2,3-cd)-pyrene Isoproturon Lead and its compounds Mercury and its compounds Naphthalene Nickel and its compounds Nonylphenol Octylphenol Pentachloro-benzene Pentachloro-phenol Simazine Tetrachloro-ethylene Tributyltin compounds Trichloro-benzenes Trichloro-ethylene Tricholoro-methane Trifluralin	

3. Site baseline

3.1. WFD water bodies

The proposed location of the works lies within the Thames River Basin District, which is covered by the Thames River Basin Management Plan (Environment Agency, 2015). The main site is within the Gloucestershire and the Vale Management Catchment and the Ock Operational Catchment. However, as the volume of water in the River Thames may be altered, due to the intake and output from the reservoir, several downstream water bodies on the Thames downstream also need to be considered, as far as Teddington. These water bodies are in the South Chilterns and Lower Thames Operational Catchments, and Thames and South Chilterns and Maidenhead and Sunbury Management Catchments. These operation catchments are illustrated in Figure 3-1. The footprint of the proposed scheme interacts with watercourses within six WFD surface water bodies within the River Ock Operational Catchment. These water bodies are illustrated in Figure 3-2. Finally, Figure 3-3 shows a more detailed view of the area around the scheme and illustrates the WFD water bodies impacted by the footprint.

Childrey Brook and Norbrook at Common Barn (GB106039023380);

- Sandford Brook (Source to Ock) (GB106039023410);
- Cow Common Brook and Portobello Ditch (GB106039023360);
- Ginge Brook and Mill Brook (GB106039023660);
- Ock and tributaries (Land Brook confluence to Thames) (GB106039023430); and,
- Thames (Evenlode to Thame) (GB106039030334).

Previous hydrological modelling work by Thames Water (2007) assessed that the main zone of hydrological influence is the reach of the River Thames between the proposed SESRO intake/outfall structure and the confluence with the River Thame, which is covered in the WFD surface water body Thames (Evenlode to Thame). However, there are four further WFD water bodies downstream of the works that may still be impacted due to the changes being made to the volumes of water in the Thames due to the intake and discharge (Figure 3-2):

- Thames Wallingford to Caversham (GB106039030331);
- Thames (Reading to Cookham) (GB106039023233);
- Thames (Cookham to Egham) (GB106039023231); and,
- Thames (Egham to Teddington) (GB106039023232).

Therefore, a total of ten WFD surface water bodies were initially screened into the assessment.

Groundwater bodies were reviewed as part of the screening assessment. Two groundwater bodies exist close to the site, namely 1) Shrivenham Corallian (GB40602G60060) which is located north of the footprint (boundary around Marcham and Shippon) and 2) Vale of White Horse Chalk (GB40601G601000) which is located south of the footprint (boundary south of the railway line). However, no groundwater body is located within the red line boundary and hence groundwater bodies have been screened out from further assessment. Any extension of the red line boundary to include the areas of the floodplain around the length impacted by any increased flow on Childrey Brook will not require the screening of any of the neighbouring groundwater bodies back into the assessment.

There is equally no potential for WFD artificial, lake, or transitional water bodies to be affected by the proposed scheme as none are within the red line boundary or would be even if the red line boundary was extended to include the areas of the floodplain around any lengths Childrey Brook experiencing increased flow. Therefore, there are none screened into the assessment.

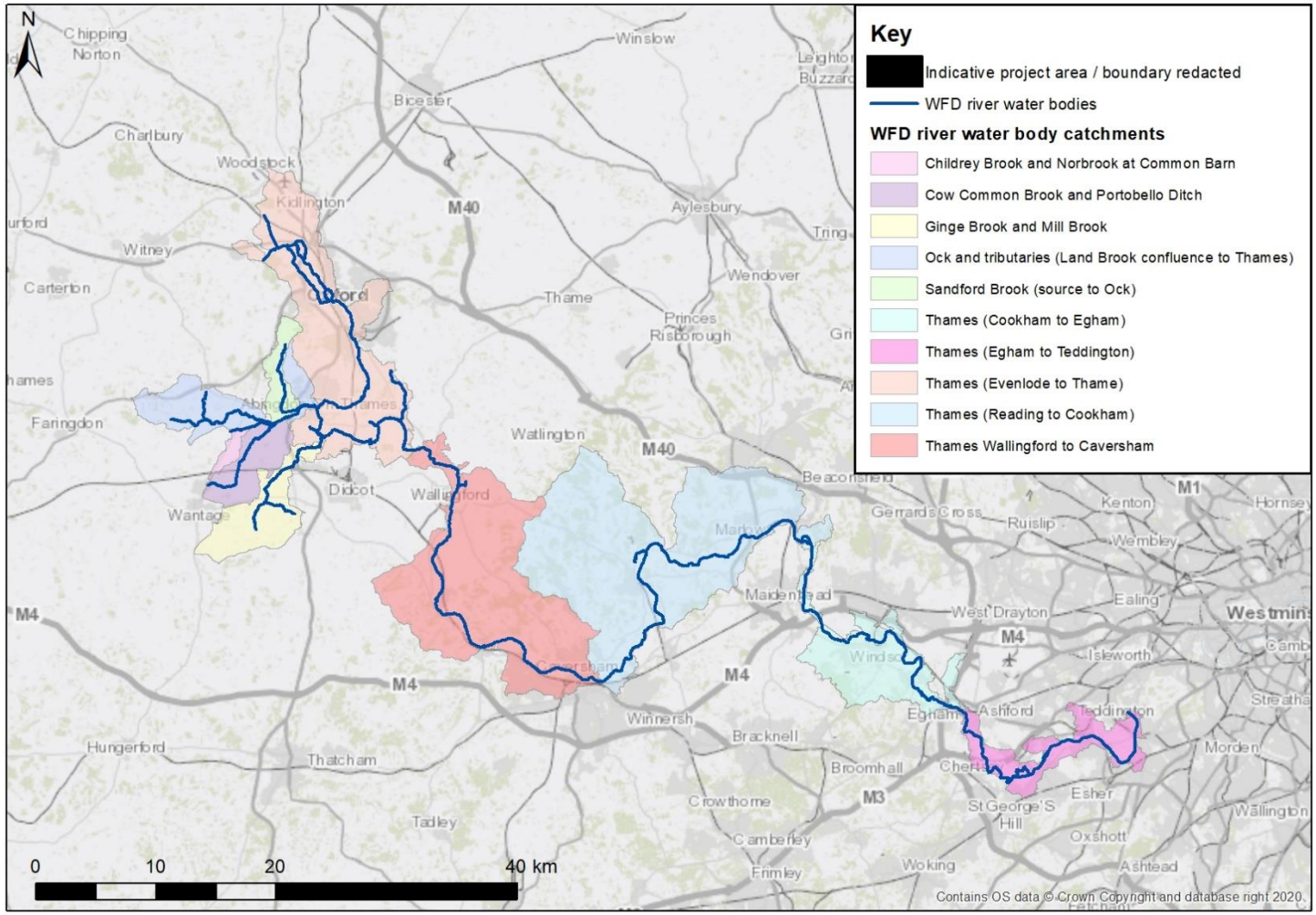

Figure 3-1 - WFD operational catchments and management catchments potentially impacted by the proposed scheme

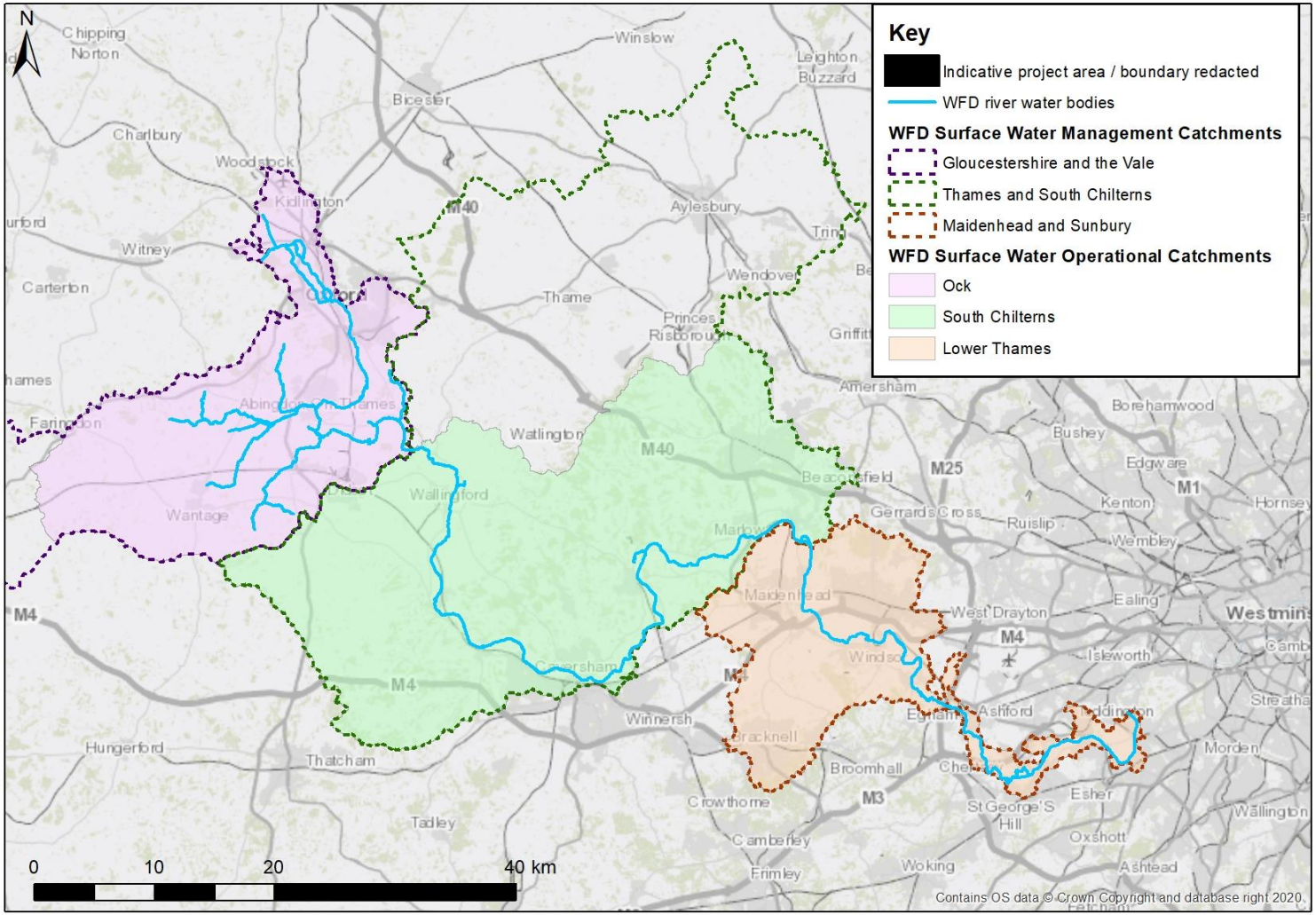

Figure 3-2 - WFD water bodies potentially impacted by the proposed scheme

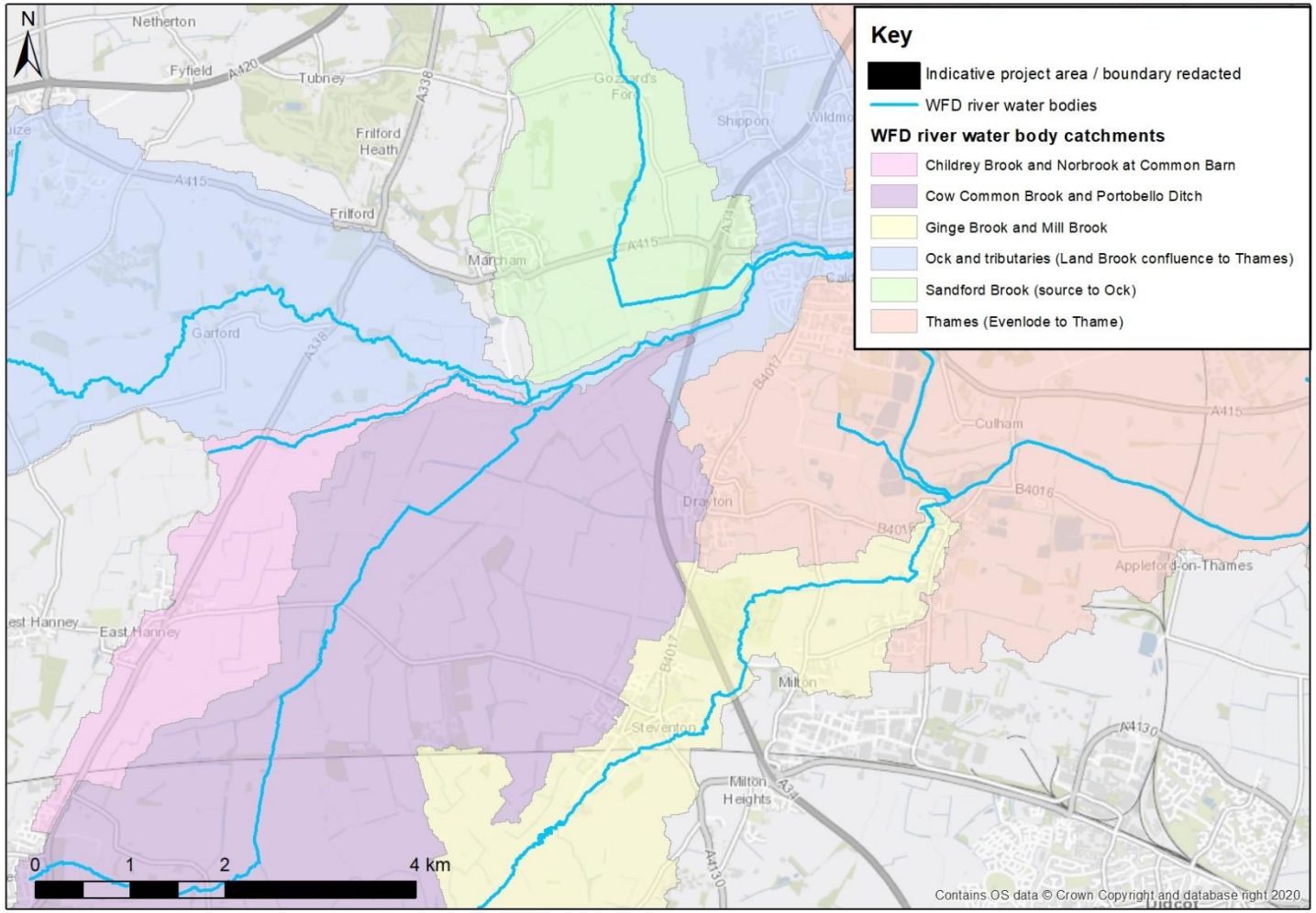

Figure 3-3 – WFD surface water bodies impacted by the proposed scheme footprint

3.2. Site baseline

This section provides a summary of the site baseline for the catchment containing the ten WFD water bodies. The baseline for each of the WFD water bodies (in terms of WFD status) has been provided in Section 3.3 below. The Gate 1 Environmental Assessment Reports (Technical Annex B1) provides the supporting physical environment, water quality and aquatic ecology information and assessments that underpin the WFD compliance assessment.

As a result of the Covid-19 pandemic no site visits have been undertaken at this stage of the project and so all baseline information was obtained through desk-based review.

3.2.1. General description of the water environment

The site is in a lowland landscape primarily used for arable agriculture (mostly Grade 3 and 4) with some pasture and two large solar panel farms. The topography of the landscape is flat with subtle variation associated with catchment boundaries. There are various water courses of differing size and form within the boundary of the project. The position of these watercourses is shown in Figure 3-4, these are labelled with their names where known, if unknown a code has been given to them. The watercourses include a large number of ditches that follow field boundaries, some of these are previously straightened channels and flow pathways, others are completely man-made amendments to assist land drainage. There are also several Main Rivers, as described below. The geology of the area within the footprint of the reservoir is Ampthill Clay Formation and Kimmeridge Clay Formation (undifferentiated) - Mudstone.

3.2.2. Cow Common Brook and Portobello Ditch

The Cow Common Brook flows through the centre of the site and is estimated from aerial imagery and Google Street View to be approximately 1.5m wide. The planform is predominantly straight and has been since at least 1900 as shown in the 1885-1900 Ordnance Survey (OS) one, inch map (National Library of Scotland, 2021). Only a section of approximately 600m downstream of Hanney Road has been straightened since that time. Upstream of Hanney Road the planform has retained some sinuosity and so has the potential to be in reasonable morphological condition; the rest of the channel is likely to have limited geomorphic or ecological value on account of its apparently limited morphological and flow diversity. Portobello Ditch, a tributary of the Cow Common Brook, is also a Main River and appears to be straightened, with limited diversity. Therefore, it is also likely to provide limited aquatic value.

3.2.3. Other notable ditches

The Mere Dyke is a Main River that forms the lower part of a system of drainage ditches draining into the River Ock. All of the channels in the system are straightened and probably partially artificial, including the section that is Main River. Therefore, they are likely to provide limited aquatic value. Landmead Ditch, Hanney Ditch and the Oday Ditches have a similarly straightened planform and are likely to be in a similarly poor condition. The same applies Sandford Brook and Marcham Brook in the area of the proposed scheme, though they have a more natural and sinuous planform upstream of the Hanney Road.

3.2.4. Childrey Brook and River Ock

The sections of Childrey Brook and the River Ock within the area of the proposed scheme have retained much of their sinuosity, though the section of the Ock between Marcham Mill and the A34 have been straightened since the 1888-1913 OS map (National Library of Scotland, 2021). The section of the Ock either side of the A34 appears to have been straightened to power New Cut Mill sometime prior to the late 1800s. The Ock and Childrey Brook may, therefore, provide appreciable geomorphic and ecological value. The River Ock is approximately 10m wide and Childrey Brook approximately 5m wide.

3.2.5. River Thames

The River Thames at the location near to the site, including for several hundred metres up and downstream, appears to have retained some of its sinuosity although the river is maintained for navigation so the channel is comparatively heavily maintained, especially the riparian and marginal zones of the river. At this location, the channel is approximately 50-60m wide (Table 3-1 Photo 1). Just downstream of the proposed intake/outfall structure site the River Thames splits for a short distance (Table 3-1 Photo 2), some of the water going down Culham Cut on which there is a lock used to navigate past weirs on the main Thames. These weirs help retain

water levels for navigation which also impacts on the geomorphology of the Thames upstream, ponding the river more than would be natural. The location around these weirs is an important local feature known as Sutton Pools.

3.2.6. Designated sites

There are no statutory or non-statutory designated sites within the site area, although the whole local area is a nitrate vulnerable zone and a drinking water safeguard zone (surface water). The site is in the impact zone for three different Sites of Special Scientific Interest (SSSIs), all of which are impacted by water levels in the adjacent watercourses. These are Barrow Farm Fen SSSI which is upstream of the site on Sandford Brook, Frilford Heath Ponds and Fens SSSI which is upstream on Marcham Brook, and Culham Brake SSSI which is adjacent to the River Thames.

Table 3-1 - Photos taken of the Thames next to the proposed site on a site visit for another Thames Water project (Dec 2020 and Jan 2021)

	
Photo 1: Looking across the Thames from the right bank (Flow from left to right). The scale of the Thames at this location can be seen, approximately 50-60m wide. Right bank is pasture with a small riparian zone of trees and minimal marginal vegetation. Left bank has more marginal vegetation, predominantly reeds of indeterminate species.	Photo 2: Looking downstream on the Thames (flow from foreground to background). Channel going to the left is Culham Cut which contains the lock. The channel going straight forward is the main Thames, further downstream on this section are weirs.

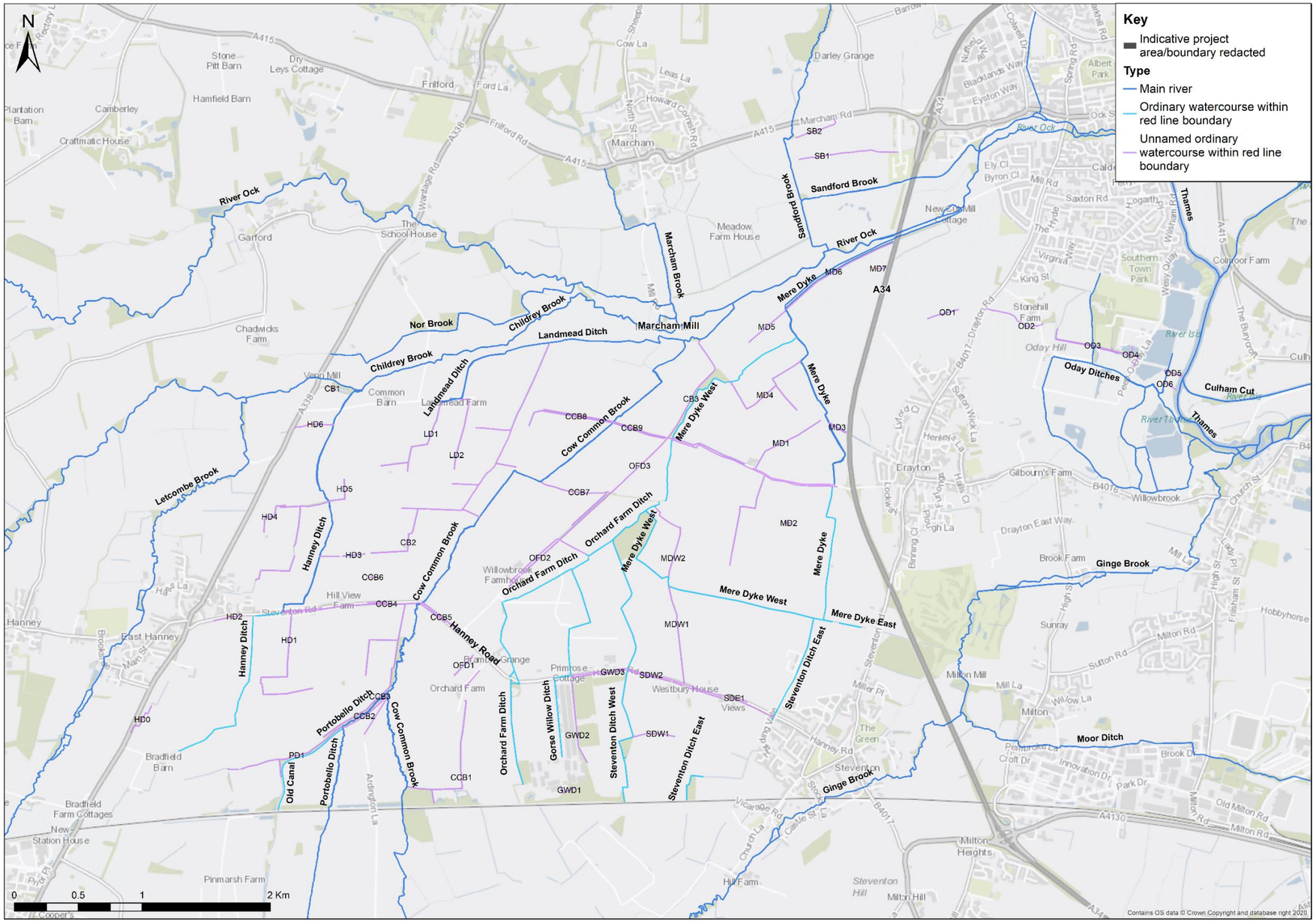

Figure 3-4 - Location of named Main Rivers and Ordinary Watercourses, and the codes given to unnamed Ordinary Watercourses

3.3. Existing WFD baseline and water body descriptions

In accordance with the ACWG methodology, this section provides an overview of the WFD baseline in terms of the formal status for each of the ten water bodies as reported for 2015 (Cycle 2).

The 2019 WFD interim updates have also been provided. The 2015 Directions note the reporting of additional substances from 2018. These are not status elements in RBMP2 and do not currently have a formal status. Although an interim status position has been documented by Environment Agency for 2019, it is not considered appropriate at this time to include these substances in a WFD compliance assessment. It is noted that the gated process will continue beyond RBMP3 publication, at which point these additional substances will have a formal status and a target status for 2027 from which to update the WFD compliance assessment.

3.3.1. Childrey Brook and Norbrook at Common Barn (GB106039023380)

Table 3-2 provides information from the 2015 cycle 2 WFD assessment and 2019 cycle 2 WFD interim update of the Childrey Brook and Norbrook at Common Barn surface water body. The water body is not designated as an artificial or heavily modified water body (A/HMWB) and therefore is expected to reach GES.

The water body is currently at Poor status. This is due to both ecological and chemical status, with macrophytes and phytobenthos at Poor, phosphate at Moderate, cypermethrin at Fail in Priority Substances and polybrominated diphenyl ethers (PBDE) and mercury and its compounds at Fail in Priority Hazardous Substances. The objective for the water body was to reach Poor Status by 2015 which it has already achieved, the reason for an objective below Good is that no known technical solution is available.

The classification data were taken from the Environment Agency's Catchment Data Explorer (2021) as were the reasons for not achieving GES. However, the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. They do still give a good indication of the issues in the catchment and so are listed below:

- Point source – sewage discharge both intermittent and continuous from the water industry responsible for phosphate and macrophytes and phytobenthos;
- Diffuse source – poor livestock management in the agriculture and rural land management category responsible for phosphate and macrophytes and phytobenthos combined; and
- Physical modification – land drainage (operational management) in the agriculture and rural land management category responsible for macrophytes and phytobenthos combined.

Table 3-2 - Childrey Brook and Norbrook at Common Barn WFD surface water body classification

Water body name	Childrey Brook and Norbrook at Common Barn		
Water body ID	GB106039023380		
National Grid Reference	SU4424195147		
River Basin District	Thames		
Management catchment	Gloucestershire and the Vale		
Operational catchment	Ock		
A/HMWB	Not designated A/HMWB		
Classification	2015 Cycle 2	2019 Cycle 2	Objectives
Overall Water Body	Poor	Poor	Poor 2015
Ecological	Poor	Poor	Poor 2015
Biological quality elements	Poor	Poor	Poor 2015
Macrophytes and phytobenthos	Poor	Poor	Poor 2015
Fish	Not assessed	Not assessed	-
Invertebrates	High	High	Good 2015
Hydromorphological supporting elements	Supports Good	Supports Good	Supports Good 2015
Hydrological regime	Supports Good	Supports Good	Supports Good 2015
Morphology	Supports Good	Supports Good	-
Physico-chemical quality elements	Moderate	Moderate	Moderate 2015
Ammonia	High	High	Good 2015
Dissolved Oxygen	High	High	Good 2015
pH	High	High	Good 2015
Phosphate	Poor	Moderate	Poor 2015
Temperature	High	High	Good 2015
Specific pollutants	Not assessed	Not assessed	Not assessed 2015
Chemical	Good	Fail	Good 2015
Priority substances	Does not require assessment	Fail	Does not require assessment 2015
Cypermethrin	-	Fail	-
Fluoranthene	-	Good	-
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment 2015
Priority hazardous substances	Does not require assessment	Fail	Does not require assessment 2015
Polybrominated diphenyl ethers (PBDE)	-	Fail	-
Perfluorooctane sulphonate (PFOS)	-	Good	-
Benzo(a)pyrene	-	Good	-
Dioxins and dioxin-like compounds	-	Good	-
Heptachlor and cis-Heptachlor epoxide	-	Good	-
Hexabromocyclododecane (HBCDD)	-	Good	-
Hexachlorobenzene	-	Good	-
Hexachlorobutadiene	-	Good	-
Mercury and Its Compounds	-	Fail	-

3.3.2. Sandford Brook (Source to Ock) (GB106039023410)

Table 3-3 provides information from the 2015 cycle 2 WFD assessment and 2019 cycle 2 WFD interim update of the Sandford Brook (Source to Ock) surface water body. The water body is not designated as an A/HMWB and therefore is expected to reach GES.

The water body is currently at Poor status. This is due to both ecological and chemical status, with macrophytes and phytobenthos at Poor, and polybrominated diphenyl ethers (PBDE) and mercury and its compounds at Fail in Priority Hazardous Substances. The objective for the water body is to reach Good Status by 2027 which it has not achieved.

There are no reasons for not achieving GES for this water body currently on the Environment Agency's Catchment Data Explorer (2021) as they were not updated when the classification data was updated in 2020, therefore they refer to the 2016 classification data, at this point the water body was assessed as being at Good status.

Table 3-3 - Sandford Brook (Source to Ock) WFD surface water body classification

Water body name	Sandford Brook (source to Ock)		
Water body ID	GB106039023410		
National Grid Reference	SU4693698504		
River Basin District	Thames		
Management catchment	Gloucestershire and the Vale		
Operational catchment	Ock		
A/HMWB	Not designated A/HMWB		
Classification	2015 Cycle 2	2019 Cycle 2	Objectives
Overall Water Body	Poor	Poor	Good 2027
Ecological	Poor	Poor	Good 2027
Biological quality elements	Poor	Poor	Good 2027
Macrophytes and phytobenthos	Poor	Poor	Good 2027
Fish	Not assessed	Not assessed	-
Invertebrates	Good	Good	Good 2015
Hydromorphological supporting elements	Supports Good	Supports Good	Supports Good 2015
Hydrological regime	Supports Good	High	Supports Good 2015
Physico-chemical quality elements	High	High	Good 2015
Ammonia	High	High	Good 2015
Dissolved Oxygen	High	High	Good 2015
pH	High	High	Good 2015
Phosphate	High	High	Good 2015
Temperature	High	High	Good 2015
Specific pollutants	Not assessed	Not assessed	Not assessed 2015
Chemical	Good	Fail	Good 2015
Priority substances	Does not require assessment	Good	Does not require assessment 2015
Cypermethrin (Priority hazardous)	-	Good	-
Fluoranthene	-	Good	-
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment 2015
Priority hazardous substances	Does not require assessment	Fail	Does not require assessment 2015
Polybrominated diphenyl ethers (PBDE)	-	Fail	-
Perfluorooctane sulphonate (PFOS)	-	Good	-
Benzo(a)pyrene	-	Good	-
Dioxins and dioxin-like compounds	-	Good	-
Heptachlor and cis-Heptachlor epoxide	-	Good	-
Hexabromocyclododecane (HBCDD)	-	Good	-
Hexachlorobenzene	-	Good	-
Hexachlorobutadiene	-	Good	-
Mercury and Its Compounds	-	Fail	-

3.3.3. Cow Common Brook and Portobello Ditch (GB106039023360)

Table 3-4 provides information from the 2015 cycle 2 WFD assessment and 2019 cycle 2 WFD interim update of the Cow Common Brook and Portobello Ditch surface water body. The water body is not designated as an A/HMWB and therefore is expected to reach GES.

The water body is currently at Poor status. This is due to both ecological and chemical status, with macrophytes and phytobenthos at Poor, invertebrates at Moderate, dissolved oxygen at Bad, phosphate at Poor and polybrominated diphenyl ethers (PBDE) at Fail in Priority Hazardous Substances. The objective for the water body is to reach Good by 2027 which it has not achieved.

The classification data were taken from the Environment Agency's Catchment Data Explorer (2021) as were the reasons for not achieving GES. However, the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. However, they do still give a good indication of the issues in the catchment and so are listed below:

- Point source – continuous sewage discharge from urban and transport and domestic general public responsible for Macrophytes and Phytobenthos Combined, Phosphate and Dissolved Oxygen;
- Diffuse source – poor livestock and nutrient management in the agriculture and rural land management category responsible Macrophytes and Phytobenthos Combined, Phosphate and Dissolved Oxygen;
- Physical modification – land drainage (operational management) in the agriculture and rural land management category responsible for invertebrates;
- Natural – drought responsible for dissolved oxygen and other natural conditions responsible for invertebrates; and
- Suspect data – responsible for Macrophytes and Phytobenthos Combined.

Table 3-4 - Cow Common Brook and Portobello Ditch WFD surface water body classification

Water body name	Cow Common Brook and Portobello Ditch		
Water body ID	GB106039023360		
National Grid Reference	SU4341192347		
River Basin District	Thames		
Management catchment	Gloucestershire and the Vale		
Operational catchment	Ock		
A/HMWB	Not designated A/HMWB		
Classification	2015 Cycle 2	2019 Cycle 2	Objectives
Overall Water Body	Poor	Poor	Good 2027
Ecological	Poor	Poor	Good 2027
Biological quality elements	Poor	Poor	Good 2027
Fish	Not assessed	Not assessed	
Invertebrates	Moderate	Moderate	Good 2027
Macrophytes and phytobenthos	Poor	Poor	Good 2027
Hydromorphological supporting elements	Supports Good	Supports Good	Supports Good 2015
Hydrological regime	High	High	Supports Good 2015
Physico-chemical quality elements	Moderate	Moderate	Good 2027
Ammonia	High	High	Good 2015
Dissolved Oxygen	Bad	Bad	Good 2027
pH	High	High	Good 2015
Phosphate	Poor	Poor	Good 2027
Temperature	High	High	Good 2015
Specific pollutants	Not assessed	Not assessed	Not assessed 2015
Chemical	Good	Fail	Good 2015
Priority substances	Does not require assessment	Good	Does not require assessment 2015
Cypermethrin (Priority hazardous)	-	Good	-
Fluoranthene	-	Good	-
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment 2015
Priority hazardous substances	Does not require assessment	Fail	Does not require assessment 2015
Polybrominated diphenyl ethers (PBDE)	-	Fail	-
Perfluorooctane sulphonate (PFOS)	-	Good	-
Benzo(a)pyrene	-	Good	-
Dioxins and dioxin-like compounds	-	Good	-
Heptachlor and cis-Heptachlor epoxide	-	Good	-
Hexabromocyclododecane (HBCDD)	-	Good	-
Hexachlorobenzene	-	Good	-
Hexachlorobutadiene	-	Good	-
Mercury and Its Compounds	-	Fail	-

3.3.4. Ginge Brook and Mill Brook (GB106039023660)

Table 3-5 provides information from the 2015 cycle 2 WFD assessment and 2019 cycle 2 WFD interim update of the Ginge Brook and Mill Brook surface water body. The water body is not designated as an A/HMWB and therefore is expected to reach GES.

The water body is currently at Moderate status. This is due to both ecological and chemical status, with macrophytes and phytobenthos and fish at Moderate, phosphate at moderate, and polybrominated diphenyl ethers (PBDE), Perfluorooctane sulphonate (PFOS) and mercury and its compounds at Fail in Priority Hazardous Substances. The objective for the water body was to reach Moderate by 2015 so it has reached its objective. The reason for an objective below Good is unfavourable balance of costs and benefits.

The classification data were taken from the Environment Agency's Catchment Data Explorer (2021) as were the reasons for not achieving GES. However, the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. However, they do still give a good indication of the issues in the catchment and so are listed below:

- Point source – continuous sewage discharge from the Water Industry responsible for Macrophytes and Phytobenthos Combined and Phosphate; and
- Other pressures – responsible for Macrophytes and Phytobenthos Combined.

Table 3-5 - Ginge Brook and Mill Brook WFD surface water body classification

Water body name	Ginge Brook and Mill Brook		
Water body ID	GB106039023660		
National Grid Reference	SU4664188618		
River Basin District	Thames		
Management catchment	Gloucestershire and the Vale		
Operational catchment	Ock		
A/HMWB	Not designated A/HMWB		
Classification	2015 Cycle 2	2019 Cycle 2	Objectives
Overall Water Body	Moderate	Moderate	Moderate 2015
Ecological	Moderate	Moderate	Moderate 2015
Biological quality elements	High	Moderate	Good 2015
Macrophytes and phytobenthos	Not assessed	Moderate	-
Fish	Not assessed	Not assessed	-
Invertebrates	High	High	Good 2015
Hydromorphological supporting elements	Supports Good	Supports Good	Supports Good 2015
Hydrological regime	Supports Good	Supports Good	Supports Good 2015
Morphology	Supports Good	Supports Good	-
Physico-chemical quality elements	Moderate	Moderate	Moderate 2015
Ammonia	High	High	Good 2015
Dissolved Oxygen	High	High	Good 2015
pH	High	High	Good 2015
Phosphate	Moderate	Moderate	Moderate 2015
Temperature	High	High	Good 2015
Specific pollutants	Not assessed	Not assessed	Not assessed 2015
Chemical	Good	Fail	Good 2015
Priority substances	Does not require assessment	Good	Does not require assessment
Cypermethrin (Priority hazardous)	-	Good	-
Fluoranthene	-	Good	-
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment
Priority hazardous substances	Does not require assessment	Fail	Does not require assessment
Polybrominated diphenyl ethers (PBDE)	-	Fail	-
Perfluorooctane sulphonate (PFOS)	-	Fail	-
Benzo(a)pyrene	-	Good	-
Dioxins and dioxin-like compounds	-	Good	-
Heptachlor and cis-Heptachlor epoxide	-	Good	-
Hexabromocyclododecane (HBCDD)	-	Good	-
Hexachlorobenzene	-	Good	-
Hexachlorobutadiene	-	Good	-
Mercury and Its Compounds	-	Fail	-

3.3.5. Ock and tributaries (Land Brook confluence to Thames) (GB106039023430)

Table 3-6 provides information from the 2015 cycle 2 WFD assessment and 2019 cycle 2 WFD interim update of the Ock and tributaries (Land Brook confluence to Thames) surface water body. The water body is not designated as an A/HMWB and therefore is expected to reach GES.

The water body is currently at Poor status. This is due to both ecological and chemical status, with fish at Poor, phosphate at Poor, and polybrominated diphenyl ethers (PBDE), Perfluorooctane sulphonate (PFOS) and mercury and its compounds at Fail in Priority Hazardous Substances. The objective for the water body is to reach Moderate status by 2027, which it has achieved. The reasons for an objective below good are, disproportionate burdens, no known technical solution is available and cause of adverse impact unknown.

The classification data were taken from the Environment Agency's Catchment Data Explorer (2021) as were the reasons for not achieving GES. However, the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. However, they do still give a good indication of the issues in the catchment and so are listed below:

- Point source – continuous and intermittent sewage discharge from the Water Industry responsible for Phosphate;
- Diffuse source – poor livestock and nutrient management in the agriculture and rural land management category responsible for Phosphate; and,
- Physical modification – land drainage and barriers to ecological discontinuity from agriculture and land use management responsible for fish.

Table 3-6 - Ock and tributaries (Land Brook confluence to Thames) WFD surface water body classification

Water body name	Ock and tributaries (Land Brook confluence to Thames)		
Water body ID	GB106039023430		
National Grid Reference	SU4962096695		
River Basin District	Thames		
Management catchment	Gloucestershire and the Vale		
Operational catchment	Ock		
A/HMWB	Not designated A/HMWB		
Classification	2015 Cycle 2	2019 Cycle 2	Objectives
Overall Water Body	Poor	Poor	Moderate 2027
Ecological	Poor	Poor	Moderate 2027
Biological quality elements	Poor	Poor	Good 2027
Macrophytes and phytobenthos	Good	Good	Good 2015
Fish	Poor	Poor	Good 2027
Invertebrates	High	High	Good 2015
Hydromorphological supporting elements	Supports Good	Supports Good	Supports Good 2015
Hydrological regime	Supports Good	Supports Good	Supports Good 2015
Morphology	Supports Good	Supports Good	-
Physico-chemical quality elements	Moderate	Moderate	Moderate 2015
Ammonia	High	High	Good 2015
Dissolved Oxygen	Good	Good	Good 2015
pH	High	High	Good 2015
Phosphate	Poor	Poor	Moderate 2027
Temperature	High	High	Good 2015
Specific pollutants	High	High	High 2015
Chemical	Good	Fail	Good 2015
Priority substances	Good	Good	Good 2015
Cypermethrin (Priority hazardous)	-	Good	-
Fluoranthene	-	Good	-
Others (Priority substances)	Good	Good	-
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment 2015
Priority hazardous substances	Good	Fail	Good 2015
Polybrominated diphenyl ethers (PBDE)	-	Fail	-
Perfluorooctane sulphonate (PFOS)	-	Fail	-
Mercury and Its Compounds	-	Fail	-
Others (Priority hazardous substances)	Good	Good	-

3.3.6. Thames (Evenlode to Thame) (GB106039030334)

Table 3-7 provides information from the 2015 cycle 2 WFD assessment and 2019 cycle 2 WFD interim update of the Thames (Evenlode to Thame) surface water body. The water body is not designated as an A/HMWB and therefore is expected to reach GES.

The water body is currently at Moderate status. This is due to both ecological and chemical status, with fish and invertebrates at Moderate, phosphate at Moderate, and polybrominated diphenyl ethers (PBDE), Perfluorooctane sulphonate (PFOS) and mercury and its compounds at Fail in Priority Hazardous Substances. The objective for the water body was to reach Moderate status by 2015, which it has achieved. The reasons for such a low objective are: unfavourable balance of costs and benefits, disproportionate burdens and no known technical solution is available.

The classification data were taken from the Environment Agency's Catchment Data Explorer (2021) as were the reasons for not achieving GES. However, the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. However, they do still give a good indication of the issues in the catchment and so are listed below:

- Point source – continuous sewage discharge from the Water Industry responsible for Phosphate and Tributyltin Compounds (as of 2019 Tributyltin compounds are now at Good status, so no longer an issue);
- Diffuse source – poor nutrient management in the agriculture and rural land management category responsible for Phosphate;
- Invasive non-native species – North American signal crayfish responsible for invertebrates; and,
- Suspect data – responsible for invertebrates.

Table 3-7 - Thames (Evenlode to Thame) WFD surface water body classification

Water body name	Thames (Evenlode to Thame)		
Water body ID	GB106039030334		
National Grid Reference	SP4574111361		
River Basin District	Thames		
Management catchment	Gloucestershire and the Vale		
Operational catchment	Ock		
A/HMWB	Not designated A/HMWB		
Classification	2015 Cycle 2	2019 Cycle 2	Objectives
Overall Water Body	Moderate	Moderate	Moderate 2015
Ecological	Moderate	Moderate	Moderate 2015
Biological quality elements	Moderate	Moderate	Good 2027
Macrophytes and phytobenthos	Not assessed	Not assessed	-
Fish	Moderate	Good	Good 2027
Invertebrates	Moderate	Moderate	Good 2027
Hydromorphological supporting elements	Supports Good	Supports Good	Supports Good 2015
Hydrological regime	Supports Good	Supports Good	Supports Good 2015
Morphology	Supports Good	Supports Good	-
Physico-chemical quality elements	Moderate	Moderate	Moderate 2015
Ammonia	High	High	Good 2015
Dissolved Oxygen	High	High	Good 2015
pH	High	High	Good 2015
Phosphate	Moderate	Moderate	Moderate 2015
Temperature	High	High	Good 2015
Specific pollutants	High	High	High 2015
Chemical	Fail	Fail	Good 2027
Priority substances	Good	Good	Good 2015
Cypermethrin (Priority hazardous)	-	Good	-
Fluoranthene	-	Good	-
Others	Good	Good	-
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment 2015
Priority hazardous substances	Fail	Fail	Good 2027
Polybrominated diphenyl ethers (PBDE)	Good	Fail	-
Perfluorooctane sulphonate (PFOS)	-	Fail	-
Mercury and Its Compounds	Good	Fail	-
Tributyltin Compounds	Fail	Good	-
Others	Good	Good	-

3.3.7. Thames Wallingford to Caversham (GB106039030331)

Table 3-8 provides information from the 2015 cycle 2 WFD assessment and 2019 cycle 2 WFD interim update of the Thames Wallingford to Caversham surface water body. The water body is designated as a HMWB and therefore is expected to reach GEP rather than GES.

The water body is currently at Moderate status. This is due to both ecological and chemical status, with mitigation measures assessment at Moderate or less, phosphate at Moderate, Cypermethrin at Fail in Priority hazardous, and polybrominated diphenyl ethers (PBDE), Perfluorooctane sulphonate (PFOS), Benzo(b)fluoranthene, Benzo(g-h-i)perylene and mercury and its compounds at Fail in Priority Hazardous Substances. The objective for the water body was to reach Moderate by 2015 which it has achieved. The reasons for an objective below Good are: cause of adverse impact unknown, disproportionate burdens and no known technical solution is available.

The classification data were taken from the Environment Agency's Catchment Data Explorer (2021) as were the reasons for not achieving GES. However, the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. However, they do still give a good indication of the issues in the catchment and so are listed below:

- Point source – continuous sewage discharge from the Water Industry responsible for Phosphate;
- Diffuse source – from agriculture and rural land management for Phosphate;
- Physical modification – in the categories of Recreation, Navigation and Local and Central Government responsible for Mitigation Measures Assessment;
- Invasive non-native species – North American signal crayfish responsible for invertebrates; and,
- Suspect data – for invertebrates.

Table 3-8 - Thames Wallingford to Caversham WFD surface water body classification

Water body name	Thames Wallingford to Caversham		
Water body ID	GB106039030331		
National Grid Reference	SU5975592031		
River Basin District	Thames		
Management catchment	Thames and Chilterns South		
Operational catchment	Chilterns South		
A/HMWB	HMWB		
Classification	2015 Cycle 2	2019 Cycle 2	Objectives
Overall Water Body	Moderate	Moderate	Moderate 2015
Ecological	Moderate	Moderate	Moderate 2015
Supporting elements	Moderate	Moderate	Good 2027
Mitigation measures assessment	Moderate or less	Moderate or less	Good 2027
Biological quality elements	Moderate	High	Good 2027
Macrophytes and phytobenthos	Good	Not assessed	Good 2015
Fish	Not assessed	Not assessed	-
Invertebrates	Moderate	High	Good 2027
Hydromorphological supporting elements	Supports Good	Supports Good	Supports Good 2027
Hydrological regime	Does not Support Good	Supports Good	Does not Support Good 2015
Physico-chemical quality elements	Moderate	Moderate	Moderate 2015
Acid Neutralising Capacity	High	High	Good 2015
Ammonia	High	High	Good 2015
Dissolved Oxygen	High	High	Good 2015
pH	High	High	Good 2015
Phosphate	Moderate	Moderate	Moderate 2015
Temperature	High	High	Good 2015
Specific pollutants	Moderate	High	High 2027
Triclosan	Moderate	High	High 2027
Chemical	Good	Fail	Good 2015
Priority substances	Good	Fail	Good 2015
Cypermethrin	-	Fail	-
Fluoranthene	-	Good	-
Others (priority substances)	Good	Good	-
Other Pollutants	Good	Good	Good 2015
Priority hazardous substances	Good	Fail	Good 2015
Polybrominated diphenyl ethers (PBDE)	-	Fail	-
Perfluorooctane sulphonate (PFOS)	-	Fail	-
Benzo(b)fluoranthene	-	Fail	-
Benzo(g-h-i)perylene	-	Fail	-
Mercury and its compounds	-	Fail	-
Others	Good	Good	-

3.3.8. Thames (Reading to Cookham) (GB106039023233)

Table 3-9 provides information from the 2015 cycle 2 WFD assessment and 2019 cycle 2 WFD interim update of the Thames (Reading to Cookham) surface water body. The water body is designated as a HMWB and therefore is expected to reach GEP rather than GES.

The water body is currently at Moderate status. This is due to both ecological and chemical status, with mitigation measures assessment at Moderate or Less, phosphate at Moderate, and polybrominated diphenyl ethers (PBDE), Perfluorooctane sulphonate (PFOS), Benzo(b)fluoranthene and Benzo(g-h-i)perylene at Fail in Priority Hazardous Substances. The objective for the water body was to reach Moderate by 2015 which it has achieved. The reasons for an objective below Good are: disproportionate burdens and no known technical solution is available.

The classification data were taken from the Environment Agency's Catchment Data Explorer (2021) as were the reasons for not achieving GES. However, the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. However, they do still give a good indication of the issues in the catchment and so are listed below:

- Point source – continuous sewage discharge from the Water Industry responsible for Phosphate; and,
- Physical modification – in the categories of Recreation and Navigation responsible for Mitigation Measures Assessment.

Table 3-9 - Thames (Reading to Cookham) WFD surface water body classification

Water body name	Thames (Reading to Cookham)		
Water body ID	GB106039023233		
National Grid Reference	SU8387684421		
River Basin District	Thames		
Management catchment	Thames and Chilterns South		
Operational catchment	Chilterns South		
A/HMWB	HMWB		
Classification	2015 Cycle 2	2019 Cycle 2	Objectives
Overall Water Body	Moderate	Moderate	Moderate 2015
Ecological	Moderate	Moderate	Moderate 2015
Supporting elements	Moderate	Moderate	Good 2027
Mitigation measures assessment	Moderate or less	Moderate or less	Good 2027
Biological quality elements	High	Good	Good 2015
Macrophytes and phytobenthos	Not assessed	Not assessed	-
Fish	Not assessed	Not assessed	-
Invertebrates	High	Good	Good 2015
Hydromorphological supporting elements	Supports Good	Supports Good	Supports Good 2015
Hydrological regime	Supports Good	Supports Good	Supports Good 2015
Physico-chemical quality elements	Moderate	Moderate	Moderate 2015
Ammonia	High	High	Good 2015
Biochemical Oxygen Demand (BOD)	Moderate	Not assessed	-
Dissolved Oxygen	Good	Good	Good 2015
pH	High	High	Good 2015
Phosphate	Moderate	Moderate	Moderate 2015
Temperature	Good	Good	Good 2015
Specific pollutants	High	High	High 2015
Chemical	Good	Fail	Good 2015
Priority substances	Good	Good	Good 2015
Cypermethrin (Priority hazardous)	-	Good	-
Fluoranthene	-	Good	-
Others (priority substances)	Good	Good	-
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment 2015
Priority hazardous substances	Good	Fail	Good 2015
Polybrominated diphenyl ethers (PBDE)	-	Fail	-
Perfluorooctane sulphonate (PFOS)	-	Fail	-
Benzo(b)fluoranthene	-	Fail	-
Benzo(g-h-i)perylene	-	Fail	-
Others (priority hazardous substances)	Good	Good	-

3.3.9. Thames (Cookham to Egham) (GB106039023231)

Table 3-10 provides information from the 2015 cycle 2 WFD assessment and 2019 cycle 2 WFD interim update of the Thames (Cookham to Egham) surface water body. The water body is designated as a HMWB and therefore is expected to reach GEP rather than GES.

The water body is currently at Moderate status. This is due to both ecological and chemical status, with mitigation measures assessment at Moderate or less, phosphate at Moderate, and polybrominated diphenyl ethers (PBDE), and Perfluorooctane sulphonate (PFOS) at Fail in Priority Hazardous Substances. The objective for this water body was to reach Moderate Status by 2015 which it achieved. The reasons for an objective below Good are, disproportionate burdens and no known technical solution is available.

The classification data were taken from the Environment Agency's Catchment Data Explorer (2021) as were the reasons for not achieving GES. However, the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. However, they do still give a good indication of the issues in the catchment and so are listed below:

- Point source – continuous sewage discharge from the Water Industry responsible for Phosphate;
- Diffuse source – poor nutrient management in the agriculture and rural land management category and Transport Drainage in the urban and transport sector responsible for Phosphate;
- Physical modification – by local and central government, the water industry and for navigation responsible for Mitigation Measures Assessment; and,
- Flow – Surface water abstraction by the water industry responsible for hydrological regime.

Table 3-10 - Thames (Cookham to Egham) WFD surface water body classification

Water body name	Thames (Cookham to Egham)		
Water body ID	GB106039023231		
National Grid Reference	TQ0099272440		
River Basin District	Thames		
Management catchment	Maidenhead and Sunbury		
Operational catchment	Thames Lower		
A/HMWB	HMWB		
Classification	2015 Cycle 2	2019 Cycle 2	Objectives
Overall Water Body	Moderate	Moderate	Moderate 2015
Ecological	Moderate	Moderate	Moderate 2015
Supporting elements	Moderate	Moderate	Good 2027
Mitigation measures assessment	Moderate or less	Moderate or less	Good 2027
Biological quality elements	Good	Good	Good 2015
Macrophytes and phytobenthos	Not assessed	Not assessed	Not assessed 2015
Fish	Not assessed	Not assessed	-
Invertebrates	Good	Good	Good 2015
Hydromorphological supporting elements	Not assessed	Not assessed	Not assessed 2015
Hydrological regime	Not assessed	Not assessed	-
Physico-chemical quality elements	Moderate	Moderate	Moderate 2015
Acid Neutralising Capacity	Not assessed	High	-
Ammonia	High	High	Good 2015
Dissolved Oxygen	High	High	Good 2015
pH	High	High	Good 2015
Phosphate	Moderate	Moderate	Moderate 2015
Temperature	High	High	Good 2015
Specific pollutants	High	High	High 2015
Chemical	Good	Fail	Good 2015
Priority substances	Good	Good	Good 2015
Cypermethrin (Priority hazardous)	-	Good	-
Fluoranthene	Good	Good	Good 2015
Others (priority substances)	Good	Good	Good 2015
Other Pollutants	Good	Good	Good 2015
Priority hazardous substances	Good	Fail	Good 2015
Polybrominated diphenyl ethers (PBDE)	-	Fail	-
Perfluorooctane sulphonate (PFOS)	-	Fail	-
Others (priority hazardous substances)	Good	Good	Good 2015

3.3.10. Thames (Egham to Teddington) (GB106039023232)

Table 3-11 provides information from the 2015 cycle 2 WFD assessment and 2019 cycle 2 WFD interim update of the Thames (Egham to Teddington) surface water body. The water body is designated as a HMWB and therefore is expected to reach GEP rather than GES.

The water body is currently at Poor status. This is due to both ecological and chemical status, with mitigation measures assessment at Moderate or less, macrophytes and phytobenthos and invertebrates at Poor, phosphate and temperature at moderate, cypermethrin at Fail in Priority Substances and polybrominated diphenyl ethers (PBDE), Perfluorooctane sulphonate (PFOS) and Tributyltin Compounds at Fail in Priority Hazardous Substances. The objective for this water body was to reach Poor by 2015. The reasons for an objective below Good are: disproportionate burdens and no known technical solution is available.

The classification data were taken from the Environment Agency's Catchment Data Explorer (2021) as were the reasons for not achieving GES. However, the reasons for not achieving good (RNAG) were not updated in the last interim update and therefore relate to the 2016 classification data. However, they do still give a good indication of the issues in the catchment and so are listed below:

- Point source – continuous sewage discharge from the Water Industry responsible for Macrophytes and Phytobenthos Combined, Phosphate and Temperature;
- Diffuse source – poor nutrient management in the agriculture and rural land management category responsible for Macrophytes and Phytobenthos Combined and Phosphate. Transport Drainage in the urban and transport sector responsible for Phosphate;
- Physical modification – by local and central government, the water industry and for navigation responsible for Mitigation Measures Assessment. Water level management in impounded water bodies responsible for temperature; and,
- Flow – Surface water abstraction by the water industry responsible for hydrological regime and low flow (not drought) responsible for temperature.

Table 3-11 - Thames (Egham to Teddington) WFD surface water body classification

Water body name	Thames (Egham to Teddington)		
Water body ID	GB106039023232		
National Grid Reference	TQ0505668161		
River Basin District	Thames		
Management catchment	Maidenhead and Sunbury		
Operational catchment	Thames Lower		
A/HMWB	HMWB		
Classification	2015 Cycle 2	2019 Cycle 2	Objectives
Overall Water Body	Poor	Poor	Poor 2015
Ecological	Poor	Poor	Poor 2015
Supporting elements (Surface Water)	Moderate	Moderate	Good 2027
Mitigation Measures Assessment	Moderate or less	Moderate or less	Good 2027
Biological quality elements	Poor	Poor	Poor 2015
Macrophytes and phytobenthos	Poor	Poor	Poor 2015
Fish	Not assessed	Not assessed	-
Invertebrates	Good	Poor	Good 2015
Hydromorphological supporting elements	Not assessed	Not assessed	Not assessed 2015
Hydrological regime	Not assessed	Not assessed	-
Physico-chemical quality elements	Moderate	Moderate	Moderate 2015
Ammonia	High	High	Good 2015
Biochemical Oxygen Demand (BOD)	Good	Not assessed	
Dissolved Oxygen	High	Good	Good 2015
pH	High	High	Good 2015
Phosphate	Moderate	Moderate	Moderate 2015
Temperature	Good	Moderate	Good 2015
Specific pollutants	High	High	High 2015
Chemical	Good	Fail	Good 2015
Priority substances	Good	Fail	Good 2015
Cypermethrin (Priority hazardous)	-	Fail	-
Fluoranthene	Good	Good	Good 2015
Others (Priority substances)	Good	Good	Good 2015
Other Pollutants	Good	Does not require assessment	Good 2015
Priority hazardous substances	Good	Fail	Good 2015
Polybrominated diphenyl ethers (PBDE)	-	Fail	-
Perfluorooctane sulphonate (PFOS)	-	Fail	-
Tributyltin Compounds	-	Fail	-
Others (Priority hazardous substances)	Good	Good	Good 2015

3.3.11. Relevant local target measures

Only one potentially relevant local target measure was mentioned in the Catchment Data Explorer for all the catchments potentially impacted by the proposed scheme. This is for the South Chilterns Operational Catchment and entails river rehabilitation for brook habitat to mitigate the impact of low flows.

There are additional measures supplied in the Thames RBMP (Environment Agency, 2015) potentially relevant to the proposed scheme shown in Table 3-12.

Table 3-12 - Relevant measures in Thames River Basin Management Plan

Operation Catchment	Measure proposed
Ock	Engage landowners to adjust land management through land use models to reduce flood risk, diffuse pollution, taking into account the effect of sewage treatment work (STW) improvements. Take an upstream to downstream approach and protect and build out from the freshwater, standing water and wetland 'hot-spot' locations.
	Extend downstream existing river 'hot-spot' sections, create water quality buffers around key freshwater and wetland sites, implement measures for species of conservation concern and install clean water ponds and wetlands across the catchment.
South Chilterns	None
Maidenhead to Sunbury	Engagement and training of community volunteers in river restoration, invasive species management and putting mitigation measures in place.
	Small-scale habitat projects with consideration for cross catchment mutual gains involving volunteers to re-naturalise a river corridor and improve water quality, habitat, biodiversity and flood resilience by removing hard banking and planting with marginal native macrophytes, and installing a small scale SuDS reed bed on a priority surface water body.
	High media level promoting of the Lower Thames, for catchment-wide engagement of people and business.
	Citizen science and accredited training for community volunteers in the catchment area.
	Strategic review of barriers to fish, and back waters and scope implementation of new design fish passages at priority weirs (for example, Salthill stream and Roundmoor Ditch). This will improve fish populations and habitat for refuge.

4. WFD Level 1 screening

4.1. Overview

This section assesses where the proposed scheme design may impact the WFD water bodies within the assessment area. It screens in those water bodies that will need further assessment and screens out those that will not be impacted.

The ACWG template Level 1 screening findings have been recorded in Appendix A (ACWG_WFD No Det_Framework Assessment_Spreadsheet_October 2020), notably:

- Worksheet 1 – “List relevant water bodies”
- Worksheet 2 – “Level 1 activities”

Worksheet 3 “Level 1 summary” is auto-generated to summarise those water bodies to be carried forward to the Level 2 assessment.

As the ACWG template does not have specific sections for documenting the reasoning behind the selection of water bodies or activities, relevant description is set out below.

4.2. Scheme elements

There are several scheme elements that may have an impact on the WFD water bodies within the vicinity of the proposed scheme. A description of the proposed scheme can be found in Section 2 above and in more detail in the 2021 CDR (Technical Annex A). The location of all the scheme elements are displayed on Figure 4-1 to Figure 4-12 with the potential impacts of these elements on water bodies shown as either a point or a line. For each of the WFD Water bodies screened in, the scheme elements that potentially impact that water body, the description of their potential effects, and the potential impacts are listed in Table 4-1 below. For each scheme element the options which they relate to are also stated. The scheme elements are named the same in the table as on the figures where possible to keep it as clear as possible. One exception to this is “reservoir footprint” which is used in the table but encompasses all the elements in the figures located within the perimeter access track as they have the same potential impact.

As the WFD is primarily focused on the permanent impacts of works, the construction impacts, or temporary impacts are not discussed in Table 4-1, instead they will be considered separately in Section 4.3.

The WRSE WFD assessment is undertaken using a standard list of construction and operation activities, as specified in the WRSE (2020) ACWG methodology. These have been linked to the scheme elements in Table 4-1 where relevant and are documented as part of the ACWG methodology. However, there are several construction and operation activities in the standard list that are not relevant to the works in this proposed scheme and so are not in Table 4-1, these are listed below:

- Construction of below ground structures (shaft/retaining wall) with associated dewatering, within 500m of a sensitive groundwater feature;
- Presence of new underground structure (tunnel/shaft/retaining wall) within 500m of a sensitive groundwater feature;
- Construction of new cutting with external dewatering with no sensitive groundwater feature within 500m;
- Construction of new cutting with external dewatering within 500m of a sensitive groundwater feature;
- Removal of significant in channel watercourse structure (such as impassable weir);
- Removal of existing culverts or other in channel watercourse structure;
- High volume discharge of water with a quality element of higher WFD status than the receiving water body;
- High volume discharge of water with a quality element of a lower WFD status than the receiving water body;
- Low volume discharge of water with a quality element of the same or higher WFD status than the receiving water body;
- Low volume discharge of water with a quality element of a lower WFD status than the receiving water body;
- Low volume discharge of water with a quality element of the same WFD status as the receiving water body;
- New WTW discharge to watercourse;

- New discharge of highly saline water to a coastal or transitional water body;
- New discharge of highly saline water to a surface water body or groundwater;
- Cessation of existing discharge to a watercourse;
- Construction of a new abstraction borehole headworks and associated infrastructure;
- Refurbishment of existing boreholes;
- Drilling new abstraction boreholes;
- Maintenance and use of abstraction borehole infrastructure;
- Daylighting of existing culverts;
- Maintenance and use of coastal intakes;
- Use of existing ground and surface water abstraction licences, within licence conditions and recent abstraction patterns;
- Use of existing surface water and groundwater abstraction licences, within existing licence conditions but outside of the recent actual rates;
- Emergency or drought use of existing surface water or groundwater abstraction outside of licence conditions;
- New or increased groundwater abstraction;
- Increase in surface water and groundwater abstraction licences;
- New coastal or transitional water body abstraction licence;
- Reduction of coastal or transitional water body abstraction licence;
- Increase of coastal or transitional water body abstraction licence;
- Trenching and laying of pipelines involving large watercourse crossings with in channel modifications;
- Removal / decommissioning of existing pipeline (no watercourse crossings);
- Removal / decommissioning of existing pipeline (involving watercourse crossings);
- New above ground pipelines (crossing watercourse);
- New above ground pipelines (not crossing watercourse);
- Modification of an existing storage reservoir;
- Modification of an existing service reservoir adjacent in close proximity to watercourse;
- Presence of new reservoir or modified existing service reservoir in close proximity to watercourse;
- Modification of an existing service reservoir not in close proximity to watercourse;
- Presence of new reservoir or modified existing service reservoir not in close proximity to watercourse;
- New or continuation of contractual agreement between companies to continue providing transfer with no change to abstraction licence associated;
- Contractual agreement between companies to continue providing transfer with decrease in abstraction licence associated;
- Contractual agreement between companies to continue providing transfer with increase in abstraction licence associated;
- Catchment management schemes;
- Modification of an existing WTW or pumping station relating to treated water;
- Construction of a new WTW or pumping station relating to treated water;
- Maintenance and use of pumping stations and WTW;
- Removal of existing WTW and associated discharge;
- Construction or modification of a desalination plant; and,
- Construction or modification of a desalination plant.

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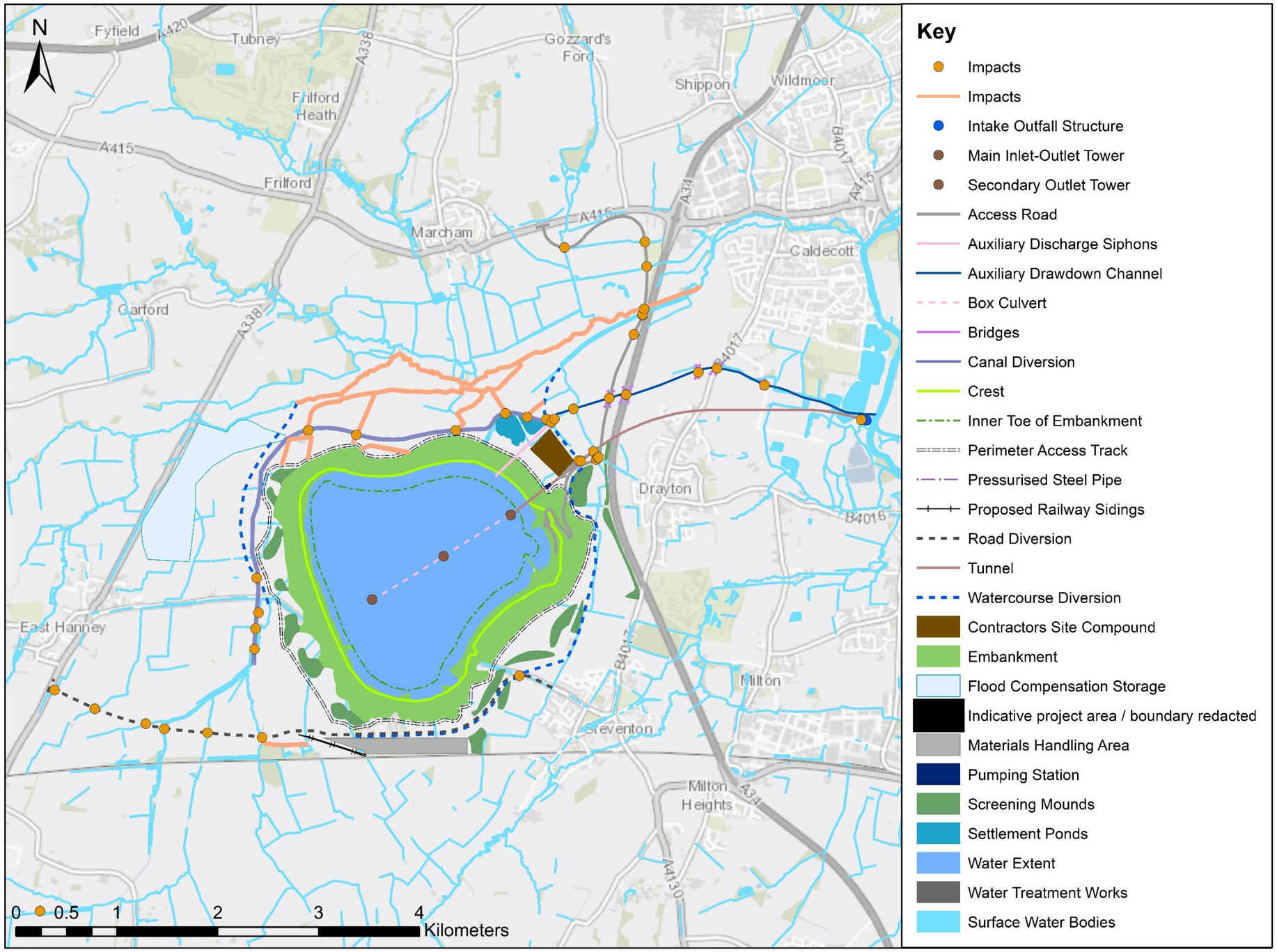

Figure 4-1 - Locations where there is the potential for impacts from the 75Mm³ reservoir option

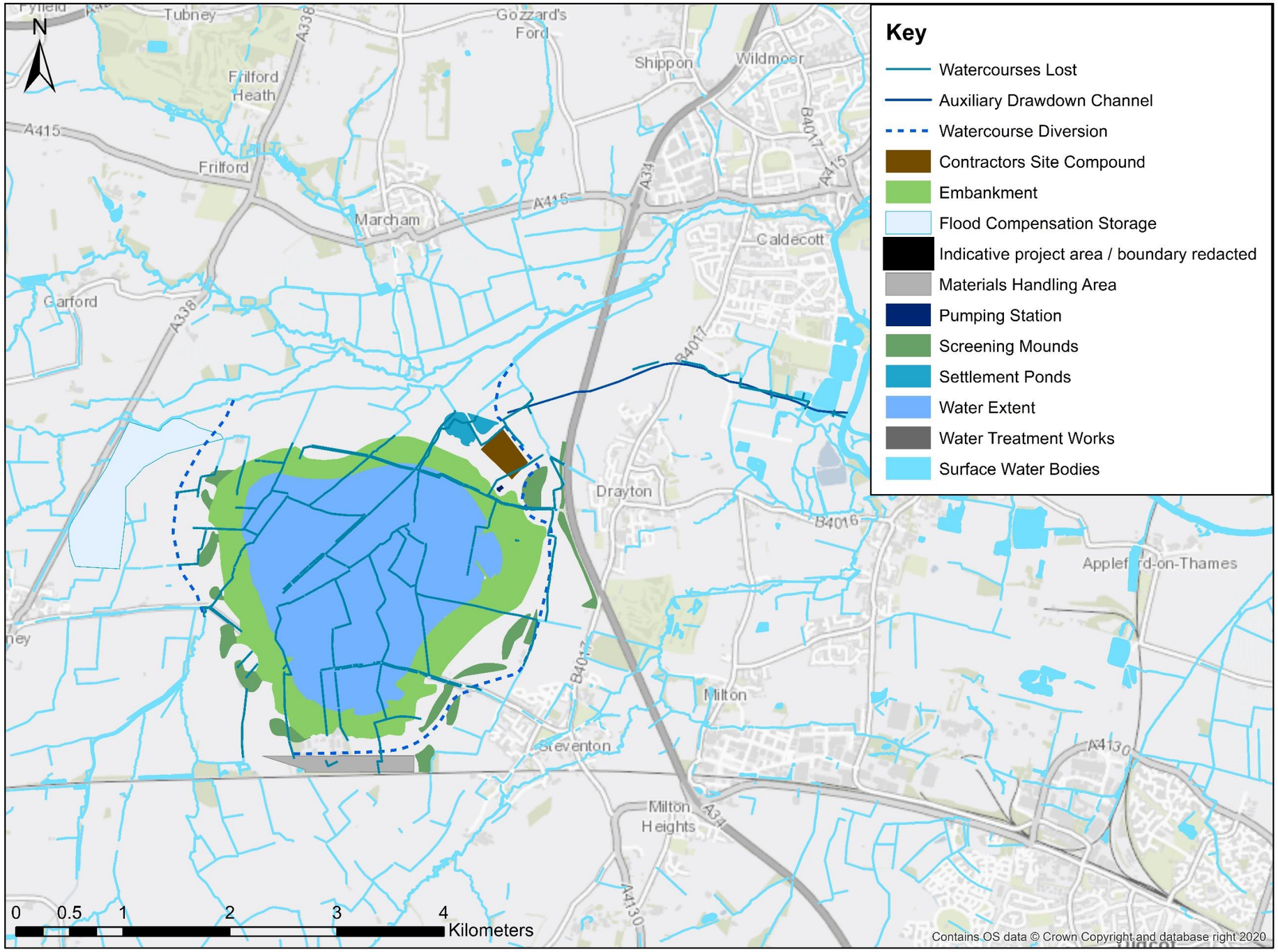

Figure 4-2 – Watercourses potentially lost and created for the 75Mm³ reservoir option

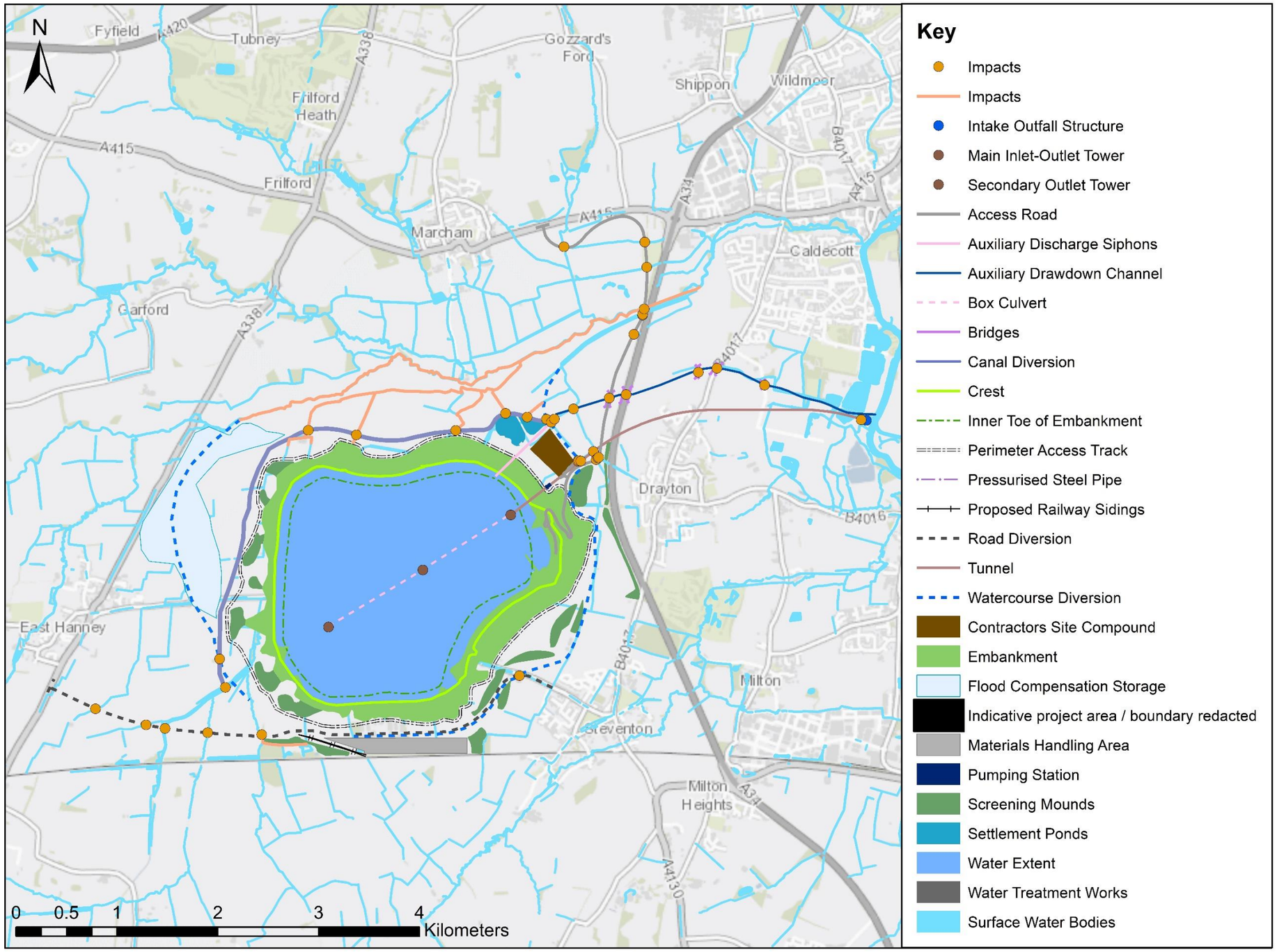

Figure 4-3 - Locations where there is the potential for impacts from the 100Mm³ reservoir option

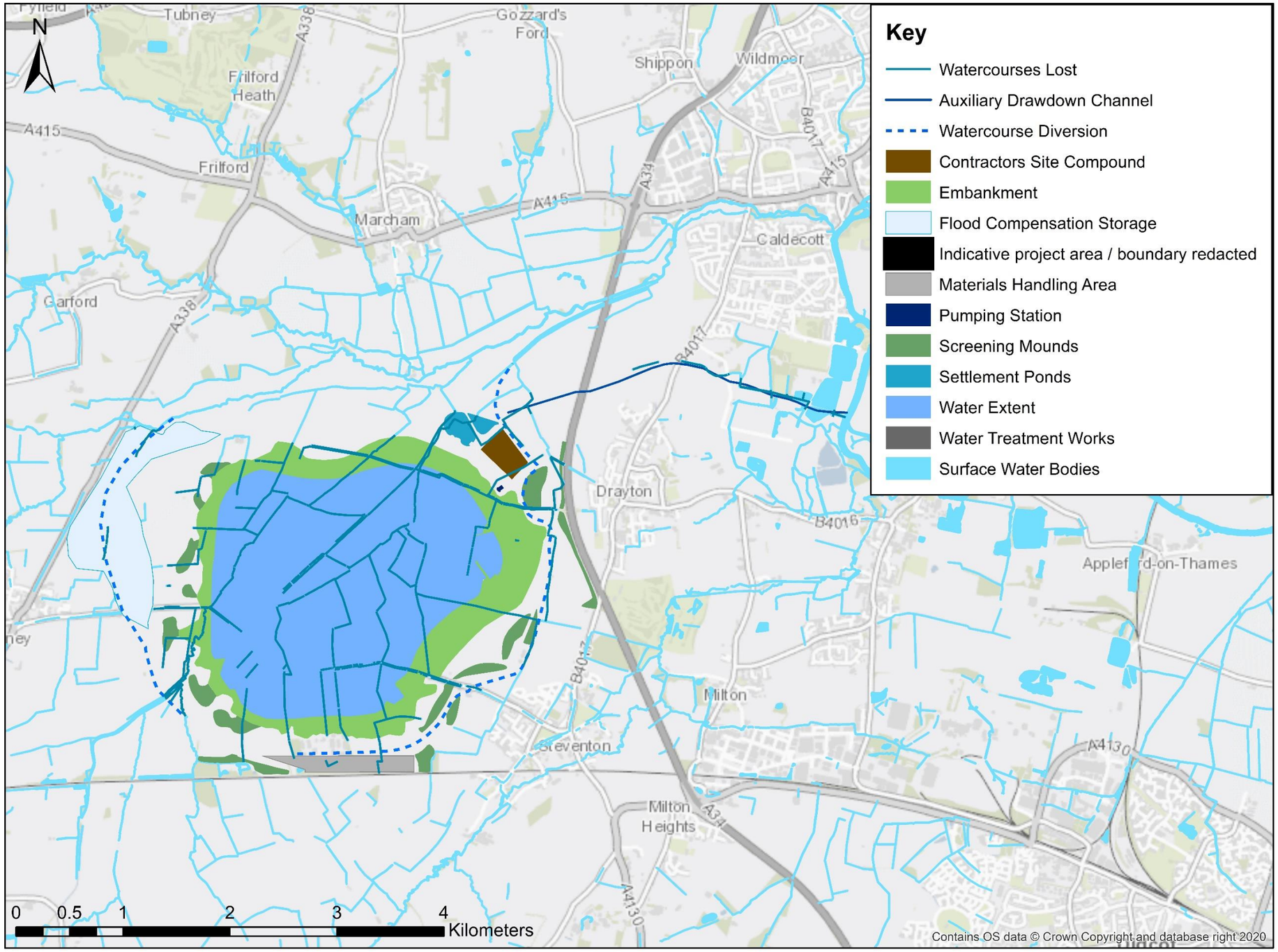

Figure 4-4 - Watercourses potentially lost and created for the 100Mm³ reservoir option

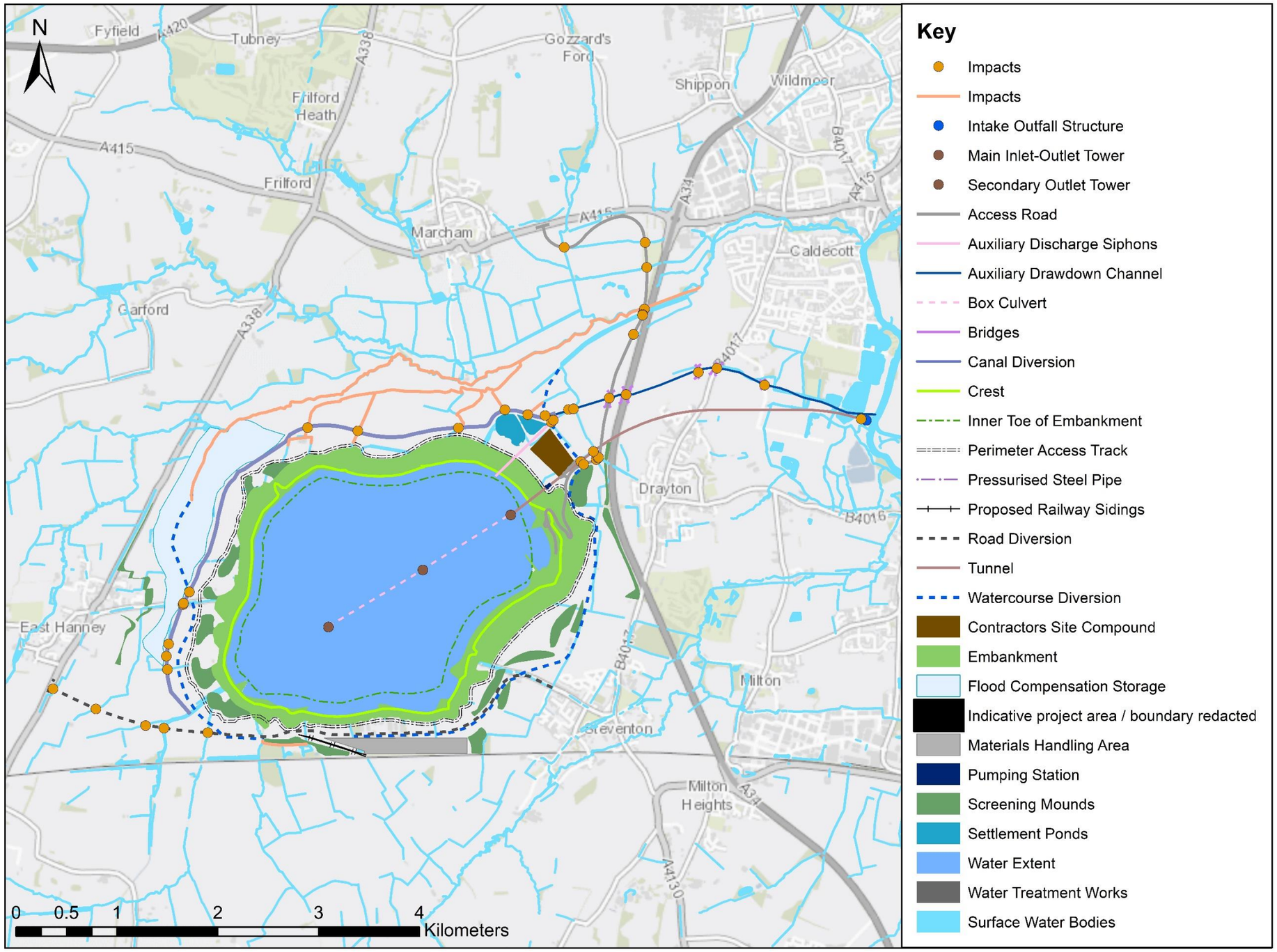

Figure 4-5 - Locations where there is the potential for impacts from the 125Mm³ reservoir option

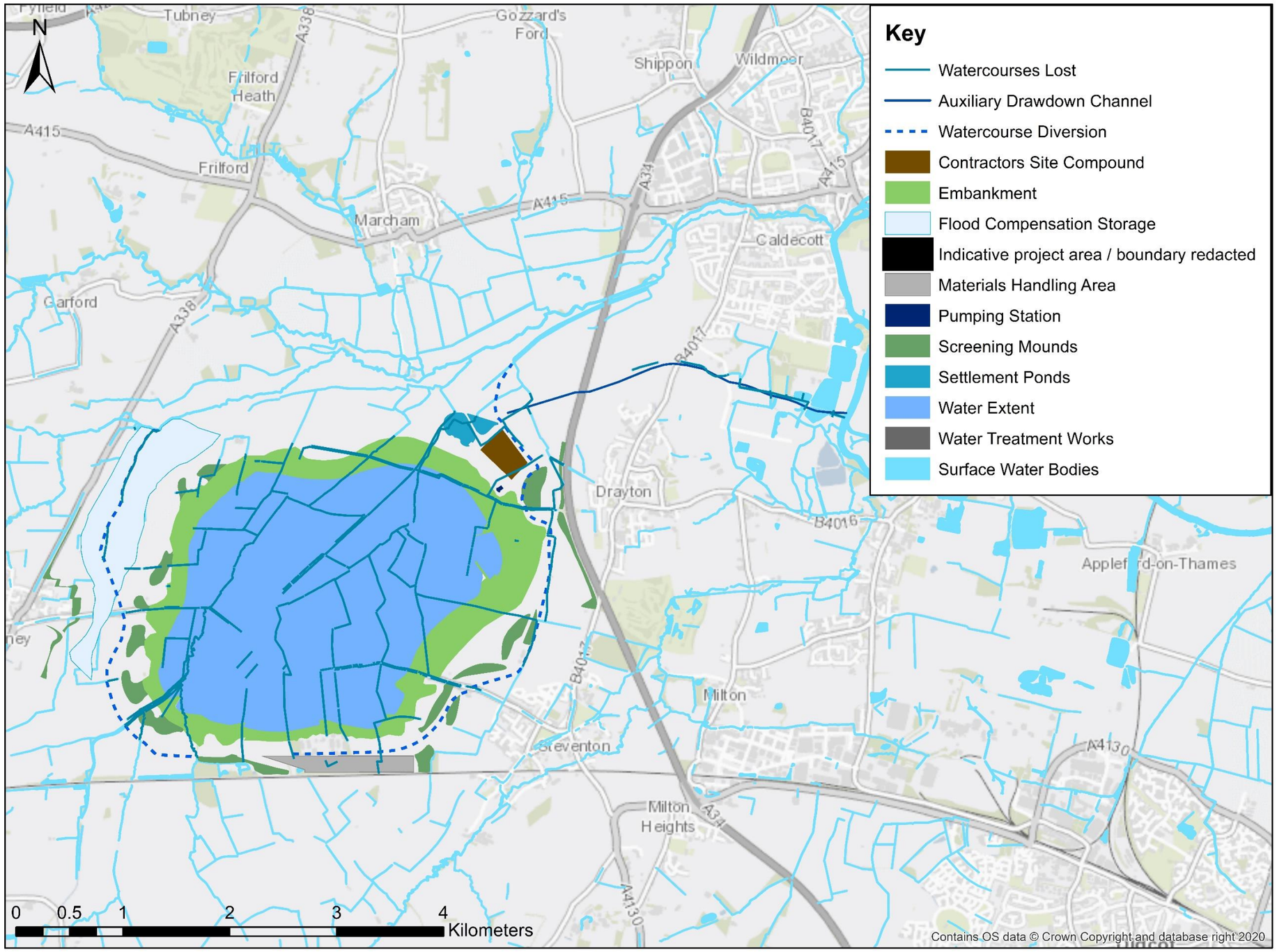

Figure 4-6 – Watercourses potentially lost and created for the 125Mm³ reservoir option

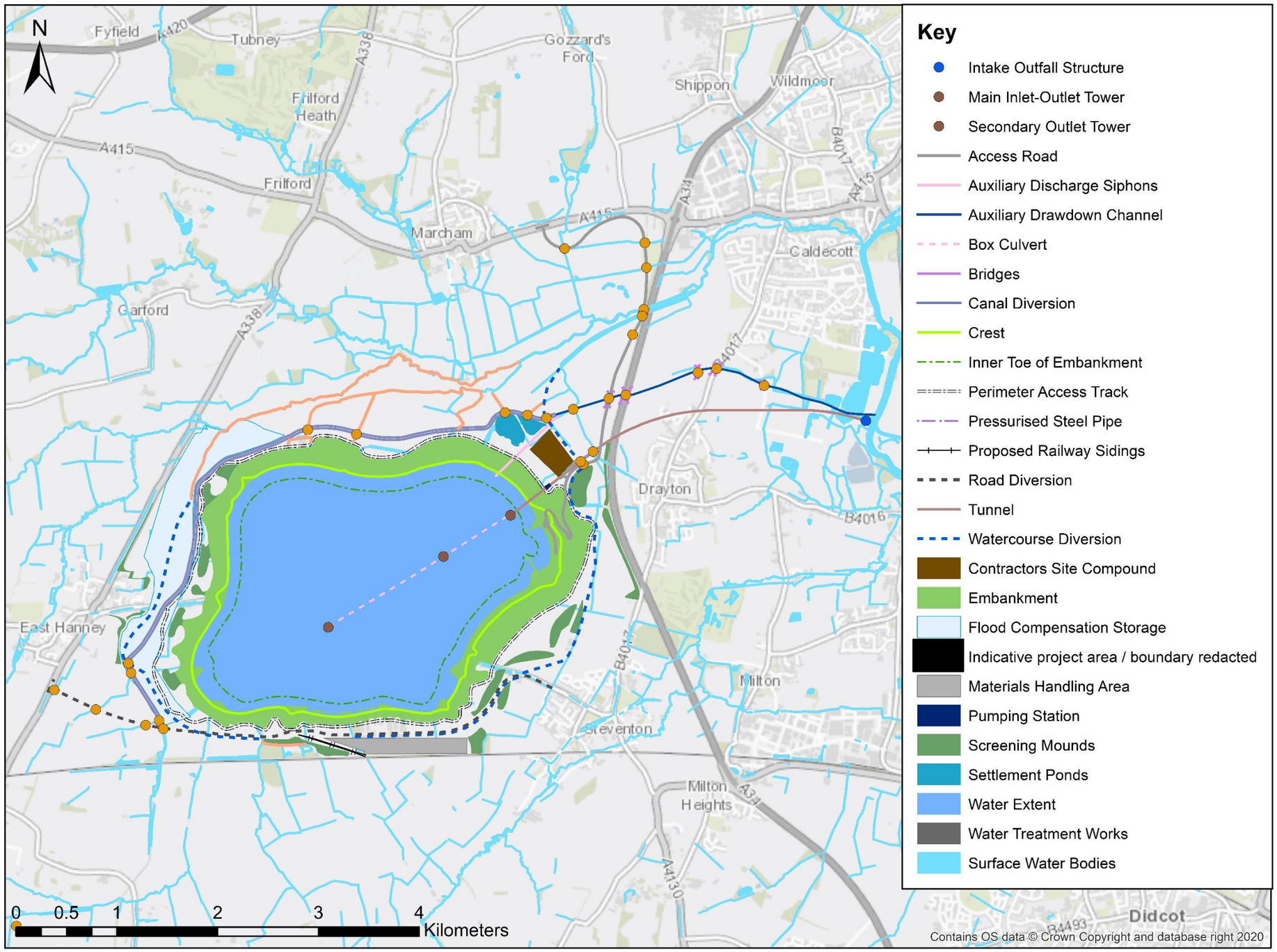

Figure 4-7 – Locations where there is the potential for impacts from the 150Mm³ reservoir option

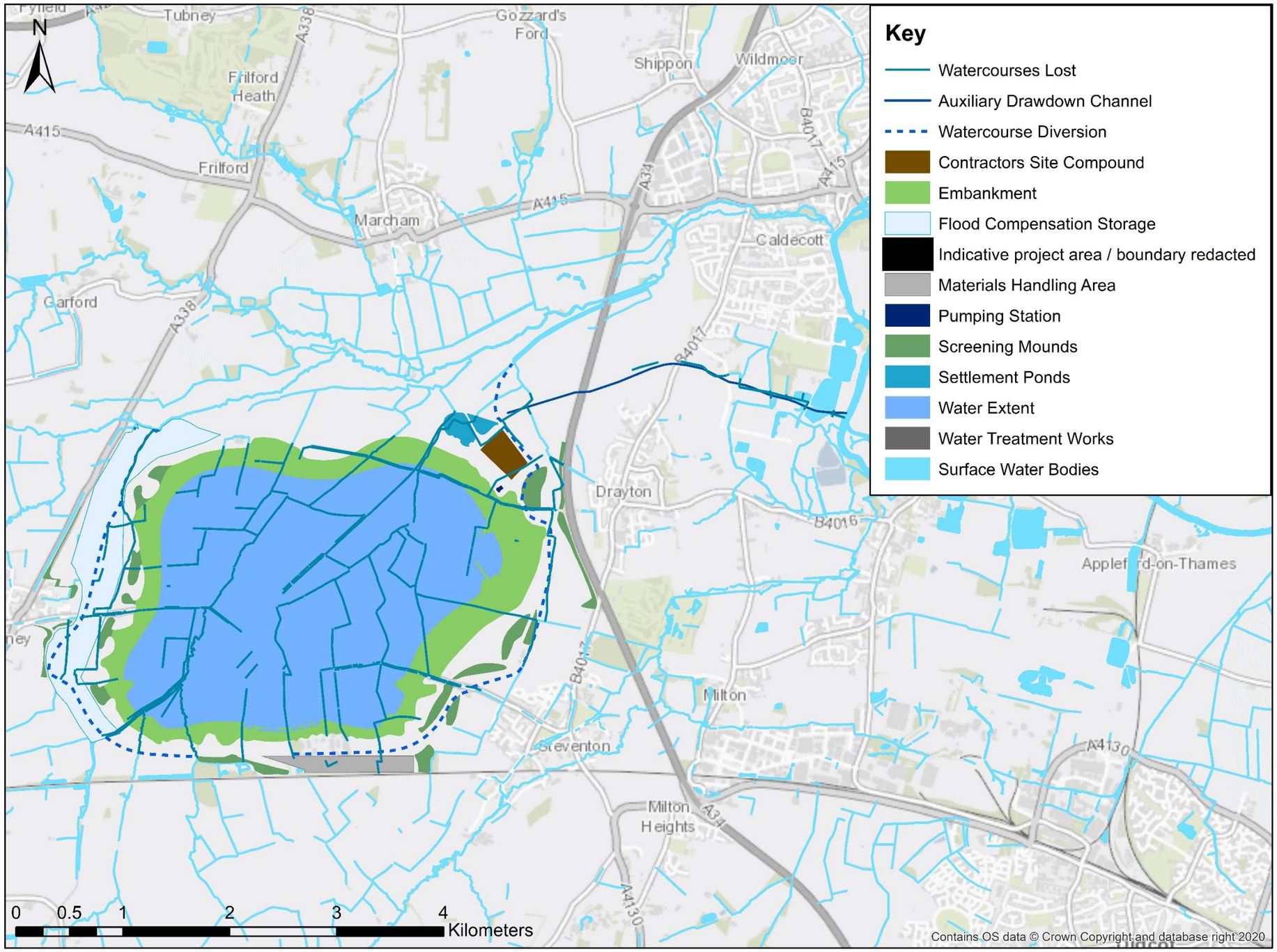

Figure 4-8 – Watercourses potentially lost and created for the 150Mm³ reservoir option

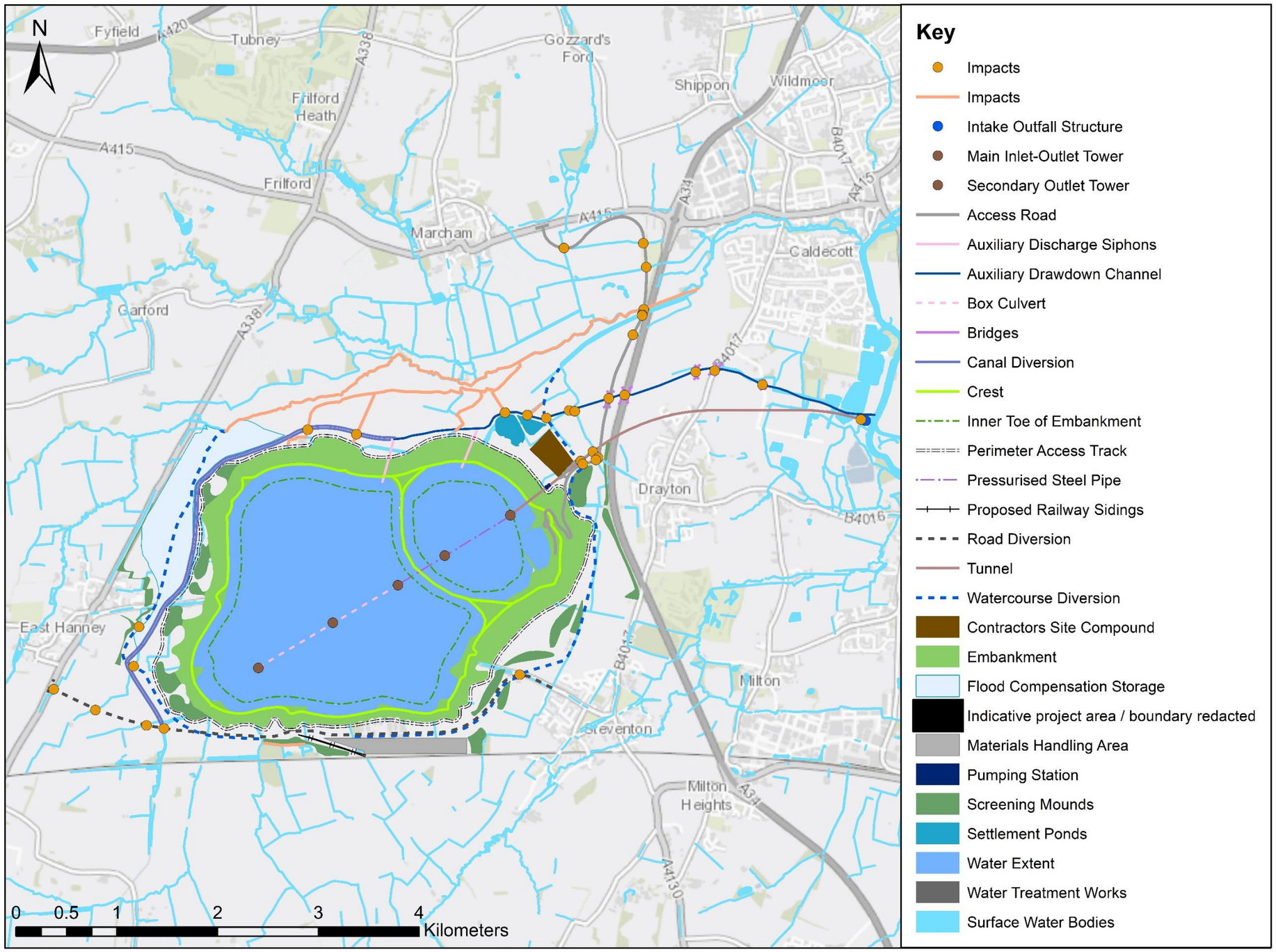

Figure 4-9 – Locations where there is the potential for impacts from the 100+30Mm³ (2-phase) reservoir option

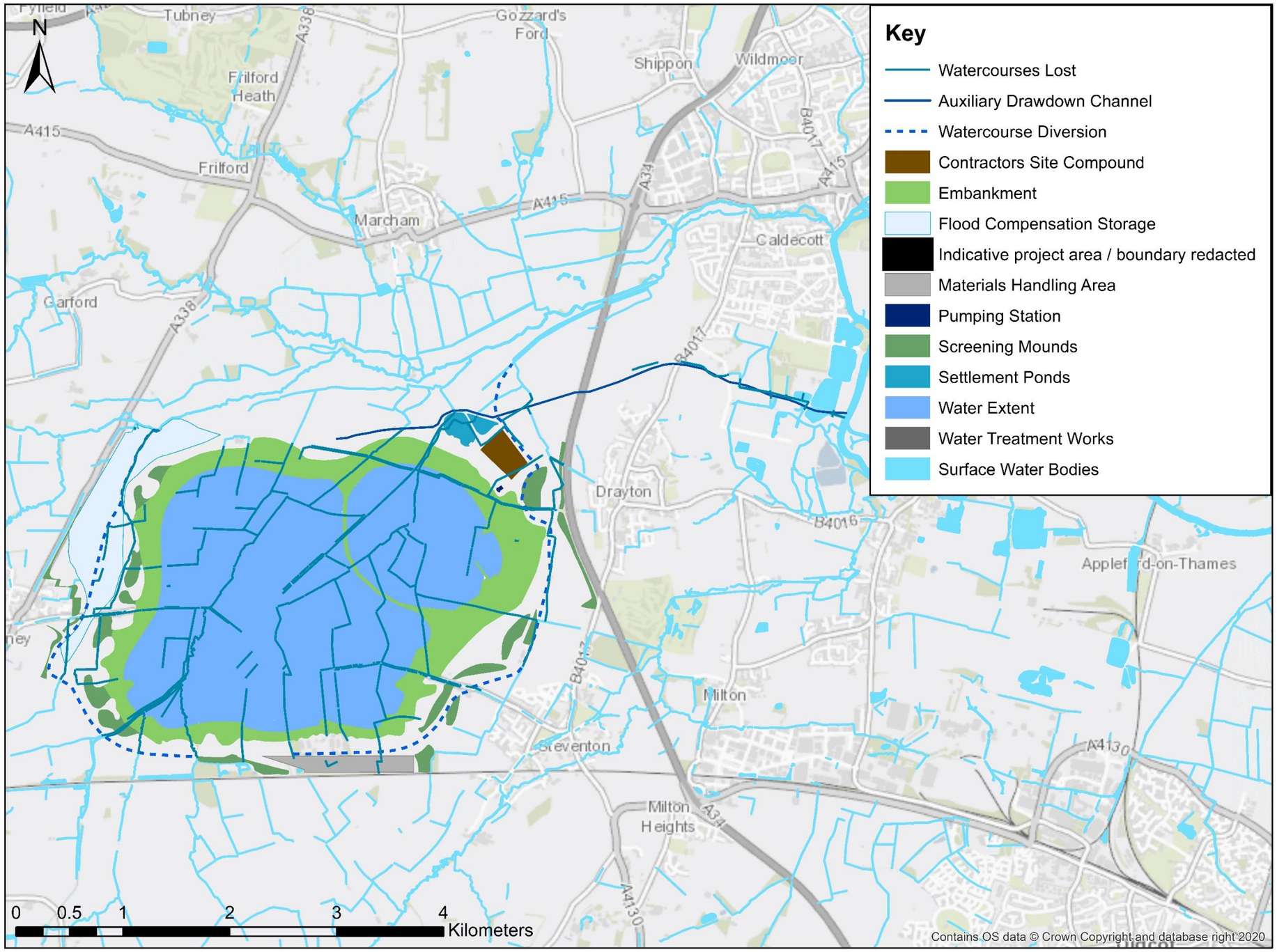

Figure 4-10 – Watercourses potentially lost and created for the 100+30Mm³ (2-phase) reservoir option

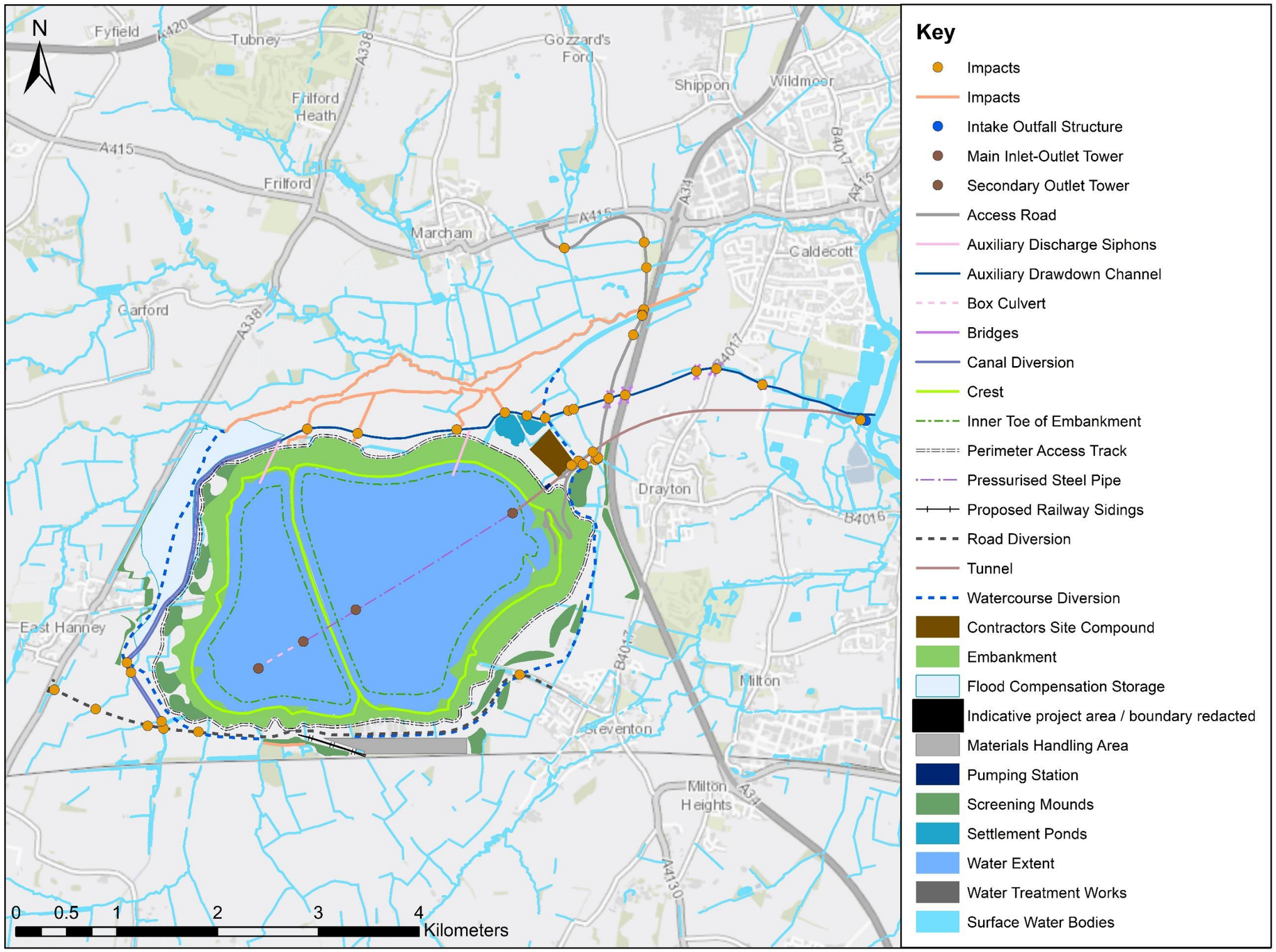

Figure 4-11 - Locations where there is the potential for impacts from the 80+42Mm³ (2-phase) reservoir option

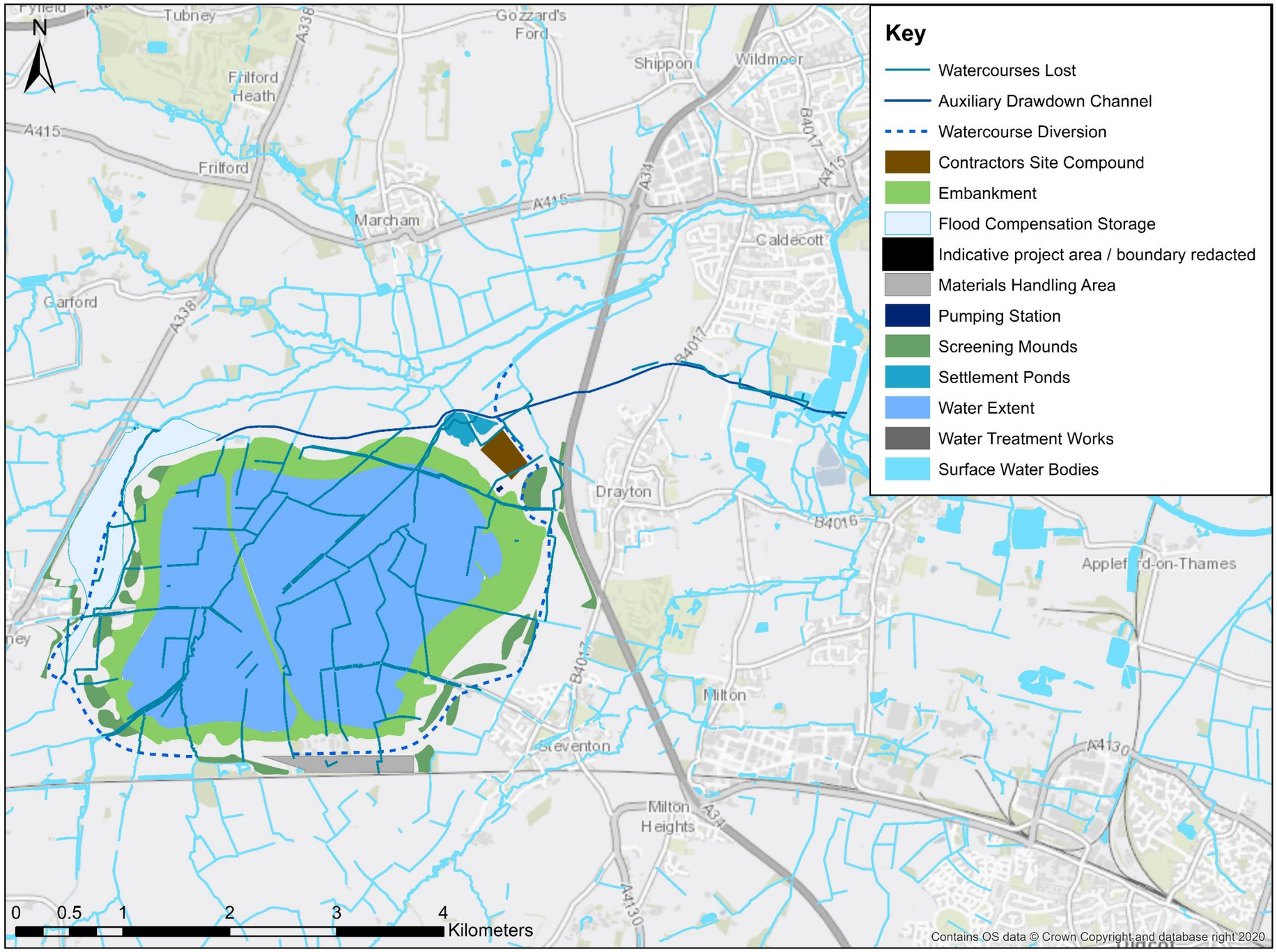

Figure 4-12 – Watercourses potentially lost and created for the 80+42Mm³ (2-phase) reservoir option

Table 4-1 - Potential implications for the WFD water bodies of the scheme elements

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
Cow Common Brook and Portobello ditch	Construction/repair of new tunnels and conduits (Construction) Construction and presence of below ground structures (shaft/retaining wall) with associated dewatering, with no sensitive groundwater feature within 500m (Construction and Operation)	Tunnel	All	The proposed tunnel route crosses the Main River Mere Dyke and the Eastern Watercourse Diversion in all six options.	There are two potential options of method used for a tunnel crossing a watercourse. As it is not yet known what method is most likely, both are considered. One option is to bore under the channel. This should have minimal impact on the watercourse but might not always be feasible. This is the current preferred option. The other option is to cut a section into the channel, lay the tunnel down and then reinstate the channel on top. This will have temporary impacts but should not have permanent impacts, providing the channel is reinstated to a good enough standard, either like for like or creating an improvement in morphology and habitat.
	Construction of new culvert (Construction) Presence of new culvert mid or lower catchment and Presence of new culvert, in headwaters or on drainage ditches (Operation)	Road Diversion	All	For all options the proposed road diversion crosses watercourses. The 75Mm³ and 100Mm³ options will cross six watercourses including Cow Common Brook which is both a Main River and a WFD water body; Portobello Ditch which is a main river; the Eastern Watercourse Diversion; and three ordinary watercourses. The 125Mm³ option will cross two ordinary watercourses, Portobello Ditch (a Main River) and both the Eastern and Western Watercourse Diversions. The 150Mm³, 80+42Mm³ and 30+100Mm³ options will cross two ordinary watercourses and both the Eastern and Western Watercourse Diversions.	The potential impact of the crossings will depend on the type of structure used. A single, clear span bridge will have a lower impact than a box culvert. A Main River and/or WFD assessed watercourse would require a single-span bridge. A box culvert may be considered on smaller watercourses and ditches if the culvert is appropriately designed and mitigated. A box culvert would: disrupt natural hydraulic and sediment transport processes; act as a barrier to the movement of fish and other wildlife; damage the bed and banks of the watercourse during construction; and reduce the extent of the riparian zone. A clear span bridge would: shade the channel and riparian zone reducing photosynthetic ability. Depending on the restriction of each situation it can also impact on the morphology and hydrological regime, though less than with a culvert.
	Construction of new inverted siphon or drop inlet culvert (Construction) Presence of new inverted siphon or drop inlet culvert (Operation) Trenching and laying of pipelines within the interfluves of a catchment (no watercourse crossings) (Construction) Trenching and laying of pipelines involving watercourse crossings (Construction) Maintenance of pipelines (Operation) Draining of pipelines for maintenance (Operation)	Auxiliary Discharge Siphons	75Mm³ 100Mm³ 125Mm³ 150Mm³	The Auxiliary Discharge Siphon crosses a watercourse in the 75Mm³, 100Mm³, 125Mm³ and 150Mm³ options.	There are two potential options of method used for an auxiliary discharge siphon crossing a watercourse. As it is not yet known what method is most likely, both are considered. One option is to bore under the channel. This should have minimal impact on the watercourse but might not always be feasible. The other option is to cut a section into the channel, lay the pipe down and then reinstate the channel on top. This will have temporary impacts but should not have permanent impacts, providing the channel is reinstated to a good enough standard, either like for like or creating an improvement in morphology and habitat.
	Construction of new culvert (Construction) Presence of new culvert mid or lower catchment (Operation)[2]	Canal diversion	All	The proposed canal diversion route has a varying number of crossings for the different options. All but the 80+42Mm³ and the 30+100Mm³ options include a crossing over Cow Common Brook which is a Main River and WFD water	As the canal diversion shown in the design is only proposed to be left for potential future development, there will not be any direct impacts from leaving the space available. Future design of the canal would need to consider WFD impacts.

[2] This category has been used in this case to cover the crossing of two watercourses.

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
				body. All but the 80+42Mm³ option cross the Main River Landmead Ditch.	
	Construction of new culvert (Construction) Presence of new culvert mid or lower catchment (Operation)[3]	Auxiliary Drawdown Channel	All	The proposed route for the Auxiliary Drawdown Channel on single reservoir options include up to two crossings, one over Mere Dyke a Main River. The proposed route for the double reservoir options includes up to eight crossings including the Eastern Watercourse Diversion, with the 80+42Mm³ route crossing three Main Rivers (Landmead Ditch, Cow Common Brook and Mere Dyke) and the 100+30Mm³ route including two Main River crossings (Cow Common Brook and Mere Dyke).	There are a few methods that could be used in this situation, although ideally this should be avoided as it is not easy for two watercourses to cross. One option would be to divert the watercourses into the Auxiliary Drawdown Channel or the Eastern Watercourse Diversion, whichever is more appropriate. However, this would cause a loss of watercourse, reducing flow into downstream channels, a loss of riparian zone, planform, floodplain, sediment continuity and aquatic habitat for macrophytes, phytobenthos, macroinvertebrates and fish leading to loss of abundance and species. The loss of flow to downstream water bodies would be particularly large if the Mere Dyke watercourse is diverted into the Auxiliary Drawdown Channel. The other option would be for a box culvert or aqueduct for one of the watercourses. However, a box culvert would: disrupt natural hydraulic and sediment transport processes; act as a barrier to the movement of fish and other wildlife; damage the bed and banks of the watercourse during construction; and reduce the extent of the riparian zone. An aqueduct would be an artificial channel with limited habitat and no morphological diversity. It also may not always be feasible.
	Construction of new culvert (Construction) Presence of new culvert mid or lower catchment and Presence of new culvert, in headwaters or on drainage ditches (Operation)	Access Road	All	The proposed access road route crosses seven watercourses. All routes cross the Main River Mere Dyke twice, the Eastern Watercourse Diversion and the Auxiliary Drawdown Channel.	The potential impact of the crossings will depend on the type of structure used. A single-span bridge will have a lower impact than a box culvert. A Main River and/or WFD assessed watercourse would require a single-span bridge. A box culvert may be considered on smaller watercourses and ditches if the culvert is appropriately designed and mitigated. A box culvert would: disrupt natural hydraulic and sediment transport processes; act as a barrier to the movement of fish and other wildlife; damage the bed and banks of the watercourse during construction; and reduce the extent of the riparian zone. A clear span bridge would: shade the channel and riparian zone reducing photosynthetic ability. Depending on the restriction of each situation it can also impact on the morphology and hydrological regime, though less than with a culvert.
	Construction of new reservoir (in line/next to watercourse - within 500m) (Construction) Presence of new reservoir or modified existing storage reservoir (Operation) Construction of reservoir (set back from watercourse) (Construction) [4] Creation of significant areas of riparian habitats (Construction) Minor habitat creation (Construction) Channel realignment with natural bed substrate and good riparian connections (Operation)	Reservoir footprint	All	75Mm³ Option: Loss of approximately 22km of watercourse. 100+30Mm³ Option: Loss of approximately 34km of watercourse. * 125Mm³ Option: Loss of approximately 33km of watercourse. * 150Mm³ Option: Loss of approximately 35km of watercourse. * 80+42Mm³ Option: Loss of approximately 34km of watercourse. * 100Mm³ Option: Loss of approximately 31km of watercourse. *	Potential loss of channel which would cause loss of: • riparian zone; • planform; • floodplain; • sediment continuity; • aquatic habitat for macrophytes, phytobenthos, macroinvertebrates and fish leading to a loss of abundance of species; and • reduced flow in remaining sections of channel downstream due to loss in upstream watercourse. As a large section of the main Cow Common Brook will be diverted into the Western Watercourse Diversion there is the opportunity to create a new channel that presents a morphological improvement to the baseline over its realigned length.

[3] This category has been used in this case to cover the crossing of two watercourses.
[4] This WRSE category has been used to represent loss of length or area of water bodies in absence of the right category being available. This is the case each time it is used in this assessment. Therefore, the actual impact we wish to describe is NOT set back from watercourse but the watercourse or water body itself.

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
				*some of the lost watercourse may also be in Childrey Brook and Norbrook at Common Barn water body. The total length of watercourse lost for all features across all waterbodies for each option is shown in Table 4-2.	
	Transfer of water via a river, canal or aqueduct (Operation) Creation of significant areas of riparian habitats (Construction) Minor habitat creation (Construction) Channel realignment with natural bed substrate and good riparian connections (Operation)		All	Reduction in flow in the Main River Cow Common Brook and numerous ditches downstream of the proposed reservoir due to much of the water body catchment being within the reservoir footprint.	The current channel has a capacity greater than would be required with this reduction in flow, and so morphological adjustments may be expected. The likely impact would be that the water levels would be shallower resulting in the temperature of the water being likely to increase at a faster rate. The water would also be less diluted, so water quality is likely to be worse. All these impacts are likely to have a detrimental impact on the ecology of the channel. It is also less likely that the watercourse will flow onto the floodplain as often reducing the scale and diversity of any floodplain habitat. There is the opportunity to create a new channel that presents a morphological improvement to the baseline over its realigned length.
	Construction of reservoir (set back from watercourse) (Construction) Minor habitat creation (Construction)	Settlement Ponds	All	Loss of approximately 1.2km of watercourse for all options.	Reduced flow in downstream channels, loss of riparian zone, planform, floodplain, sediment continuity and aquatic habitat for macrophytes, phytobenthos, macroinvertebrates and fish leading to loss of abundance and species. The settlement ponds will also provide some new still water habitat which will encourage new species to the area, different to those in the nearby watercourses.
	Construction of reservoir (set back from watercourse) (Construction)	Contractors site compound	All	Loss of approximately 0.8km of watercourse for all options.	Potential loss of channel which would cause loss of: • riparian zone; • planform; • floodplain; • sediment continuity; • aquatic habitat for macrophytes, phytobenthos, macroinvertebrates and fish leading to a loss of abundance of species; and • reduced flow in remaining sections of channel downstream due to loss in upstream watercourse.
	Construction or modification of a new pumping station and/or intake from raw water (river or coastal waters)	Pumping station	All	New pumping station	No permanent effect anticipated.
	Construction of reservoir (set back from watercourse) (Construction)	Eastern and Western Watercourse Diversions	All	Loss of approximately 3km of watercourse for all options.	Potential loss of channel which would cause loss of: • riparian zone; • planform; • floodplain; • sediment continuity; • aquatic habitat for macrophytes, phytobenthos, macroinvertebrates and fish leading to a loss of abundance of species; and • reduced flow in remaining sections of channel downstream due to loss in upstream watercourse.
Ock and Tributaries (Land Brook confluence to Thames)	Construction of new culvert (Construction) Presence of new culvert mid or lower catchment and Presence of new culvert, in headwaters or on drainage ditches (Operation)	Access Road	All	All options include a crossing of the River Ock, which is a Main River and ditch MD7.	The potential impact of the crossings will depend on the type of structure used. A single-span bridge will have a lower impact than a box culvert. A Main River and/or WFD assessed watercourse would require a single-span bridge. A box culvert may be considered on smaller watercourses and ditches if the culvert is appropriately designed and mitigated.

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
					A box culvert would: disrupt natural hydraulic and sediment transport processes; act as a barrier to the movement of fish and other wildlife; damage the bed and banks of the watercourse during construction; and reduce the extent of the riparian zone. A clear span bridge would: shade the channel and riparian zone reducing photosynthetic ability. Depending on the restriction of each situation it can also impact on the morphology and hydrological regime, though less than with a culvert.
	Transfer of water via a river, canal or aqueduct (Operation)	Western Watercourse Diversion	All	There will be an increase in flow in a short section of the River Ock from the point where it is joined by the Childrey Brook due to extra water from the Western Watercourse Diversion, to its confluence with Cow Common Brook.	The current channel has a capacity lower than would be required with this increase in flow. This means that the water is likely to be deeper, even during lower flows, so there would be a reduced drawdown on marginal habitats potentially reducing the diversity of ecology in the channel or increasing channel resilience to low flows. It is also more likely that the watercourse will flow onto the floodplain more often and for longer periods of time. This could have a positive or negative effect, depending on the floodplain habitat already available.
	Transfer of water via a river, canal or aqueduct (Operation)	Reservoir Footprint	All	There will be reduced flow in the River Ock downstream of the confluence with the Cow Common Brook due to a reduction in flow in the Cow Common Brook because much of the catchment is within the reservoir footprint.	The current channel has a capacity greater than could be required with this reduction in flow. The water in the channel is likely to be shallower meaning the temperature of the water would increase faster. The water would also be less diluted, so water quality is likely to be worse. All this is likely to have a detrimental impact on the ecology of the channel. It is also less likely that the watercourse will flow onto the floodplain as often reducing the scale and diversity of any floodplain habitat. The level of this impact is currently uncertain, it would need to be looked at in more detail and quantified as part of the Gate 2 process.
Ginge Brook and Mill Brook	Construction of new reservoir (in line/next to watercourse - within 500m)	Proposed railway sidings and materials handling area	All	Potential minor loss of headwater channels for all options.	At this stage, it is unclear whether there are any headwater channels upstream of the railway line due to the lack of a baseline survey. However, at this point it is assumed that there is (from a remote review of the watercourse network) and therefore there *could* be a loss of headwater channels. This view needs validating as part of Gate 2. Potential loss of channel could cause loss of: • riparian zone; • planform; • floodplain; • sediment continuity; • aquatic habitat for macrophytes, phytobenthos, macroinvertebrates and fish leading to a loss of abundance of species; and • reduced flow in remaining sections of channel downstream due to loss in upstream watercourse.
Sandford Brook (Source to Ock)	Construction of new culvert (Construction) Presence of new culvert mid or lower catchment and Presence of new culvert, in headwaters or on drainage ditches (Operation)	Access road	All	The proposed access road route for all options crosses the watercourse Sandford Brook (a Main River) twice and ditch SB1.	The potential impact of the crossings will depend on the type of structure used. A single-span bridge will have a lower impact than a box culvert. A Main River and/or WFD assessed watercourse would require a single-span bridge. A box Mill may be considered on smaller watercourses and ditches if the culvert is appropriately designed and mitigated. A box culvert would: disrupt natural hydraulic and sediment transport processes; act as a barrier to the movement of fish and other wildlife; damage the bed and banks of the watercourse during construction; and reduce the extent of the riparian zone.

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
					A clear span bridge would: shade the channel and riparian zone reducing photosynthetic ability. Depending on the restriction of each situation it can also impact on the morphology and hydrological regime, though less than with a culvert.
Thames (Evenlode to Thame)	Construction/repair of new tunnels and conduits (Construction) Construction and presence of below ground structures (shaft/retaining wall) with associated dewatering, with no sensitive groundwater feature within 500m (Construction and Operation)	Tunnel	All	The proposed tunnel crosses the Oday Ditches under all options.	There are two potential options of method used for a tunnel crossing a watercourse. As it is not yet known what method is most likely, both are considered. One option is to bore under the channel. This should have minimal impact on the watercourse but might not always be feasible. The other option is to cut a section into the channel, lay the tunnel down and then reinstate the channel on top. This will have temporary impacts but should not have permanent impacts, providing the channel is reinstated to a good enough standard, either like for like or creating an improvement in morphology and habitat.
	Construction of reservoir (set back from watercourse) (Construction) Creation of significant areas of riparian habitats (Construction) Minor habitat creation (Construction) Channel realignment with artificial banks/base	Auxiliary Drawdown Channel	All	Loss of approximately 2km of watercourse for all options.	The small watercourses will be lost at this location, reduced flow into any remaining downstream channels. The primary impact will be the loss of riparian zone, planform, floodplain, sediment continuity and aquatic habitat for macrophytes, phytobenthos, macroinvertebrates and fish leading to loss of abundance and species. The construction of the new Auxiliary Drawdown Channel gives the opportunity to create a new channel with the creation of some still water[5] and riparian habitat. However, due to the use of this channel for navigation, with locks to be added, some of the bank and bed may be artificial.
	Construction of a new outfall structure to a watercourse, coastal waters, transitional waters or reservoir (Construction) Maintenance and use of river, coastal or transitional water outfall (Operation) Construction or modification of a new pumping station and/or intake from raw water (river or coastal waters) (Construction) Maintenance and use of river intakes (Operation) Trenching and laying of pipelines within the interfluves of a catchment (no watercourse crossings) (Construction) Maintenance of pipelines (Operation) Draining of pipelines for maintenance (Operation)	Intake and outfall structure	All	New intake and outfall structure probably on the bank of the River Thames. Exact details of structure unknown. May require some bank protection.	New structure on the bank of the River Thames would result in the loss of some riparian habitat and potentially marginal habitat. If bank protection were required there would be an impact on the geomorphology of the channel.
	High volume discharge of water with a quality element of the same WFD status as the receiving water body (Operation) New or increased surface water abstraction (Operation)	Reservoir water intake and outfall	All	Change in volumes of water for all options. Water taken from river during higher flows to fill reservoir and put into the Thames during lower flows.	This may reduce the extremes of water flow and levels in the Thames. It could have an impact on marginal zones and floodplain habitat as it could reduce the regularity and longevity of habitats being exposed and inundated respectively. This may reduce the biodiversity of the marginal, riparian and floodplain habitats as well as having impacts to fish habitat and migration. There is some potential for benefits during low flows as it could reduce the vulnerability of habitats to low flow conditions. The discharges could also impact water quality of the receiving

[5] It is assumed at this stage that the Auxiliary Drawdown Channel will be a non-flowing water body which is in continuity with the River Thames. It would form part of the Berks and Wilts Canal if this is pursued at a later stage.

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
	Transfer of water via a river, canal or aqueduct (Operation)				water body and this would be assessed further in Gate 2 as part of the 1D hydrodynamic model. At this stage it is not certain what the level of impact would be, both positive and negative, this is being investigated and would be clearer at later stages of the proposed scheme.
Childrey Brook and Norbrook at Common Barn	Construction of new culvert (Construction) Presence of new culvert mid or lower catchment (Operation)[6]	Canal diversion	125Mm³ 150Mm³ 80+42Mm³ 100+30Mm³	Under the 80+42Mm³, 100+30Mm³ and 150Mm³ options, the proposed canal diversion crossed the Main River Hanney Ditch. HD1 is crossed by the canal diversion in the 125Mm³ option.	As the canal shown in the design is only proposed to be left for potential future development, there will not be any direct impacts from leaving the space available. Future designers of the canal would need to consider the impact would likely be that the majority of the crossings of watercourses will result in the loss of upstream channel. This would reduce flow into downstream channels, cause a loss of riparian zone, planform, floodplain, sediment continuity and aquatic habitat for macrophytes, phytobenthos, macroinvertebrates and fish leading to loss of abundance and species. However, they may use some other option such as a culvert or an aqueduct. A box culvert would: disrupt natural hydraulic and sediment transport processes; act as a barrier to the movement of fish and other wildlife; damage the bed and banks of the watercourse during construction; and reduce the extent of the riparian zone. An aqueduct would be an artificial channel with limited habitat and no morphological diversity. It may not always be feasible either.
	Construction of new reservoir (in line/next to watercourse - within 500m) Presence of new reservoir or modified existing storage reservoir (Operation) Construction of reservoir (set back from watercourse) (Construction) Creation of significant areas of riparian habitats (Construction) Minor habitat creation (Construction) Channel realignment with natural bed substrate and good riparian connections (Operation)	Reservoir footprint	125Mm³ 150Mm³ 80+42Mm³ 100+30Mm³	Loss of watercourse in all but 100Mm³ and 75Mm³ options.	Potential loss of channel which would cause loss of: • riparian zone; • planform; • floodplain; • sediment continuity; • aquatic habitat for macrophytes, phytobenthos, macroinvertebrates and fish leading to a loss of abundance of species; and • reduced flow in remaining sections of channel downstream due to loss in upstream watercourse. As a large section of watercourse will be diverted in the Western Watercourse Diversion there is the presumption that this will be created using a naturalised channel design so that the new channel presents a morphological improvement to the baseline over its realigned length.
	Construction of new culvert (Construction) Presence of new culvert mid or lower catchment and Presence of new culvert, in headwaters or on drainage ditches (Operation)	Road Diversion	All	The proposed road diversion route crosses Hanney Ditch, an ordinary watercourse at this point, in all options.	The potential impact of the crossings will depend on the type of structure used. A single-span bridge will have a lower impact than a box culvert. A Main River and/or WFD assessed watercourse would require a single-span bridge. A box culvert may be considered on smaller watercourses and ditches if the culvert is appropriately designed and mitigated. There is general presumption against culverts from a WFD perspective. A box culvert could: disrupt natural hydraulic and sediment transport processes; act as a barrier to the movement of fish and other wildlife; damage the bed and banks of the watercourse during construction; and reduce the extent of the riparian zone. A clear span bridge could: shade the channel and riparian zone reducing photosynthetic ability. Depending on the restriction of each situation it can also impact on the morphology and hydrological regime, though less than with a culvert.

[6] This category has been used in this case to cover the crossing of two watercourses.

WFD water body	WRSE element	Scheme element	Reservoir options impacted	Description	Potential Impact
	Construction of reservoir (set back from watercourse) (Construction)	Western Watercourse Diversion	All	Loss of watercourse for all options.	Potential loss of channel which would cause loss of: • riparian zone; • planform; • floodplain; • sediment continuity; • aquatic habitat for macrophytes, phytobenthos, macroinvertebrates and fish leading to a loss of abundance of species; and reduced flow in remaining sections of channel downstream due to loss in upstream watercourse.
	Transfer of water via a river, canal or aqueduct (Operation)	Western Watercourse Diversion	All	There will be an increase in flow in the Childrey Brook when it is joined by the Western Watercourse Diversion down to its confluence with the River Ock.	The current channel has a capacity lower than would be required with this increase in flow. This means that the water would be deeper, even during lower flows, so there would be a reduced drawdown on marginal habitats reducing the diversity of ecology in the channel. It is also more likely that the watercourse will flow onto the floodplain more often and for longer periods of time. This could have a positive or negative effect, depending on the floodplain habitat already available. Further work would need to be undertaken to establish the impacts of this increase in flow and mitigation provided to ensure that there was no increased flood risk to key assets.
Thames Wallingford to Caversham Thames (Reading to Cookham) Thames (Cookham to Egham) Thames (Egham to Teddington)	Transfer of water via a river, canal or aqueduct (Operation)	Reservoir water intake and outfall	All	Change in volumes of water for all options. Water taken from river during higher flows to fill reservoir and returned into the River Thames during lower flows.	This may reduce the extremes of water flow and levels in the Thames. It could have an impact on marginal zones and floodplain habitat as it could reduce the regularity and longevity of habitats being exposed and inundated respectively. This may reduce the biodiversity of the marginal, riparian and floodplain habitats as well as fish passage. There is some potential for benefits during low flows as it could reduce the vulnerability of habitats to low flow conditions. The discharges could also impact water quality of the receiving water body and this would be assessed further in Gate 2 as part of 1D hydrodynamic model. At this stage it is not certain what the level of impact would be, both positive and negative, this is being investigated and would be clearer at later stages of the proposed scheme. The impact is likely to reduce as you go further downstream. Thames Water (2007) assessed that the main zone of hydrological influence is the reach of the River Thames between the proposed SESRO intake/outfall structure and the confluence with the River Thame, which is covered in the WFD surface water body Thames (Evenlode to Thame).

Table 4-2 - Length of watercourse lost (total, Main River, Ordinary Watercourse and WFD watercourse) and gained per option across all WFD waterbodies

	75 Mm³	100 Mm³	125 Mm³	150 Mm³	100+30 Mm³	84+24 Mm³
Main River	4.5 km	5.4 km	6.9 km	8.3 km	8.4 km	8.4 km
Ordinary Watercourse	37.0 km	39.1 km	41.1 km	44.9 km	44.9 km	44.9 km
Total	**41.5 km**	**44.6 km**	**48.1 km**[7]	**53.2 km**	**53.3 km**	**53.3 km**
WFD Watercourse lost	3.6 km	3.8 km	4.4 km	4.5 km	4.6 km	4.6 km
Watercourse gained	11.3 km	12.2 km	12.9 km	13.3 km	15.0 km	16.1 km

Note: A WFD watercourse could be Main River or an Ordinary Watercourse

4.3. Temporary impacts

From a WFD compliance perspective, only permanent impacts are considered and mitigated against. As a result, construction impacts, as long as they are only temporary will not be considered to be causing any WFD compliance issues. To ensure that this happens it is assumed that as documented in the WRSE high level WFD screening assessment (WRSE WFD Assessment, 2020) that 'appropriate precautions will be taken when working in the channels of or adjacent to watercourses, providing new culverts and or extending culverts, if required, to appropriately manage flood risk and the potential for deposition of silt or release of other forms of suspended material or pollution within the water column.'

It assumed also that all measures will be in line with the requirements set out within the following Guidance for Pollution Prevention (GPP), Pollution Prevention Guidelines (PPGs) and CIRIA guidance. GPP5 for works and maintenance in or near water (which replaces PPG5 - works near or liable to affect watercourses) forms a key point of reference for the Project (NRW/NIEA/SEPA, 2018). Other GPP documents that should be sourced as good practice include: GPP1 (understanding your environmental responsibilities) (NRW/NIEA/SEPA, 2020); and GPP21 (pollution incident response planning) (NRW/NIEA/SEPA, 2017). In the absence of a complete set of new GPP documents the existing PPGs should also be used as a source of information on good practice e.g. PPG6 (working at construction and demolition sites) (EA/NIEA/SEPA, 2012) and PPG3 (use and design of oil separators in surface water drainage systems) (EA/NIEA/SEPA, 2006). Key CIRIA guidance to which the Project will adhere includes CIRIA C648 Control of water pollution from linear construction projects (CIRIA, 2006) and CIRIA Culvert Screen and outfall manual C786F (CIRIA, 2019).

4.4. Proposed scheme development

As discussed in the potential impact table (Table 4-1Table), the proposed scheme is likely to have an impact on the water environment and there are some changes that need to be made to the proposed scheme to reduce the impact and create an option that will function well for the water environment. This is likely to happen during work undertaken as part of Gate 2. Further assessment and validation of impacts will also happen in these later stages, when more detail is known.

This will involve ensuring that during the design of the Watercourse Diversions, channel improvements are considered, especially along the western diversion where it runs through the flood compensation storage area. There is potential at this location to improve on the current state of the Cow Common Brook by creating a more complex meandering planform, increasing the length of the channel, creating heterogeneity in the instream habitat, the riparian zone and the floodplain, increasing the habitat diversity of the water body. There is also great potential at this location to integrate the design of the Watercourse Diversions into a wider wetland habitat design. Any other places where a realignment or diversion is required should be designed under the same principles where possible.

[7] Due to rounding, the total length of watercourse lost shown in Table 4-2 is not equal to the sum of the Main River and Ordinary Watercourse lengths in the 125Mm³ option.

The scale of the movement and loss of watercourses required by the reservoir footprint and other associated works is dependent on the option (Table 4-2). As the size of the reservoir is decreased, there is a reduction in area to the west of the proposed scheme that is impacted. The 75Mm³ option impacts the fewest watercourses and least length of watercourse in the Cow Common Brook and Portobello Ditch and Childrey Brook and Norbrook at Common Barn WFD surface water bodies. As the size of the reservoir increases, the number and length of watercourses impacted increases, with the 150Mm³, 30+100Mm³ and 80+42Mm³ having the same size reservoir footprint and therefore approximately the same and largest impact on the watercourses on the western side of the scheme.

In the 80+42Mm³ and 100+30Mm³ option designs, there is a crossing of the Eastern Watercourse Diversion and Auxiliary Drawdown Channel. In practice, two open watercourses cannot cross without an aqueduct or culvert. During the design phase, if these options are chosen, it should be considered to change the route to remove the need for this crossing or appropriate infrastructure will need to be designed with the aim of ensuring the crossing has the lowest impact on the watercourses. An alternative approach is that the Eastern Watercourse Diversion can be channelled into the Auxiliary Drawdown Channel (to create a new water body which will flow more routinely and provide gains for BNG), but this needs further work as part of Gate 2.

4.5. WFD Level 1 Screening conclusions

In total ten WFD surface water bodies have the potential to be impacted by the construction and operation of all reservoir options (Table 4-3). Other WFD water bodies around these water bodies, including groundwater bodies underneath the site and transitional water bodies downstream of Teddington Weir, can be screened out at this stage (see further details in Section 3.1). The current proposals are at conceptual design and this initial screening assessment shows that all of the options have the potential to conflict with the objectives of WFD to varying degrees.

Table 4-3 – WFD water bodies screened into the next phase of the assessment

WFD water body	Option(s) where water body is screened in as part of the ACWG Level 1 Methodology					
	75Mm³	100Mm³	125Mm³	150Mm³	30+100Mm³	80+42Mm³
River Ock						
Cow Common Brook and Portobello Ditch	✓	✓	✓	✓	✓	✓
Ock and tributaries (Land Brook confluence to Thames)	✓	✓	✓	✓	✓	✓
Ginge Brook and Mill Brook	✓	✓	✓	✓	✓	✓
Sandford Brook (source to Ock)	✓	✓	✓	✓	✓	✓
Childrey Brook and Norbrook at Common Barn	✓	✓	✓	✓	✓	✓
River Thames						
Thames (Evenlode to Thame)	✓	✓	✓	✓	✓	✓
Thames Wallingford to Caversham	☒	☒	☒	☒	☒	☒
Thames (Reading to Cookham)	☒	☒	☒	☒	☒	☒
Thames (Cookham to Egham)	☒	☒	☒	☒	☒	☒
Thames (Egham to Teddington)	☒	☒	☒	☒	☒	☒

Table 4-3 shows how the WFD water bodies within the River Ock catchment are all screened in for further assessment, but that four River Thames water bodies downstream of the River Thame are not taken forward for Level 2 assessment as a result of the maximum score (1) not meeting the ACWG threshold (see Table 4-3).

The impacts on the water bodies of Cow Common Brook and Portobello Ditch as well as Childrey Brook and Norbrook at Common Barn were given scores of 3 (high impact) prior to mitigation. Other water bodies have low or no/minimal impact.

The scale of impact on the Cow Common Brook and Portobello Ditch is potentially significant. While the channel itself is proposed to be diverted to the west of the reservoir footprint, resulting in creation of new watercourse channel, the contributing network of tributaries and ditches will largely be lost as a result of the project. Impacts have the potential to prevent target WFD objectives from being achieved. Post-mitigation, the scoring of 3 was retained for Cow Common Brook and Portobello ditch as it is difficult to currently see how the impacts of the scheme can be mitigated for within the current shape of this particular water body.

For Childrey Brook and Norbrook at Common Barn the impact is related to watercourse diversion and flow re-distribution. The impacts could be mitigated for with changes to the scheme design so post mitigation the scoring was taken to 2 (medium impact).

Table 4-4 – WFD water bodies screened into the next phase of the assessment

Impacted Water body	Impacted Water body name	Level 1 Maximum score
GB106039023380	Childrey Brook and Norbrook at Common Barn	3
GB106039023410	Sandford Brook (source to Ock)	2
GB106039023360	Cow Common Brook and Portobello Ditch	3
GB106039023660	Ginge Brook and Mill Brook	2
GB106039023430	Ock and tributaries (Land Brook confluence to Thames)	2
GB106039030334	Thames (Evenlode to Thame)	3
GB106039030331	Thames Wallingford to Caversham	1
GB106039023233	Thames (Reading to Cookham)	1
GB106039023231	Thames (Cookham to Egham)	1
GB106039023232	Thames (Egham to Teddington)	1

5. WFD Level 2 assessment

5.1. Overview

This section provides the outcome from the ACWG Level 2 assessment. the ACWG template Level 2 assessment comprises the following worksheets completed by Atkins:

- Worksheet 4 “Assign Level2 WB Impacts” – these are the specific activities to be assessed per water body. For consistency, these have been selected as those reported in worksheet “2. Level 1 activities” and set out in Section 4 above.
- Worksheet 5 “Level 2 assessment template” – a copy of this template has been set out for each of the water bodies carried forward to the Level 2 assessment and these are renamed as the water body ID code.

A third worksheet “6. Level 2 summary” is auto-generated by the template to summarise the per water body level 2 assessments.

Using the information presented in the spreadsheets, a narrative description of the WFD compliance assessment for each grouping is provided below. In particular, the narrative provides information on the confidence in the assessment – the data confidence and the design certainty. Where the assessment reports the potential for WFD objective non-compliance, additional mitigation actions that may reduce this potential and lead to WFD compliance is indicated in the narrative summary.

5.2. Summary of findings

Table 5-1 illustrates how the other water bodies will be impacted following a Level 2 assessment while Table 5-2 illustrates the scoring approach developed for the assessment process. There are two water bodies that have a maximum score of 3 with no mitigation, namely:

- Childrey Brook and Norbrook at Common Barn (GB106039023380)
- Cow Common Brook and Portobello Ditch (GB106039023360)

A score of 3 means that ‘Impacts when taken on their own have the potential to lead to a significant effect and permanent deterioration of WFD status. Potential for high impact on preventing target WFD objectives from being achieved.’ For Childrey Brook and Norbrook at Common Barn water body and Cow Common Brook and Portobello Ditch water bodies they are both at risk of failing WFD objective 1 which is ‘to prevent deterioration of any WFD element of any water body - in line with Regulation 13(2)a and 13(5)a.’

The reason for this risk for Cow Common Brook and Portobello Ditch (GB106039023360) is primarily a loss of physical habitat, which is a relatively large proportion of the overall catchment size of the current RBMP2 WFD water body shape and size. In absence of detailed discussion with the Environment Agency there is currently no clear way of mitigating this impact on this water body thus the score remains a 3 even with mitigation.

For Childrey Brook and Norbrook at Common Barn (GB106039023380) water body, the reason for the 3 score pre-mitigation is linked to the re-distribution, and change of volumes, of flow from the diverted watercourses which could have a detrimental impact on this water body. It is thought that with mitigation the impacts could be reduced and thus a score of 2 was awarded post-mitigation. This means that the water body still has ‘Impacts that, when taken on their own, have the potential to lead to a widespread or prolonged effect on the quality of the water environment that may result in the temporary reduction in WFD status. Impacts have the potential to prevent target WFD objectives from being achieved.’ There is the potential for this to be further mitigated against following more detailed assessment and potential changes into the red line boundary. In addition, discussions with the Environment Agency are required to support this process.

All other WFD water bodies have been deemed as compliant with the three WFD objectives assessed against. For the River Thames (Evenlode to Thame) WFD water body, WFD compliance is based on agreement of an environmental abstraction & discharge permit with the Environment Agency which includes a WFD compliant operational regime. Thus, mitigation reduced the impacts on this water body from a 1 to a 0.

Table 5-1 – WFD water bodies screened into the next phase of the assessment (see descriptions for Level 2 scores in Table 5-2)

WFD Water body name	Level 2 Maximum score (pre-mitigation)	Level 2 Maximum score (post-mitigation)	WFD compliant against assessed WFD objective	Potential non-compliant issue
Childrey Brook and Norbrook at Common Barn (GB106039023380)	3	2	No (Medium confidence)	Failure to 'prevent deterioration of any WFD element of any water body.- in line with Regulation 13(2)a and 13(5)a' Elements impacted Invertebrates, Macrophytes and Phytobenthos Combined, Hydrological regime, Morphology
Sandford Brook (source to Ock) (GB106039023410)	1	1	Yes (High confidence)	n/a
Cow Common Brook and Portobello Ditch (GB106039023360)	3	3	No (High confidence)	Failure to 'prevent deterioration of any WFD element of any water body.- in line with Regulation 13(2)a and 13(5)a' Invertebrates, Macrophytes and Phytobenthos Combined, Hydrological regime, Morphology
Ginge Brook and Mill Brook (GB106039023660)	0	0	Yes (High confidence)	n/a
Ock and tributaries (Land Brook confluence to Thames) (GB106039023430)	1	1	Yes (Medium confidence)	n/a
Thames (Evenlode to Thame) (GB106039030334)	1	0	Yes (High confidence)	n/a

Table 5-2 – Impact scoring system for assessments (WRSE, 2020)

Impact	Score	Description
Very Beneficial	**-2**	Impacts that, taken on their own, have the potential to lead to the improvement in the ecological status or potential of a WFD quality element for the entire water body
Beneficial	**-1**	Impacts that, when taken on their own, have the potential to lead to a minor localised or temporary improvement that does not affect the overall WFD status of the water body or any quality elements
No/Minimal	**0**	No measurable change in the quality of the water environment or the ability for target WFD objectives to be achieved.
Low	**1**	Impacts that, when taken on their own, have the potential to lead to a minor localised, short-term and fully reversible effects on one or more of the quality elements but would not result in the lowering of WFD status. Impacts would be very unlikely to prevent any target WFD objectives from being achieved.
Medium	**2**	Impacts that, when taken on their own, have the potential to lead to a widespread or prolonged effect on the quality of the water environment that may result in the temporary reduction in WFD status. Impacts have the potential to prevent target WFD objectives from being achieved.
High	**3**	Impacts when taken on their own have the potential to lead to a significant effect and permanent deterioration of WFD status. Potential for high impact on preventing target WFD objectives from being achieved

6. Conclusions

6.1. Summary

The preliminary assessment undertaken in the conceptual design stage in Gate 1 process has identified those water bodies that need to be screened into future assessment phases of work on SESRO. As part of the Gate 2 work on the proposed scheme additional detailed, feasibility studies will help to refine the concept designs further. From a WFD Compliance Assessment perspective, further work on various scheme elements associated with the concept designs will reduce uncertainty on the likely impacts that the proposed scheme will have on the water environment. In particular, it is recommended that work focus on the key areas detailed below:

Proposed scheme Footprint

- Watercourse and ditch re-alignments around the proposed scheme footprint need further assessment to determine which sections of watercourse and ditches will be retained, lost or realigned.
- Connections between watercourses and ditches with other scheme elements need to be assessed further to determine the most appropriate connections, notably:
  - Diversion of Cow Common Brook and Portobello Ditch particularly in relation to its form, location, interrelationship with Hanney Ditch and Childrey Brook, crossing around the diverted road and potential crossing of location of proposed area for the canal;
  - The form of crossings proposed for the new Access Road and the Road Diversion over any watercourses, both current and proposed (i.e. clear span bridge or box culvert);
  - Mere Dyke (which is 'Main River') currently crosses the Auxiliary Drawdown Channel so an assessment as to whether it is best to cross the channel or connect into it (which could offer some significant benefits) needs to be undertaken;
  - A review of the Eastern Watercourse Diversion needs to be performed to assess the most appropriate planform arrangement; and
  - Auxiliary Drawdown Channel design, around the old canal will needs further assessment around the construction and operation as it could offer suitable mitigation for the proposed scheme if suitably designed and operated, including having a constant flow of water.
- Flow considerations in Childrey Brook, Hanney Ditch, Landmead Ditch and the River Ock will need to be assessed with regard to changes in flow as a result of the realignment of Cow Common Brook and Portobello Ditch. This change means that these watercourses will connect to Hanney Ditch and then Childrey Brook further upstream than is currently the case. This means that a section of channel on Hanney Ditch, Childrey Brook and River Ock will be undersized compared to the new flow regimes. Conversely, a section of Landmead Ditch will have less flow as a result of this realignment. All the lower section of the River Ock is likely to receive less flow merely as a result of the footprint extent reducing the volume of water reaching these lower reaches of the river. Impacts on water quality would need to be assessed using a 1D hydrodynamic model.
- Red line boundary extensions – work will be required on the various watercourses listed above as a result of the realignment of Cow Common Brook and Portobello Ditch. In addition, the Tunnel and Direct Supply Pipeline will have direct interfaces with a range of channels and the interfaces will need to be considered more fully.

Intake and Discharge into the River Thames

- The impacts of the intake and discharge into the River Thames needs to be considered in relation to potential opportunities and impacts of these changes on the flow regime and water quality on the downstream water bodies and what impacts and benefits that this may have. This will include more detailed hydrodynamic modelling of the fluvial River Thames, local assessments to changes to flow, level and velocity for Sutton Pools and Clifton Weir, and algal assessment work.

Mitigation and Biodiversity Net Gain (BNG)

- Noting that BNG is not a requirement for WFD compliance, mitigation for the loss in length of watercourses and ditches will need to be further assessed going forward. An initial assessment has been made in the

BNG calculations for rivers and ditches. Thames Water have committed to a 10% BNG[8] for all engineering projects in their latest Biodiversity policy (POL037)[9]. For the rivers and ditches part of the metric it is important that this impact is fully assessed, and any mitigation requirements integrated into the proposed scheme's design going forward. BNG will need to be assessed using DEFRA's revised BNG metric of which version 3 is due to be released in July 2021. An initial assessment suggests that 10% BNG can be achieved across the project but that there is currently a shortfall in the rivers and ditches components of the metric if it is assumed that all component parts would need to attain 10% individually, as is the case in version 2 of the metric (it is noted that version 3 is expected later in 2021).

The screening assessment undertaken has highlighted those water bodies that need to be screened into the next phase of any WFD assessment.

According to the ACWG Level 1 assessment, these are:

- Childrey Brook and Norbrook at Common Barn - GB106039023380;
- Sandford Brook (source to Ock) - GB106039023410;
- Cow Common Brook and Portobello Ditch - GB106039023360;
- Ock and tributaries (Land Brook confluence to Thames) - GB106039023430;
- Ginge Brook and Mill Brook - GB106039023660; and,
- Thames (Evenlode to Thames) - GB106039030334.

The following WFD water bodies were screened out of any further Level 2 assessment:

- Thames Wallingford to Caversham - GB106039030331
- Thames (Reading to Cookham) - GB106039023233
- Thames (Cookham to Egham) - GB106039023231
- Thames (Egham to Teddington) - GB106039023232

The ACWG Level 1 assessment is in keeping with historic modelling work undertaken by Thames Water which highlights that the greatest zone of influence of the SESRO scheme within the River Thames is between Culham and the River Thame. It is also in keeping with Atkins Gate 1 proportional assessment work for water quality and ecology (see Technical Annex B1, Environmental Assessment Report).

Despite the findings of the ACWG Level 1 assessment and the Technical Annex B1, based on a precautionary principle, it is recommended that the downstream-most River Thames WFD water bodies are retained as part of any Gate 2 WFD assessments as this will involve further assessment work on hydrodynamics and water quality in the River Thames.

Out of these WFD water bodies, the ACWG Level 2 assessment concluded that there is a potential risk of WFD non-compliance for Cow Common Brook and Portobello Ditch (GB106039023360) and Childrey Brook and Norbrook at Common Barn (GB106039023380) water bodies, respectively. Fundamentally, the two water bodies are at risk of failing WFD objective 1 which is 'to prevent deterioration of any WFD element of any water body - in line with Regulation 13(2)a and 13(5)a.' The reason for this risk for Cow Common Brook and Portobello Ditch (GB106039023360) is primarily a loss of physical habitat, which is a relatively, large proportion of the overall catchment size of the current RBMP2 WFD water body shape and size. For Childrey Brook and Norbrook at Common Barn (GB106039023380) water body, the reason is linked to the re-distribution, and change of volumes, of flow from the diverted watercourses which could have a detrimental impact on this water body on flow and water quality All other WFD water bodies have been deemed as compliance with the three WFD objectives assessed against.

6.2. Recommendations

It is recommended that a baseline assessment of the impacted channels be undertaken in Gate 2 to establish the current conditions of the site from which future assessments can be based. This would include geomorphological and ecological surveys from which a mitigation and compensation plan for the project would be developed to off-set, and mitigate for, any impacts identified. This will be aligned to the latest Regulation 19 requirements (previously referred to as Article 4.7 of the WFD regulations) (see Figure 6-1) where data needs

[8] The Environment Bill which is expected to come into force in Autumn 2021 is likely to stipulate 10%.
[9] Current TWUL Biodiversity policy: https://www.thameswater.co.uk/media-library/home/about-us/governance/our-policies/sustainability/biodiversity-policy.pdf

to be collected to support in the determination of whether the proposed modification/alteration/new sustainable development activity has the potential to cause deterioration/compromise the achievement of good status/potential at the scale of the water body. It is considered, currently, that a derogation could be required for the scheme as outlined. It is noted that this is limited to two of the River Ock WFD waterbodies only.

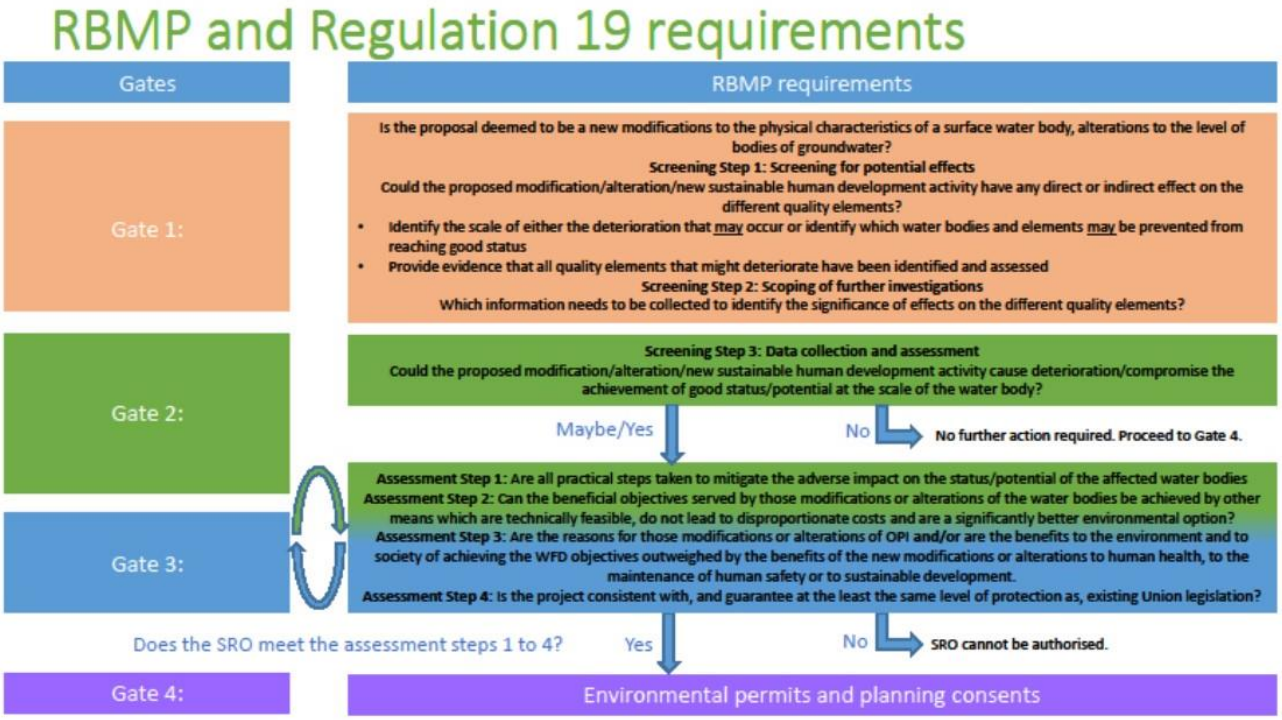

Figure 6-1 – Guidance on RBMP and Regulation 19 requirements, as provided by the Environment Agency National Appraisal Unit

It is recommended that the screening assessment be shared with the Environment Agency as they will need to approve any compliance process. Liaison with the Environment Agency will be critical to scope future phases of the WFD assessment for the proposed scheme. Ultimately, it is important that the impacts of the proposed scheme are sufficiently understood in the next phase of the works so that each option can be assessed with sufficient information to fully appraise them and ensure that sufficient space is factored in for any necessary mitigation.

It should be noted that a draft version of this report was shared with the Environment Agency for comment, ahead of the formal Gate 1 submission.

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Appendices

Appendix A. ACWG WFD No Det Assessment Spreadsheet for SESRO 150 Mm^3 option

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