

SUNNICA ENERGY FARM

EN010106

Environmental Statement

Volume 6

6.2 Appendix 8E: Aquatic Scoping and Ditch Surveys

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and
Procedure) Regulations 2009



Planning Act 2008

**The Infrastructure Planning
(Applications: Prescribed Forms and
Procedure) Regulations 2009**

Sunnica Energy Farm

**Environmental Statement
Appendix 8E: Aquatic Scoping and Ditch Surveys**

Regulation Reference:	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	EN010106
Application Document Reference	EN010106/APP/6.2
Author	Sunnica Energy Farm Project Team

Version	Date	Status of Version
Rev 00	18 November 2021	Application Version

Executive summary

AECOM was instructed by Sunnica Ltd to undertake aquatic scoping and subsequent aquatic ecology surveys of the proposed Sunnica Energy Farm (the 'Scheme') within the Scheme boundary (the Development Consent Order (DCO) Site) (the Site) (also referred to as the Order limits).

This report, detailing aquatic habitats within land required for the Scheme, was commissioned following the Preliminary Ecological Appraisal (PEA) (Ref 1). The PEA identified a number of standing and flowing waterbodies which have potential to support notable and, or protected species. Aquatic scoping and required surveys were undertaken to identify whether there are known or potential aquatic receptors that may constrain or influence the design and implementation of the Scheme.

The purpose of the aquatic ecology surveys, reported in this document, is to determine the assemblages of aquatic macroinvertebrate, macrophyte and fish species within the survey area and characterise the aquatic habitats present.

A desk study was undertaken in December 2018 through Cambridgeshire & Peterborough Environmental Records Centre (CPERC) and Suffolk Biodiversity Information Service (SBIS). Further to this, information relevant to this assessment was sought from the Environment Agency and online resources. These were accessed in 2020 to identify historical fish, macroinvertebrate, macrophyte and invasive non-native species (INNS) records.

Aquatic scoping surveys were carried out on the 14 and 15 August 2019 and ditch surveys were conducted on the 10 and 11 September 2020 by two qualified and experienced aquatic ecologists.

There were records of three UK BAP priority fish species in the study area: Brown/Sea Trout, European Eel and Spined Loach. Records were returned of two Annex II fish species: Bullhead and Brook Lamprey.

During the ditch surveys, no macrophyte species of conservation importance were recorded, with the community sampled typical of nutrient rich waterbodies. Narrow-leaved Water Plantain was present at all three ditches in the Sunnica East Site A and is considered a Suffolk rarity, however, it is not a priority species and is common throughout England. A similar macrophyte assemblage is expected to be common in the wider landscape. Therefore, none of the ditches can be considered to support macrophyte assemblages of any more than Local value.

During surveys at Sunnica East Site A, three species with a local distribution were recorded: the Hairy Dragonfly, the snail *Bithynia leachi*. and caddisfly *Agrypnia pagetana*. One species with a local distribution was recorded at the Sunnica West Site B; the diving beetle *Ilybius quadriguttatus*. None of these are Red Data Book species or species of conservation importance.

The community composition across all the surveyed sites is considered to be of moderate conservation value under the CCI index, with similar macroinvertebrate assemblages expected to be common across the wider landscape. There were no local BAP species recorded during any of the surveys. Therefore, none of the ditches can be considered to support macroinvertebrate communities of any more than Local value.

Table of contents

Chapter	Pages
Executive summary	i
1 Introduction	1
1.2 The Scheme	1
1.3 Site description	2
1.4 Scope of the report	4
2 Methods	5
2.1 Desk study	5
2.2 Field survey	5
2.3 Nature conservation evaluation approach	10
2.4 Assumptions and limitations	11
3 Results	13
3.1 Desk study	13
3.2 Field survey	16
4 Nature Conservation Evaluation and Conclusions	25
5 References	26
Annex A Figures	27
Annex B Whalley, Hawkes, Paisley and Trigg (WHPT) Metric	28
Annex C Community Conservation Index (CCI)	30
Annex D Lotic-Invertebrate Index for Flow Evaluation (LIFE)	31
Annex E Proportion of sediment-sensitive invertebrates (PSI)	32
Annex F Photographs	33
Annex G Aquatic Macroinvertebrate Data	36

Table of Tables

Table 2-1: Aquatic scoping survey areas	6
Table 2-2: Aquatic plant conservation status scores.....	9
Table 2-3: Ellenberg indicator values for nitrogen and associated scores	9
Table 2-4: Geographic Scale Used to Qualify Relative Nature Conservation Value of Features.....	11
Table 3-1: Environment Agency fish records	13
Table 3-2: Desk study records of invasive non-native species	16
Table C-1: Conservation Scores from the Community Conservation Index (from Chadd & Extence, 2004).....	30
Table C-2: General guide to CCI scores (from Chadd & Extence, 2004).....	30
Table D-3: Flow groups used to derive LIFE scores (from Extence, Balbi and Chadd, 1999)	31
Table D-4: Abundance categories used to derive LIFE scores (from Extence, Balbi and Chadd, 1999)	31
Table D-5: A guide to interpreting LIFE scores (from Extence, Balbi and Chadd, 1999) ...	31
Table E-6: Fine Sediment Sensitivity Rating (FSSR) groups used to derive PSI scores (from Extence et al., 2013).....	32
Table E-7: Abundance categories used to derive PSI scores (from Extence, et al., 2013)	32
Table E-8: Interpretation of PSI scores (from Extence et al., 2013)	32
Table G-9: Aquatic Macroinvertebrate Data.....	37

1 Introduction

1.1.1 AECOM was instructed by Sunnica Ltd to undertake aquatic scoping and subsequent aquatic ecology surveys of the proposed Sunnica Energy Farm (the 'Scheme') within the Scheme boundary (the Development Consent Order (DCO) Site) (the Site) (also referred to as the Order limits).

1.1.2 This report, detailing aquatic habitats within land required for the Scheme, was commissioned following the Preliminary Ecological Appraisal (PEA) (Ref 1). The PEA identified a number of standing and flowing waterbodies which have potential to support notable¹ and, or protected species. Aquatic scoping and required surveys were undertaken to identify whether there are known or potential aquatic receptors that may constrain or influence the design and implementation of the Scheme.

1.2 The Scheme

1.2.1 Sunnica Energy Farm (the Scheme) is a new solar energy farm proposal that will deliver electricity to the national electricity transmission network. Sunnica Limited is proposing to install ground mounted solar photovoltaic (PV) panel arrays to generate electrical energy from the sun and combine these with a Battery Energy Storage System (BESS) which will connect to Burwell National Grid Substation in Cambridgeshire.

1.2.2 Electricity will be generated at Sunnica East Site A, near Isleham in Cambridgeshire; Sunnica East Site B, near Worlington and Freckenham in Suffolk; Sunnica West Site A near Chippenham and Kennett in Cambridgeshire; and Sunnica West Site B, near Snailwell in Cambridgeshire. All locations will comprise ground mounted solar PV panel arrays, supporting electrical infrastructure and, with the exception of Sunnica West Site B, a BESS.

1.2.3 Supporting electrical infrastructure will include on-site substations on Sunnica East Site A and Sunnica East Site B and Sunnica West Site A, and on-site cabling between the different electrical elements across the Scheme. The generating equipment of the Scheme will be fenced and protected via security measures such as Closed Circuit Television. Inside the fenced areas, in addition to the generating equipment will be, internal access tracks, and drainage. It is not proposed for any area to be continuously lit.

1.2.4 Visual, ecological and archaeological mitigation is proposed which includes proposed grassland planting and new woodland; retention of existing woodland, wetlands and other vegetation; provision of replacement habitat; and offsetting areas, where there will be no development. The BESSs will consist of a compound and battery array to allow for the importation, storage and exportation of energy to the National Grid. There will also be areas at Sunnica East Site A and Sunnica East Site B for office and storage facilities for use during the Scheme's operation.

1.2.5 The Scheme will be connected to a new substation extension at the existing Burwell National Grid Substation, using 132 kilovolt (kV) cables buried

¹ A notable habitat or species has a conservation designation assigned to it, but no legal protection.

underground. The cables will run between Sunnica East Site A, Sunnica East Site B and Sunnica West Site A (Grid Connection Route A), and then from Sunnica West Site A to Sunnica West B and onwards to the Burwell National Grid Substation (Grid Connection Route B). The Burwell National Grid Substation Extension will convert the 132kV to 400kV. The 400kV cables will be buried and will connect the Scheme to the existing Burwell National Grid Substation to allow distribution to the national transmission network.

- 1.2.6 The Scheme will have two main access points, one north of Elms Road at Sunnica East Site B and one south of La Hogue Road at Sunnica West Site A. The main access route to Sunnica West Site A will be via the Chippenham junction of the A11, to the north of junction 38 of the A14. Sunnica East Site B will be accessed via the A11 and B1085. A number of secondary access points are proposed to access the individual land parcels through construction, operation, and decommissioning phases.
- 1.2.7 The Scheme is defined as a Nationally Significant Infrastructure Project (NSIP) and will require a DCO from the Secretary of State for Business, Energy and Industrial Strategy (Secretary of State), due to its generating capacity exceeding 50 megawatts (MW).
- 1.2.8 The Scheme comprises the following key areas:
- a. Solar Farm Sites:
 - i. Sunnica East Site A;
 - ii. Sunnica East Site B;
 - iii. Sunnica West Site A; and
 - iv. Sunnica West Site B.
 - b. associated electrical infrastructure areas for connection to the national transmission system:
 - i. Grid Connection Route A (connecting the Sunnica East Site A with the Sunnica East Site B and then connecting to the Sunnica West Site A);
 - ii. Grid Connection Route B (connecting the Sunnica West Site A and Sunnica West Site B and the Burwell National Grid Substation); and
 - iii. Burwell National Grid Substation.
- 1.2.9 **Figure 1** shows the locations of these key areas.

1.3 Site description

- 1.3.1 The extent of the Scheme is shown in **Figure 1** in Annex A of this report.

Sunnica East Site

- 1.3.2 The Sunnica East Site is split into two sub-sites, one to the north of Freckenham (referred to as Sunnica East Site A) and the other to the south of Worlington (referred to as Sunnica East Site B). These two sites are approximately 1km apart and are separated by agricultural fields. The Sunnica East Site A encompasses an area of approximately 224ha and includes land within the county of Suffolk and Cambridgeshire. Sunnica East Site B lies within Suffolk and encompasses an area of approximately 319ha (**Figure 1**).

- 1.3.3 The landscape features within the Sunnica East Site A and Sunnica East Site B consist of arable agricultural fields interspersed with individual trees, hedgerows, linear tree belts, small woodland blocks, farm access tracks and local roads.
- 1.3.4 The landscape features immediately surrounding the Sunnica East Site A and Sunnica East Site B comprise small rural villages, including Worlington to the north, Barton Mills to the north-east, Red Lodge and Freckenham to the south and Isleham to the west. Industrial land uses adjoin the A11 to the south of the Sunnica East Site with an industrial installation of a 7.5MW solar farm situated adjacent to the south-eastern extent of the Sunnica East Site and an anaerobic digestion (AD) plant located to the south of the Sunnica East Site.
- 1.3.5 Aquatic features within the Sunnica East Site include Lee Brook, a series of connected ditches in close proximity to the River Lark, two ponds and an arable ditch south of Worlington. The River Lark lies outside of the Scheme.

Sunnica West Site

- 1.3.6 The Sunnica West Site is located within the East Cambridgeshire District Council administrative area, approximately 3km north east of Newmarket and 6.5 km east of Burwell.
- 1.3.7 Sunnica West is split into two sub-sites, one to the south-east (referred to as Sunnica West Site A) and the other to the north-west of Snailwell (referred to as Sunnica West Site B). These two sites are approximately 1km apart, separated by agricultural fields and Chippenham Road. The Sunnica West Site A encompasses an area of approximately 373ha and includes land to the east and west of the A11, consisting of agricultural fields bounded by trees, managed hedgerows, linear tree shelter belts, small woodland and copses and farm access tracks. Sunnica West Site B encompasses an area of approximately 66ha and comprise of agricultural fields, grassland, small woodland and copses, farm access tracks and irrigation ditches fed by the River Snail which runs along the western and northern boundaries of the Site (**Figure 1**).
- 1.3.8 The surrounding landscape comprises regularly shaped arable fields interspersed with managed hedgerows, tall shelter belts of trees and in the Chippenham Hall area, a parkland landscape with mature individual trees. Much of the area is also characterised by grazed paddocks, horse gallops and exercise tracks.
- 1.3.9 Aquatic features within the Sunnica West Site include a number of agricultural ditches, the River Snail and two ditches connected to Chippenham Fen SSSI.

Cable route corridors

- 1.3.10 The Scheme will connect to the existing Burwell National Grid Substation via a cable route corridor. The cable route corridors under consideration are Grid Connection Route A, which connects the Sunnica East Site A with the Sunnica East Site B and then runs between the Sunnica West Site A and the Sunnica East Site B; and Grid Connection Route B, between the Sunnica West Site A and Sunnica West Site B and the Burwell National Grid Substation.

Grid Connection Route A

- 1.3.11 Grid Connection Route A connects the Sunnica East Site A with Sunnica East Site B and crosses two minor roads and arable farmland (**Figure 1**).
- 1.3.12 Heading south from the Sunnica East Site B, the cable route corridor for Grid Connection Route A crosses the River Kennett, pastoral farmland, the Chippenham footpath 49/7 (a Public Right of Way (PRoW)) and B1085 (**Figure 1**).

Grid Connection Route B

- 1.3.13 Heading east from the Burwell National Grid Substation, the cable route corridor for Grid Connection Route B crosses agricultural fields and a number of roads including the B1102 and A142. Grid Connection Route B also crosses a number of watercourses, including the Burwell Lode, New River, and the River Snail, as well as a number of drainage ditches associated with Burwell Fen, Little Fen, the Broads, and agricultural drains (**Figure 1**).
- 1.3.14 The cable route corridor for Grid Connection Route B crosses a PRoW (footpath 92/19) before crossing the railway line and the A142 Newmarket / Fordham Road. The Route then runs alongside Snailwell Road and across the River Snail into Sunnica West Site B.
- 1.3.15 There are a number of aquatic features of interest within the Grid Connection Routes including the River Kennett, Burwell Lode, Catchwater Drain, New River, the River Snail and numerous ponds and ditches.

Burwell National Grid Substation Extension

- 1.3.16 The habitat within the Burwell National Grid Substation Extension (surrounding the existing substation) comprises small grassland fields to the east of the existing substation (bordered by hedgerows and mature trees) and arable land to the south and west of the existing substation (**Figure 1**).

1.4 Scope of the report

- 1.4.1 The purpose of the aquatic ecology surveys, reported in this document, is to determine the assemblages of aquatic macroinvertebrate, macrophyte and fish species within the survey area and characterise the aquatic habitats present. The survey results will identify aquatic species or habitats which could pose potential constraints to the works or influence the design or implementation of the Scheme. This baseline information can be used to inform options for impact avoidance, mitigation and, or compensation that might need to be considered.
- 1.4.2 This report is a technical appendix to accompany the Environmental Statement (ES).

2 Methods

2.1 Desk study

- 2.1.1 A desk study was undertaken in December 2018 through Cambridgeshire & Peterborough Environmental Records Centre (CPERC) and Suffolk Biodiversity Information Service (SBIS) as part of the PEA that identified nature conservation designations and protected or notable habitats and species potentially relevant to the Scheme. This was completed in advance of the aquatic surveys and informed aquatic scoping surveys. Desk study results of relevance to the assessment have been carried forward into this report, and where appropriate these data are presented in more detail or re-interrogated for the needs of the aquatic assessment.
- 2.1.2 Further to this, information relevant to this assessment was sought from the Environment Agency and online resources. These were accessed in 2020 to identify historical fish, macroinvertebrate, macrophyte and invasive non-native species (INNS) records. Environment Agency Water Framework Directive data were requested for the relevant surface waterbodies: Burwell Lode (Waterbody ID: GB105033042720), Kennett - Lee Brook (Waterbody ID: GB105033042990), Kennett - Lee Brook (Waterbody ID: GB105033043020), New River (Waterbody ID: GB105033042780) and River Lark downstream of Mill Street Bridge (Waterbody ID: GB105033043052).

2.2 Field survey

Aquatic scoping survey

Survey conditions

- 2.2.1 Aquatic scoping surveys were carried out on the 14 and 15 August 2019 by two qualified and experienced aquatic ecologists. Scoping surveys were undertaken on each waterbody within Sunnica East Site and Sunnica West Site. Scoping was undertaken on watercourses along the Grid Connection Routes where access was possible via public rights of way.
- 2.2.2 **Table 2-1** summarises the results of the aquatic scoping exercise. Weather conditions were poor on the afternoon of the 14 August with heavy rainfall. Weather and survey conditions were good during the rest of the scoping survey.

Survey method

- 2.2.3 Aquatic scoping surveys were conducted by walking the length of the watercourse or the circumference of ponds within the area required for the Scheme. Surveyed sites are listed below in **Table 2-1**. Aquatic features of interest were recorded including channel dimensions, bank features, substrate composition, flow, habitat types and features, shading, artificial features and pressures, obstructions to fish passage, invasive species and surrounding land use. Survey data were collected using the interactive mapping tool Collector and uploaded directly to a predefined GIS map.
- 2.2.4 Aquatic habitat features were used to determine the potential of waterbodies to support protected and/or notable species and to inform further survey requirements in conjunction with desk study data.

Table 2-1: Aquatic scoping survey areas

Scheme area	Waterbody reference (see Figure 2)	Waterbodies scoped in for further survey	Ordnance Survey National Grid Reference (central)
Sunnica East Site A	Lee Brook	No – Environment Agency data for macroinvertebrates, fish and macrophytes exist within the DCO limits.	TL 66307 74309 TL 66308 73144
	Ditch 01	Yes – macrophyte and macroinvertebrate surveys. Appears to permanently hold water and potential to support protected species. No desk study data exist.	TL 66870 74700
	Ditch 02	Yes – macrophyte and macroinvertebrate surveys. Deep and wide ditch connected to River Lark with fringing reeds. Potential to support protected species. No desk study data exist.	TL 66476 74864
	Ditch 03	No – predominantly dry and choked with terrestrial vegetation. Low ecological value.	TL 67003 74680
Sunnica East Site B	Ditch 04	No – dry.	TL 69265 72715
	Pond 02	No.	TL 69064 72938
	Pond 05	No – agricultural pond. Filamentous algae throughout indicating eutrophication. Low ecological potential.	TL 68567 70810
	Pond 08	No – raised reservoir with no safe access point. This waterbody will be retained and therefore no further surveys are recommended.	TL 68575 70809
Sunnica West Site A	Ditch 06	No – dry.	TL 67281 68798
	Ditch 07	No – dry.	TL 68669 68194
Sunnica West Site B	Pond 27	No – dry.	TL 63769 68632
	Ditch 05a	Yes – macrophyte and macroinvertebrate surveys. Located within Chippenham Fen SSSI impact risk zone.	TL 64000 68917
	Ditch 05b	Yes – macrophyte and macroinvertebrate. Located within Chippenham Fen SSSI impact risk zone.	TL 64228 68909
	Ditch 08	No – dry.	TL 63957 68274
	Ditch 13	No – dry.	TL 63857 68373
	River Snail	No – Environment Agency data exist for macroinvertebrates adjacent to DCO limits.	TL 63905 68254
Grid Connection Route A	River Kennett	No – dry.	TL 68932 70062
	New River	No – non-intrusive methods for crossing embedded within Scheme design.	TL 61374 68652

Scheme area	Waterbody reference (see Figure 2)	Waterbodies scoped in for further survey	Ordnance Survey National Grid Reference (central)
	River Snail	No – Environment Agency data exist for macroinvertebrates adjacent to DCO limits.	TL 63450 68949
	Pond 11	No - dry	TL 67665 68092
	Pond 11a	No - dry	TL 67708 68042
	Pond 11b	No - dry	TL 67673 68025
	Pond 11c	No - dry	TL 67644 67974
Grid Connection Route B	Burwell Lode	No – non-intrusive methods for crossing embedded within Scheme design.	TL 58220 67899
	Catchwater Drain	No – non-intrusive methods for crossing embedded within Scheme design.	TL 59211 68830
	Pond 16	N/A	TL 63279 68449
	Pond 19	N/A	TL 60850 68485
	Ditch 09	No - Not accessible for surveys – overgrown and steep banks.	TL 60250 68604
	Ditch 10	No – dry.	TL 58167 68263
	Ditch 11	Yes – macroinvertebrate survey. No desk study data exist.	TL 58355 68193
	Ditch 12	No – dry.	TL 58017 67307
	32 ditches	No – either dry or non-intrusive methods for crossing embedded within Scheme design.	Multiple locations

2.2.5 The outcome from the aquatic habitat survey and scoping was that all ponds were scoped out primarily due to their being dry. Continued dryness or regular drying out was confirmed from other ecological surveys undertaken across the Order limits. Aquatic habitat features were used to determine the potential of waterbodies to support protected and/or notable species and to inform further survey requirements in conjunction with desk study data. In the case of the New River, there was no need to undertake any surveys as the Environment Agency samples this watercourse on a regular basis.

Ditch surveys

Method

2.2.6 Ditch surveys were conducted on the 10 and 11 September 2020 by two experienced aquatic ecologists. Surveys were only conducted on ditches containing water.

2.2.7 The survey method was based on the method published by Buglife (2013) (Ref 2). A reduced version of this method was employed as it is designed for high quality grazing marsh ditch systems.

2.2.8 The macrophyte assemblage in each ditch was assessed by identifying all species to the lowest possible taxonomic level and recording their abundance using the

DAFOR scale² along a 20m stretch of each ditch. Once this had been completed, the rest of the ditch was assessed and the presence of any other macrophyte species was recorded. A grapnel was used to sample plants in deeper areas of the ditch and where the banks were too steep to access. Identification was carried out onsite where possible, with further identification of more complex specimens completed in the laboratory. Specimens that were taken for additional analysis were removed either by hand or grapnel, placed in a sealed plastic bag and refrigerated.

2.2.9 Macroinvertebrate samples were collected using a standard Freshwater Biological Association (FBA) pattern pond net (mesh size: 1 mm). Individuals were collected by netting ditch vegetation along a 50m section of each waterbody. Macroinvertebrate samples were subsequently preserved in Industrial Methylated Spirit (IMS) and taken back to the AECOM freshwater laboratory for identification.

Ditch survey – aquatic plant data analysis

2.2.10 The ditch survey methodology (Buglife, 2013) (Ref 2) provides a rarity or protected status for native plants. The assessment is based on the vascular plant Red List for Britain (Cheffings & Farrell, 2005) (updated by the Species Status Assessment Group) (Ref 3), the New Atlas (Preston *et al.*, 2002) (Ref 3) and information on the JNCC website. The British Red Lists have been drawn up by applying the revised IUCN threat categories and criteria (IUCN Species Survival Commission, 2003) (Ref 5).

2.2.11 Ditch survey methodology requires the calculation of four metrics to allow for ranking of aquatic plants:

- a. **Native Species Richness:** Native Species Richness is the number of native taxa recorded (using the list of native species provided in Buglife, 2013).
- b. **Native Species Conservation Status (Species Quality Index):** Native aquatic plant taxa are given a conservation score between one and five, with one associated with common species and five reserved for species listed on the Habitats Directive Annex II/IV, Schedule 8 or British Red List. The mean conservation score of all native species is calculated to provide the Plant Conservation Status Score. Non-native species are omitted from the calculation. See **Table 2-2**.
- c. **Habitat Quality:** A Plant Habitat Quality Score is calculated using the Ellenberg indicator values for nitrogen. This metric is used to give an indication of nutrient enrichment in the ditch. Aquatic plants are allocated an Ellenberg indicator value which has an associated habitat quality score. The Plant Habitat Quality Score is the mean of the scores of all the aquatic plant taxa (native and non-native) recorded in the ditch. See **Table 2-3**.
- d. **Community Naturalness:** Threat scores between 1 and 5 are allocated to non-native plant species, with a score of 5 indicating a species which poses a severe threat to native species. The Naturalness Score is the sum of threat scores for introduced species expressed as a negative value.

² D – Dominant coverage over 75 % of survey area, A – Abundant coverage 51 – 75 % of survey area, F – Frequent coverage 26 – 50 % of survey area, O – Occasional coverage 11 -25 % of survey area, R – Rare coverage 1 – 10 % of survey area

Table 2-2: Aquatic plant conservation status scores

Category	Score
Habitats Directive Annex II/IV, Schedule 8 or British Red List	5
*Near Threatened	4
Nationally Rare or Nationally Scarce (but not Red List or Near Threatened)	3
Local (in English Environment Agency Region or in Wales)	2
None of the above (Common)	1

* Some of these are UK Biodiversity Action Plan priority species.

Table 2-3: Ellenberg indicator values for nitrogen and associated scores

Ellenberg indicator value for nitrogen	Habitat Quality Score
1. Species indicative of extremely infertile sites	5
2. Between 1 and 3	5
3. Species indicative of more or less infertile sites	4
4. Between 3 and 5	4
5. Species indicative of sites of intermediate fertility	3
6. Between 5 and 7	2
7-9. Species of richly fertile or extremely rich conditions	1

Ditch survey – aquatic macroinvertebrate data analysis

2.2.12 Each of the samples collected was sorted and analysed in a laboratory setting by suitably trained and experienced aquatic ecologists. Lists of the aquatic invertebrate taxa present were produced in line with Environment Agency guidance (Environment Agency, 2014) (Ref 6). The aquatic invertebrate samples were identified to ‘mixed taxon level’ using stereo-microscopes. Most groups were identified to species level (where practicable), with the exception of the following:

- a. mites (*Hydracarina*) which were identified to order;
- b. worms (*Oligochaeta*) which were identified to order;
- c. marsh beetles (*Scirtidae*) which were identified to family;
- d. butterfly / moth larvae (*Lepidoptera*), which were identified to order;
- e. springtails (*Collembola*) which were identified to order;
- f. true fly larvae, which were identified to the maximum resolution possible; and
- g. immature or damaged specimens, which were identified to the maximum resolution possible on a case-by-case basis.

2.2.13 Macroinvertebrate samples were analysed using the indices set out below:

- a. Whalley Hawkes Paisley Trigg (WHPT) scores and Average Score Per Taxon (ASPT) values - scores are derived based on the sensitivity of particular taxa (families) of invertebrates to organic pollution;
- b. Community Conservation Index (CCI) method – to assess the conservation value of the macroinvertebrate populations present and identify and unusual or rare species;

- c. Lotic-Invertebrate Index for Flow Evaluation (LIFE) method – to assess the sensitivity of benthic macroinvertebrate communities to variable flows. Higher flows should result in higher LIFE scores; and
- d. Proportion of Sediment-sensitive Invertebrates (PSI) index – to assess the sensitivity of benthic macroinvertebrate communities to fine sediments.

2.2.14 Further details of the above indices can be found in Annex B, C, D and E.

2.2.15 The survey data were then used to inform an assessment of relative nature conservation value.

2.3 Nature conservation evaluation approach

2.3.1 An essential prerequisite step to allow ecological impact assessment of the Scheme is an evaluation of the relative nature conservation value of the identified ecological features (encompassing nature conservation designations, ecosystems, habitats and species).

2.3.2 The method of evaluation that has been utilised has been developed with reference to the guidance by the Chartered Institute of Ecology and Environmental Management (CIEEM) (Ref 7). These give advice on scoping and carrying out environmental assessments and place appraisal in the context of relevant policies. Data received through consultation, desk-based studies and field-based surveys are used to allow ecological features of nature conservation value or potential value to be identified, and the main factors contributing to their value described and related to available guidance. These data can also be used to identify other relevant values e.g. socio-economic or ecosystem services values, but this is beyond the remit of this report and requires the involvement of other relevant specialists.

2.3.3 Aquatic macroinvertebrate communities and individual macroinvertebrate species can be of nature conservation value for a variety of reasons, and their relative value should always be determined on a case by case basis to demonstrate a robust assessment process. Value may relate, for example, to the uniqueness of the assemblage, or to the extent to which species are threatened throughout their range, or to their rate of decline. The value of the macrophyte assemblages, aquatic macroinvertebrate assemblages and species recorded by the survey has been defined with reference to the geographical level at which the feature being assessed is considered relevant (**Table 2-4**). Relevant published national and local guidance and criteria can be used, where available, to inform the assessment of nature conservation value and to assist consistency in evaluation. Guidance and criteria of potential relevance to the aquatic macroinvertebrate features being assessed is summarised in **Table 2-4**. The identified guidance and criteria are not definitive and other criteria have been applied as relevant and appropriate to reach a decision on relative nature conservation value. For example, the previously described CCI index has been used to inform assessment of nature conservation value.

Table 2-4: Geographic Scale Used to Qualify Relative Nature Conservation Value of Features

Geographic scale of value	Definition	Example supporting guidance and assessment criteria
International	Europe	Guidelines for the selection of Special Areas of Conservation (SACs) (McLeod <i>et al.</i> 2005) (Ref 8)
National	Great Britain/ England	Guidelines for the selection of biological Sites of Special Scientific Interest (SSSIs) for Terrestrial and Freshwater Invertebrates (Curson <i>et al.</i> 2019) (Ref 9)
Regional	East Anglia	No specific guidance available, professional judgement is to be used. It will encompass features clearly of greater than county value but not of sufficient merit to demonstrate national value.
County	Suffolk and Cambridgeshire	County Wildlife Site Selection Criteria (Suffolk Wildlife Trust, 2010) (Ref 10). Cambridgeshire and Peterborough County Wildlife Sites Selection Guide (The Wildlife Trust for Bedfordshire, Cambridgeshire and Northamptonshire, 2014) (Ref 11).
District	West Suffolk and East Cambridgeshire	No specific guidance available, professional judgement is to be used.
Local	Below district value	No specific guidance available, professional judgement is to be used.

2.4 Assumptions and limitations

Desk study

2.4.1 The aim of the desk study was to help characterise the baseline context of the Scheme and provide valuable background information that would not be captured by a single site survey alone. Information obtained during the course of a desk study was dependent upon people and organisations having made and submitted records for the area of interest. As such, a lack of records for a particular habitat or species does not necessarily mean that the habitats or species do not occur in the study area. Likewise, the presence of records for particular habitats and species did not automatically mean that these still occurred within the area of interest or were relevant in the context of the Scheme.

Field survey

2.4.2 There are no significant limitations to the work undertaken. The aquatic plant survey was undertaken within the optimal season (June – September) recommended in the ditch survey methodology (Buglife, 2013). Macroinvertebrate sampling of ditches is recommended between April – June, however, representative results can be obtained until the end of October (Buglife, 2013). The ditch surveys were undertaken during good weather and low flow conditions.

2.4.3 Given the nature of biological survey, it is not possible to be certain that all the species present in a waterbody will be detected. Where juvenile or damaged macroinvertebrate specimens were collected, species level identification is not

always possible. Not all macroinvertebrate species that use waterbodies are present at all times of year and therefore some may be overlooked when surveying. Other species that may be present at other times of year, sporadically and/or in low numbers may not have been recorded. This is not considered a significant limitation as standard methods were applied, and the data collected is considered representative of the conditions present and appropriate for assessment of value.

3 Results

3.1 Desk study

Designated sites

- 3.1.1 Details of statutorily designated sites for nature conservation, relevant to aquatic ecology, are presented within the PEA report (Ref 1).

Fish

- 3.1.2 Fish records were accessed via the Environment Agency Freshwater Fish Survey Database (NFPD) via Ecology and Fish Data Explorer (Ref 12). For this assessment, the desk study records presented below are restricted to those collated between 2009 and 2020 and within 2km of the Order limits. Where there were no survey records within 2km, the closest data have been included. These restrictions are to reflect the current, rather than historic, baseline conditions associated with the watercourses. **Table 3-1** highlights fish records in the Lee Brook, Burwell Lode, New River and the River Kennett.

Table 3-1: Environment Agency fish records

Watercourse	Grid Reference	Distance and direction from Order limits (m).	Date of recent record	Species recorded
Lee Brook	TL 663 731	Within the Site	29/04/2014	Brown/Sea Trout <i>Salmo trutta</i> , Bullhead <i>Cottus gobio</i> , Stone Loach <i>Barbatula barbatula</i>
	TL 664 728	10m south	24/09/2014	3-Spined Stickleback <i>Gasterosteus aculeatus</i> , Bullhead, Dace <i>Leuciscus leuciscus</i>
	TL 639 680	100m south	23/05/2012	10-Spined Stickleback <i>Pungitius pungitius</i> , 3-Spined Stickleback, Brook Lamprey <i>Lampetra planeri</i> , Bullhead
			14/03/2014	Bullhead, 10-Spined Stickleback, 3-Spined Stickleback, Brook Lamprey
	TL 665 719	580m south	18/08/2011	Dace, Pike <i>Esox lucius</i> , Bullhead, Stone Loach, Gudgeon <i>Gobio gobio</i> , Chub <i>Squalius cephalus</i> , European Eel > elvers <i>Anguilla anguilla</i> , 3-Spined Stickleback, Brook Lamprey
			28/09/2012	Bullhead, Dace, Minnow <i>Phoxinus phoxinus</i> , gudgeon, European Eel > elvers, 3-Spined stickleback, Brook Lamprey
			24/09/2014	Dace, Bullhead, Stone loach
			02/10/2015	Bullhead, Stone Loach, Brook lamprey ammocoetes (larval

Watercourse	Grid Reference	Distance and direction from Order limits (m).	Date of recent record	Species recorded
				stage), Dace, 3-Spined Stickleback
			15/11/2018	Dace, Chub, Minnow, Bullhead, Pike, Brook Lamprey ammocoetes (larval stage)
Burwell Lode	TL 584 678	110m south-east	05/06/2014	Bullhead, Gudgeon, Perch <i>Perca fluviatilis</i> , Pike, Roach <i>Rutilus rutilus</i> , Spined Loach, Tench <i>Tinca tinca</i> , European Eel
			05/07/2010	Bleak <i>Alburnus alburnus</i> , Bullhead, Common Bream <i>Abramis brama</i> , Dace, Gudgeon, Perch, Pike, Roach, Rudd <i>Scardinius erythrophthalmus</i> , Ruffe <i>Gymnocephalus cernua</i> , Silver (White) Bream <i>Blicca bjoerkna</i> , Spined Loach, Roach x Common Bream hybrid
	TL 564 689	1830m north-west	03/06/2014	Roach, Perch, Common Bream, Spined Loach, Pike, European Eel elvers, Bitterling <i>Rhodeus amarus</i>
			15/07/2010	Common Bream, Roach, Bitterling, Bleak, Silver Bream, Common [wild] Carp <i>Cyprinus carpio</i> , Pike, Rudd, Tench, Perch, European Eel > elvers
New River	TL 619 668	1500m south	26/02/2012	No fish recorded
River Kennett	TL 702 580	1259m south	04/10/2012	Stone Loach

3.1.3 There were records of three UK BAP priority fish species in the study area: Brown/Sea Trout, European Eel and Spined Loach. Records were returned of two Annex II fish species: Bullhead and Brook Lamprey.

Macroinvertebrates

3.1.4 Macroinvertebrate species data were requested from the Environment Agency Freshwater Fish Survey Database (NFPD) via Ecology and Fish Data Explorer (Ref 12). For this assessment, desk study records below have been restricted to those collated between 2009 and 2020 and within 2km of the Order limits. Where there were no survey records within 2km, the closest data have been included. These restrictions are to reflect the current, rather than historic, baseline conditions associated with the watercourses. Species data have been returned for:

- a. Lee Brook – approximately within the Sunnica East Site A;
- b. River Snail – on the border of Sunnica West Site B and approximately 1.4 km north of Sunnica West Site A;
- c. River Lark – approximately 1 km from where ditches in Sunnica East Site A enter the river;

- d. River Kennett – approximately 0.94 km upstream of the Grid Connection Route A;
- e. New River – approximately 3.9 km downstream of the Grid Connection Route B crossing point;
- f. Catchwater Drain – approximately 0.42 km from the Grid Connection Route B crossing point; and
- g. Burwell Lode – approximately 4.5 km from the Grid Connection Route B.

3.1.5 There were records of four macroinvertebrate species in the River Kennett and River Snail that are not RDB listed but are regarded as Nationally Scarce. The aquatic beetle *Agabus biguttatus* was recorded in the Kennett in 2015, the White-barred Soldier fly *Oxycera morrisii* in the River Kennett in 2018, the caddisfly *Limnephilus nigriceps* in River Snail in 2012 and Lister's River Snail *Viviparus contectus* recorded in the River Lark in 2014.

Macrophytes

3.1.6 Macrophyte species data were requested from the Environment Agency (see above) and as with other desk study data, the records below have been restricted to those collated since 2009 and within 2km of the Order limits. Where there were no survey records within 2km, the closest data have been included. These restrictions are to reflect the current, rather than historic, baseline conditions associated with the watercourses. Species data has been returned for: Desk study records were returned from the Environment Agency for macrophyte species at the:

- a. Lee Brook – approximately 10m west of Sunnica East Site A;
- b. River Snail – on the border of Sunnica West Site B;
- c. River Lark – approximately 1km from where ditches in the Sunnica East A site enter the river;
- d. River Kennett – approximately 0.94km upstream of the Grid Connection Route A crossing point; and
- e. New River – approximately 3.9km downstream of the Grid Connection Route B crossing point.

3.1.7 No notable or protected macrophyte species records exist within the past ten years at the above sites.

3.1.8 Cambridgeshire and Peterborough Environmental Records Centre returned one RDB species classed as Vulnerable: Water Violet *Hottonia palustris*. Water Violet was recorded in Chippenham Fen in 2009, approximately 1km from Sunnica West Site B and in 2011 in New River, approximately 1.1km from the Grid Connection Route B.

3.1.9 The Suffolk Biodiversity Information Service returned records of the Near Threatened Scarce Chaser dragonfly *Libellula fulva* approximately 70m from the Sunnica East Site A in 2011. Records were also returned for Perfoliate Pondweed *Potamogeton perfoliatus*, a Suffolk rare plant, approximately 700m from the Sunnica East Site A in the River Lark in 2013. No other protected or notable aquatic invertebrate species were reported.

Invasive non-native species

- 3.1.10 Desk study records of invasive non-native species are listed in **Table 3-2**. The table highlights the most recent records of these species at each site.
- 3.1.11 Cambridgeshire and Peterborough Environmental Records Centre and Suffolk Biodiversity Information Service returned records of four invasive species of macrophyte; Nuttall's Waterweed *Elodea nuttallii* and Canadian Pondweed *Elodea canadensis*.
- 3.1.12 A freshwater shrimp, either Northern River Crangonyctid *Crangonyx pseudogracilis* or Florida Crangonyx *Crangonyx floridanus* has been recorded in both Catchwater Drain in 2009 and Burwell Lode in 2015 by the Environment Agency (**Table 3-2**). *Crangonyx pseudogracilis* is a long-established non-native species, whereas *Crangonyx floridanus* is a highly invasive non-native species, which has only recently been recorded in the UK (Mauvisseau *et al.*, 2018). Taxonomic distinction between *Crangonyx floridanus* and *Crangonyx pseudogracilis* is extremely difficult (Mauvisseau *et al.*, 2018) so the records in **Table 3-2** do not specify which species.
- 3.1.13 Records of Signal Crayfish *Pacifastacus leniusculus* exist from the River Lark in 2005, Lee Brook in 2012 and the River Kennett in 2016.

Table 3-2: Desk study records of invasive non-native species

Watercourse	Grid Reference	Distance and from Order limits	Date of recent record	Species
Lee Brook	TL 662 733	0.04 km from Sunnica East Site A	20/10/2016	Signal Crayfish
Catchwater Drain	TL 587 681	0.42 km from Grid Connection Route B	26/10/2009	Northern River Crangonyctid or Florida Crangonyx
River Lark	TL 677 747	1.1 km from Sunnica East Site A	25/08/2004	Nuttall's Waterweed
New River and Monks Lode CWS	TL 581 698	1.21 km from Grid Connection Route B	17/08/2011	Canadian Pondweed
Burwell Lode	TL 565 690	1.70 km from Grid Connection Route B	03/07/2017	Nuttall's Waterweed
Wicken Fen	TL 574 699	1.85 km from Grid Connection Route B	03/07/2010	Canadian Pondweed

3.2 Field survey

Aquatic scoping surveys

- 3.2.1 The results of aquatic scoping at Sunnica East Sites A and B, Sunnica West Sites A and B and along the Grid Connection Routes are presented in the following sections. Site photographs can be found in Annex F.

Sunnica East Site A

Lee Brook (Waterbody ID: GB105033043020)

- 3.2.2 Lee Brook is a heavily modified 'Main River' and is currently classified by the Environment Agency as having 'Poor' ecological potential. The waterbody fails to meet 'Good' ecological potential due to water abstraction, barriers to fish passage, agricultural and rural land management and the presence of invasive non-native Signal Crayfish³.
- 3.2.3 Lee Brook flows through Sunnica East Site A before flowing into the River Lark to the north. Land use in the area is predominantly arable. This section of Lee Brook is heavily modified with a straightened planform and managed riparian vegetation to the north. Beck Bridge Gauging Station is located on the site boundary and the associated weir is a barrier to fish movement during low flows (Photo 1, Annex F). The water level was significantly lower upstream of the gauging station (10 – 30cm) compared to downstream (approximately 80 – 100cm). Water passing over the weir was 2 – 3cm deep. Macrophytes were present in the brook and would provide suitable habitat for fish and macroinvertebrates. The substrate consisted predominantly of silt and glide was the only habitat type present, typical of a straightened lowland channel (Photo 2, Annex F).
- 3.2.4 Up to date macrophyte (2015), macroinvertebrate (2019) and fish (2014) data exist at the Environment Agency monitoring site Beck Bridge Gauging Station on the Site boundary.

Ditch 01

- 3.2.5 Ditch 01 is part of a series of interconnected ditches in the northern section of Sunnica East Site A at Lee Farm (see Photo 3 and Photo 4, Annex F). The vegetation structure was not well developed relative to other ditches in the land parcel, with some areas of open standing water dominated by filamentous algae. Some emergent reeds and overhanging vegetation were present in the ditch but the overall community lacked complexity. The surrounding land is used for arable crops and the riparian area consists of scrub/shrub vegetation types.
- 3.2.6 There is no desk study data for the site.

Ditch 02

- 3.2.7 Ditch 02 is connected to Ditch 01 in the northern section of Sunnica East Site A. There is broadleaved woodland to the north and arable land to the south. The ditch was well developed in terms of vegetation structure with White Water Lily *Nymphaea alba* (Photo 6, Annex F), several pondweed species and reeds, and does not appear to have been managed recently. An open area of standing water was present in the corner of the field and contained litter (Photo 6, Annex F). The east-west section of Ditch 02 was wide (up to 6m), deep (1.2m) and heavily shaded by broadleaved woodland. The north-south section was shallower (2m) and unshaded.

³ Catchment Data Explorer - Kennett - Lee Brook Water Body

3.2.8 There are no desk study data for the site.

Ditch 03

3.2.9 Ditch 03 is connected to the River Lark to the north and Ditch 02 via a culvert. The southern section of the ditch was dry at the time of survey and the wetted area was heavily vegetated (see Photo 7 and Photo 8, Annex F). The average wetted width was 1m and scrub/shrub dominated the local land area.

3.2.10 There are no desk study data for the site. Due to the ephemeral nature of the waterbody and the culvert connection, it is of little ecological value.

Pond 08

3.2.11 Pond 08 is an artificially lined pond which is raised above ground level. It is approximately 15,540m² and is used for irrigation purposes. It was not possible to safely access the site for scoping.

3.2.12 There are no desk study data for the site.

Sunnica West Site A

Ditch 06

3.2.13 Ditch 06 is located east of the A11 and was dry during scoping (see Photo 9, Annex F).

3.2.14 Ditch 07 is located to the west of the A11 and was dry during).

Sunnica West Site B

3.2.15 Two ditches in the Sunnica West Site B were not accessible during scoping due to the presence of livestock. Further surveys were undertaken on both ditches due to their close proximity to Chippenham Fen SSSI and potential to support protected and/or notable species.

River Snail (GB105033042860)

3.2.16 The River Snail is a heavily modified 'Main River' and is currently classified by the Environment Agency as having 'Moderate' ecological potential. The waterbody fails to meet 'Good' ecological potential due to physical modifications and sewage discharges⁴.

3.2.17 The River Snail flows along the western boundary of Sunnica West Site B. Land use on the left bank is predominantly broadleaved woodland and grazing pasture on the right bank. There was evidence of poaching by livestock on the right bank (see Photo 10, Annex F). There is a gauging weir where the river meets the site boundary which appears to be a barrier to the upstream movement of fish (see Photo 11, Annex F). The river was relatively shallow with an average depth of 15cm. Silt was the predominant substrate type with a small amount of gravel. Macrophytes were present in the channel including filamentous algae, Fool's

⁴ Catchment Data Explorer - Soham Lode Water Body

Watercress *Apium nodiflorum* and a water-crowfoot *Ranunculus* species which would provide suitable habitat for fish and macroinvertebrates.

- 3.2.18 Macroinvertebrate data exist at two locations on the River Snail approximately 0.1 km upstream of Sunnica West Site B (data from 2013) and approximately 1.43 km downstream of this site (data from 2019).

Ditch 08

- 3.2.19 Ditch 08 is located at Chippenham Park. The ditch was dry during scoping (see Photo 12, Annex F).

Ditch 13

- 3.2.20 Ditch 13 is also located at Chippenham Park. The ditch was dry during scoping.

Grid Connection Routes

River Kennett (Waterbody ID: GB105033042990)

- 3.2.21 The River Kennett is a heavily modified 'Main River' and is currently classed by the Environment Agency as having 'Moderate' ecological potential. The waterbody fails to meet 'Good' ecological potential due to sewage discharges, groundwater abstraction, physical modifications (ecological discontinuity), poor nutrient management and the presence of invasive non-native Signal Crayfish⁵.

- 3.2.22 The River Kennett joins the Lee Brook south of Freckenham. Due to limited access, scoping of the river was only possible outside of the Grid Connection Routes. Two areas were assessed, one upstream (see Photo 13, Annex F) and one downstream (see Photo 14, Annex F) of the Grid Connection Route A. The upstream section was heavily modified with a major bridge crossing (A11) and reinforced banks. There was no flowing water in the channel and only a few puddles of stagnant water were present following heavy rain the previous day. The substrate consisted primarily of silt. Macrophytes were growing in the channel which suggests the watercourse was not permanently dry. The invasive Himalayan Balsam *Impatiens glandulifera* was present on the banks and in the channel. The downstream section was completely dry with a visible cobble/gravel substrate. Bankside vegetation was more developed with broadleaved woodland and scrub.

- 3.2.23 Environment Agency macroinvertebrate data exist 0.94km upstream of the Grid Connection Route crossing from 2018, suggesting the site is not permanently dry.

Burwell Lode (Waterbody ID: GB105033042720)

- 3.2.24 Burwell Lode is a heavily modified 'Main River' and is currently classed by the Environment Agency as having 'Moderate' ecological potential. The waterbody fails to meet 'Good' ecological potential due to physical modifications, sewage discharges, poor livestock management, poor nutrient management, transport drainage and atmospheric deposition of mercury and its compounds⁶.

⁵ Catchment Data Explorer - Kennett-Lee Brook Water Body

⁶ Catchment Data Explorer - Burwell Lode Water Body

- 3.2.25 The Grid Connection Route B crosses Burwell Lode (see Photo 15, Annex F) north of Burwell, through arable land. This section is navigable by boat. There are public footpaths along both bank tops and riparian vegetation comprises reeds, grasses and scrub. There is little flow and glide is the only habitat type present. The channel is relatively wide (approximately 12m) and deep. Macrophytes and overhanging vegetation would provide suitable habitat for fish and macroinvertebrates.
- 3.2.26 Fish survey data exist from 2014 at two Environment Agency monitoring sites on Burwell Lode approximately 110 m and 600 m from the site boundary. Macroinvertebrate data from 2015 exist 4.5 km from the cable route crossing.

Catchwater Drain

- 3.2.27 Catchwater Drain is a 'Main River' which eventually joins another drain and becomes Burwell Lode, north of Burwell. The surveyed section sits partially within the Burwell Lode catchment and is therefore classed as having 'Moderate' ecological potential.
- 3.2.28 The Grid Connection Route B passes over Catchwater Drain north-east of Burwell. The watercourse is an artificial drainage channel, with a straightened planform and homogeneous flow (see Photo 16, Annex F). The surveyed reach had an average width of 4m and depth of 0.3m. Several habitat features of interest were noted including underwater tree roots, submerged and emergent macrophytes, detritus, overhanging vegetation and large woody debris. A short section was culverted beneath a single-track road. A small shoal of coarse fish was observed during the survey.
- 3.2.29 Macroinvertebrate data from 2009 exist 0.42km from the Site boundary.

Ditch 09

- 3.2.30 Ditch 09 is located parallel to Ness Road in the Grid Connection Route B. Vegetation was obscuring view of the ditch and there were no safe access points to assess possible habitats (see Photo 17, Annex F).

Ditch 10

- 3.2.31 Ditch 10 (see Photo 18, Annex F) is a complex of dry roadside ditches within the Grid Connection Route B, running parallel to Factory Road.

Ditch 11

- 3.2.32 Ditch 11 is located within the Grid Connection Route B, south of Factory Road. Access was restricted due to overgrown vegetation and private land.

Ditch 12

- 3.2.33 Ditch 12 (see Photo 19, Annex F) is a series of dry ditches within the Grid Connection Route B, running along Newnham Drive.

Ditch Vegetation Surveys

- 3.2.34 No macrophyte species were recorded that receive specific protection via Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), or that are listed on Section 41 of the NERC Act as being of Principal Importance for nature conservation in England. This does not remove the need to further assess the species assemblage and species recorded for their nature conservation importance. There are other criteria for nature conservation value (see **Table 2-4** for example) and legal protections do not always provide a true or current reflection of all species of nature conservation concern.
- 3.2.35 Ditches 01 and 02 located in the Sunnica East Site A were identified as requiring further investigation during the scoping survey, with an additional two ditches in Sunnica West Site B also requiring surveys. Due to its length and variable habitat, Ditch 01 on Sunnica East Site A was surveyed as two separate entities during the ditch surveys: Ditch 01A (north-south section) and Ditch 01B (east-west section).

Sunnica East Site A: Ditch 01A at Lee Farm

- 3.2.36 Ditch 01A had a native species richness score of 9, with nine native macrophyte taxa recorded in the survey area; Narrow-leaved Water Plantain *Alisma lanceolatum*, Broad-leaved Pondweed *Potamogeton natans*, Fennel-leaved Pondweed *Potamogeton pectinatus*, Filamentous Algae, Ivy-leaved Duckweed *Lemna trisulca*, Common Reed *Phragmites australis*, Reedmace *Typha latifolia*, Common Duckweed *Lemna minor* and a sedge *Carex* species Water Mint *Mentha aquatica* and Soft Rush *Juncus effusus* were also recorded in the ditch, but are not target species in the native species richness metric (Buglife, 2013) (Ref 2).
- 3.2.37 All of the species present had a conservation status score of 1 and as a result, the overall native species conservation status score was 1. A score of 1 indicates all species recorded are common throughout the UK and are not awarded any special protection.
- 3.2.38 Ditch 01A achieved a habitat quality score of 1.72 which indicates the macrophyte community is adapted to richly fertile or extremely rich conditions. Broadleaved pondweed and ivy-leaved duckweed had the highest habitat quality scores and are both indicators of moderate water quality.
- 3.2.39 All species recorded in Ditch 01A were native, therefore the plant community naturalness score was 0. A negative naturalness score would indicate the presence of invasive non-native species.

Sunnica East Site A: Ditch 01B at Lee Farm

- 3.2.40 Ditch 01B had a native species richness score of 6, with 6 native macrophyte taxa recorded in the survey area; Narrow-leaved Water Plantain, Ivy-leaved Duckweed, Common Reed, Reedmace, a stonewort *Chara* species and a sedge *Carex* species. The non-native Nuttall's Waterweed was also recorded in this ditch.
- 3.2.41 All native species present had a conservation status score of 1 and as a result, the overall native species conservation status score was 1. A score of 1 indicates all species recorded are common throughout the UK and are not awarded any special protection.

- 3.2.42 Ditch 01B achieved a habitat quality score of 1.79 which indicates the macrophyte community is adapted to richly fertile or extremely fertile conditions. A sedge, a stonewort and Ivy-leaved Duckweed had the highest habitat quality scores and are indicators of moderate water quality.
- 3.2.43 Nuttall's Waterweed was recorded in Ditch 01B, which resulted in a plant community naturalness score of -3. A negative score indicates the presence of invasive non-native species. A score of 0 would indicate invasive non-native species were not recorded.

Sunnica East Site A: Ditch 02 at Lee Farm

- 3.2.44 Ditch 02 had a native species richness score of 9, with nine native macrophyte taxa present in the survey area; Narrow-leaved Water-plantain, Ivy-leaved Duckweed, Common Reed, Reedmace, Spiked Water-milfoil *Myriophyllum spicatum*, European White-water Lily, Broad-leaved Pondweed, Branched Bur Reed *Sparganium erectum* and Common Duckweed. Nuttall's Waterweed, Canadian Pondweed and Least Duckweed *Lemna minuta* were also recorded but are not scoring species in the native species richness metric.
- 3.2.45 All species present had a conservation status score of 1 and as a result, the overall native species conservation status score was 1. A score of 1 indicates all species recorded are common throughout the UK and are not awarded any species protection.
- 3.2.46 Ditch 02 achieved a habitat quality score of 1.87 which indicates the macrophyte community is adapted to richly fertile or extremely fertile conditions. European White-water Lily and Broad-leaved Pondweed had the highest habitat quality scores, indicative of moderate water quality.
- 3.2.47 Three non-native macrophyte species were recorded in Ditch 02; Canadian pondweed, Nuttall's Waterweed and Least Duckweed, which resulted in Ditch 02 scoring -6 for plant community naturalness.

Sunnica West Site B: Ditch 01

- 3.2.48 Ditch 04 was found to be dry when access was obtained. Based upon terrestrial succession, the ditch appeared to have been dry for a prolonged period.

Sunnica West Site B: Ditch 02

- 3.2.49 Ditch 02 had a native species richness of 3, with 3 native macrophyte taxa recorded in the survey area; Fool's Water Cress, Common Duckweed and Common Reed. Other non-scoring taxa were also recorded in the survey; Field Horsetail *Equisetum arvense*, Least Duckweed, Soft Rush and Hard Rush *Juncus inflexus*.
- 3.2.50 All species present had native species conservation status scores of 1 and as a result, the overall plant conservation status score was 1. A score of 1 indicates all species recorded are common throughout the UK and are not awarded any species protection.
- 3.2.51 Ditch 02 achieved a habitat quality score of 1.38 which indicates the macrophyte community is adapted to richly fertile or extremely fertile conditions. Fool's water

Cress and Common Duckweed had the highest habitat quality scores, indicative of poor water quality.

- 3.2.52 The non-native Least Duckweed was present in Ditch 02, resulting in a plant community naturalness of -3.

Aquatic Invertebrates

- 3.2.53 No macroinvertebrate species were recorded that receive specific protection via Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) (Ref 13), or that are listed on Section 41 of the NERC Act (Ref 14) as being of principal importance for nature conservation in England. This does not remove the need to further assess the species assemblage and species recorded for their nature conservation importance. There are other criteria for nature conservation value (see **Table 2-4** for example), and legal protections do not always provide a true or current reflection of all species of nature conservation concern.

Sunnica East Site A: Ditch 01A at Lee Farm

- 3.2.54 A moderate diversity of macroinvertebrate species was recorded (17 species), however, the community was dominated by several species of snails. The CCI score was 8.4 indicating the ditch has a moderate conservation value in terms of the CCI index. The site supported one species of Local⁷ distribution, the Hairy Dragonfly *Brachytron pratense*. The majority of species recorded at the site were very common.
- 3.2.55 The biological water quality of the site was moderate, indicating the site is impacted by moderate water quality or habitat (WHPT score 71.8; ASPT 3.8). A number of pollution tolerant species were recorded in high numbers including true flies (*Orthoclaadiinae* and *Tanytarsini*), Water Hoglouse *Asellus aquaticus* and molluscs (*Lymnaeidae*, *Bithyniidae*, *Physidae*, *Planorbidae* and *Sphaeridae*). A single pollution sensitive species of caddisfly was recorded *Agrypnia pagetana* or *Agrypnia picta*.
- 3.2.56 The community was composed predominantly of taxa that are adapted to slow and/or standing waters (LIFE: 5.5) and the species present are tolerant of heavily sedimented conditions (PSI: 2.4).

Sunnica East Site A: Ditch 01B at Lee Farm

- 3.2.57 A moderate diversity of macroinvertebrate species was recorded (15 species) in the ditch. The macroinvertebrate assemblage was dominated by crustaceans (Water Hoglouse and a crangonid a *Crangonyx* species) which comprised 67% of individuals in the sample. The CCI score was 10 indicating the ditch has a moderate

⁷ Those species not uncommon enough to fall within any of the preceding categories (Regionally Notable to Endangered (RDB1)), but which are nonetheless of some interest. A species may qualify, for example, by being very widely distributed but nowhere common, by being restricted to a specialised habitat such as brackish pools but being a common component of this habitat, or simply by being uncommon but not uncommon enough to be Notable. Species with few records but which are suspected of being badly under-recorded are likely to be placed in the Local category. Local species may also be Regionally Notable (Chadd & Extence, 2004).

conservation value in terms of CCI index. The site supported one species of Local distribution, the snail Leach's Bithynia *Bithynia leachi*.

- 3.2.58 The biological water quality of the site was moderate, indicating the site is moderately impacted by water quality or habitat (WHPT 78.5; APST; 3.7). The macroinvertebrate assemblage contained largely pollution tolerant taxa, with a single pollution sensitive caddisfly recorded (*Phryganeidae* sp.).
- 3.2.59 The community was composed of taxa that are adapted to slow and/or standing waters (LIFE: 5.6) and the species present are tolerant of heavily sedimented conditions (PSI: 0).

Sunnica East Site A: Ditch 02 at Lee Farm

- 3.2.60 A moderate diversity of macroinvertebrate species was recorded (19 species) in the ditch. Molluscs dominated the macroinvertebrate community with high numbers of crangonids and Water Hoglouse. The CCI score was 9.4 indicating the ditch has a moderate conservation value in terms of CCI index. Two species of Local distribution were recorded, the Hairy Dragonfly and caddisfly *Agrypnia pagetana*.
- 3.2.61 The biological water quality of the site was moderate, indicating the site is moderately impacted by water quality or habitat (WHPT 69.4; APST; 3.7). A high number of pollution tolerant taxa were recorded, with only two pollution sensitive species of caddisfly present *Phryganea bipunctata* and *Agrypnia pagetana*.
- 3.2.62 The community was composed of taxa that are adapted to slow and/or standing waters (LIFE: 5.4) and the species present are tolerant of heavy levels of sedimentation (PSI: 0).

Sunnica West Site B: Ditch 02

- 3.2.63 A low diversity of macroinvertebrate species was recorded (12 species). The Whirlpool Ram's Horn Snail *Anisus vortex* and Water Hoglouse comprised 51 % of individuals in the sample. The CCI score was 7.9 indicating the ditch has a moderate conservation value in terms of CCI index. The site supported one species of Local distribution, the diving beetle *Ilybius quadriguttatus*.
- 3.2.64 The biological water quality of the site was poor/moderate indicating the site was impacted/moderately impacted by water quality or habitat (WHPT 59.9; APST; 3.7).
- 3.2.65 The community was dominated by taxa that are adapted to slow and/or standing waters (LIFE: 5.8) and the species present are tolerant of heavy levels of sedimentation (PSI: 6.7).

4 Nature Conservation Evaluation and Conclusions

- 4.1.1 This section contains an assessment of the aquatic plants, fish and macroinvertebrates likely to be impacted by the development of the Scheme to determine their relative nature conservation value using the approach detailed in Section 2.3 of this report. There is no reasonable likelihood of the features present being of international nature conservation importance, so this can be discounted. This is on the basis that the site does not support any species considered notable in an international context (e.g. species for which Great Britain holds a substantial part of the international population, or species which are restricted to Great Britain).

Aquatic Survey results

Macrophytes

- 4.1.2 During the ditch surveys, no macrophyte species of conservation importance were recorded, with the community sampled typical of nutrient rich waterbodies. Narrow-leaved Water Plantain was present at all three ditches in the Sunnica East Site A and is considered a Suffolk rarity, however, it is not a priority species and is common throughout England. A similar macrophyte assemblage is expected to be common in the wider landscape. Therefore, none of the ditches can be considered to support macrophyte assemblages of any more than Local value.

Macroinvertebrates

- 4.1.3 During surveys at Sunnica East Site A, three species with a local distribution were recorded: the Hairy Dragonfly, the snail *Bithynia leachi*. and caddisfly *Agrypnia pagetana*. One species with a local distribution was recorded at the Sunnica West Site B; the diving beetle *Ilybius quadriguttatus*. None of these are Red Data Book species or species of conservation importance.
- 4.1.4 The community composition across all the surveyed sites is considered to be of moderate conservation value under the CCI index, with similar macroinvertebrate assemblages expected to be common across the wider landscape. There were no local BAP species recorded during any of the surveys. Therefore, none of the ditches can be considered to support macroinvertebrate communities of any more than Local value.

5 References

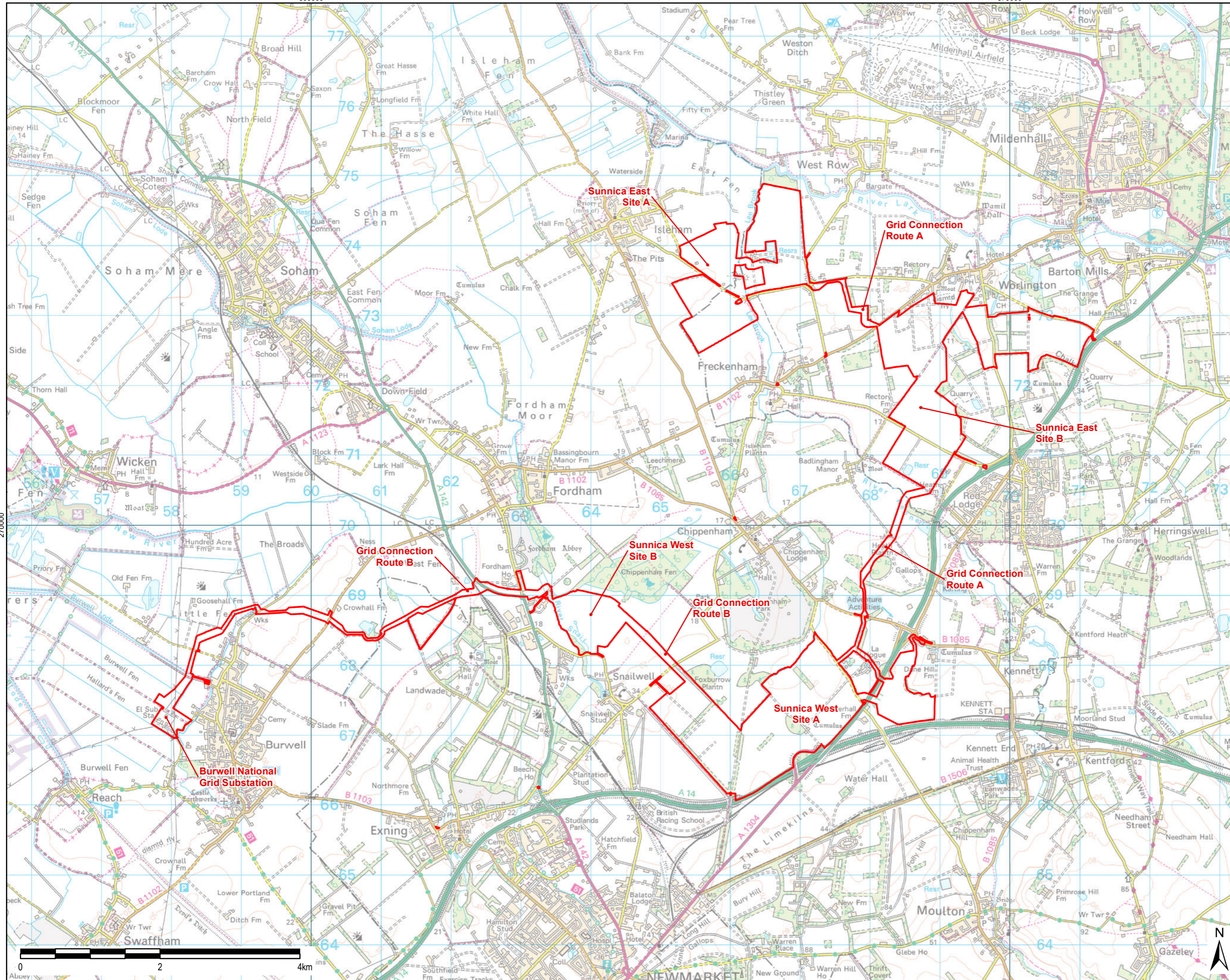
- Ref 1. AECOM, 2020. Sunnica Energy Farm Preliminary Ecological Appraisal.
- Ref 2. Buglife (2013) A Manual for the Survey and Evaluation of the Aquatic Plant and invertebrate Assemblages of Grazing Marsh Ditch Systems Version 6. Buglife.
- Ref 3. The Vascular Plant Red Data List for Great Britain. Available online.
- Ref 4. Preston, C. D., Pearman, D. A. & Dines, T. D. (ed.) (2002) New Atlas of the British and Irish flora. Oxford: Oxford University Press.
- Ref 5. IUCN Red List of Threatened Species. Available online.
- Ref 6. Environment Agency (last issue: 2014) Freshwater macro-invertebrate analysis of riverine samples. Operational instruction 024_08
- Ref 7. CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Marine. Chartered Institute of Ecology and Environmental Management, Winchester
- Ref 8. McLeod, C.R., Yeo, M., Brown, A.E., Burn, A.J., Hopkins, J.J. & Way, S.F. (eds.) (2005) The Habitats Directive: selection of Special Areas of Conservation in the UK. 2nd edn. Joint Nature Conservation Committee, Peterborough.
- Ref 9. Curson, J., Howe, M., Webb, J., Heaver, D. & Tonhasca, A. (2019) Guidelines for the Selection of Biological SSSIs Part 2: Detailed Guidelines for Habitats and Species Groups. Chapter 20 Invertebrates. Joint Nature Conservation Committee, Peterborough
- Ref 10. SBIS. County Wildlife Selection Criteria.
- Ref 11. Cambridgeshire and Peterborough County Wildlife Sites Panel., 2014. Cambridgeshire and Peterborough County Wildlife Sites Selection Guidelines. The Wildlife Trust
- Ref 12. MAGIC Website
- Ref 13. HMSO (1981). The Wildlife & Countryside Act 1981. HMSO, London.
- Ref 14. HMSO (2006). The Natural Environment and Rural Communities Act. HMSO, London.

Annex A Figures

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

The Order Limits



Document Reference: EN010106/APP/6.3
APFP Regulation: 5(2)(a)

Copyright: Reproduced from Ordnance Survey digital map data © Crown copyright 2021. All rights reserved. Licence number 0100031673.

Purpose of Issue
FOR DCO SUBMISSION

Client
SUNNICA LTD



Drawing Title
FIGURE 1:
SITE LOCATION

Drawn BF	Checked AB	Approved NC	Date 21/10/2021
AECOM Internal Project No. 60589004		Scale @ A3 1:50,000	

THIS DOCUMENT HAS BEEN PREPARED PURSUANT TO AND SUBJECT TO THE TERMS OF AECOM'S APPOINTMENT BY ITS CLIENT. AECOM ACCEPTS NO LIABILITY FOR ANY USE OF THIS DOCUMENT OTHER THAN BY ITS ORIGINAL CLIENT OR FOLLOWING AECOM'S EXPRESS AGREEMENT TO SUCH USE, AND ONLY FOR THE PURPOSES FOR WHICH IT WAS PREPARED AND PROVIDED.

AECOM
Unit 1 Waterbrook Court,
Gilton,
Cambridge, CB3 0NA
United Kingdom
Telephone (01223) 488000
www.aecom.com

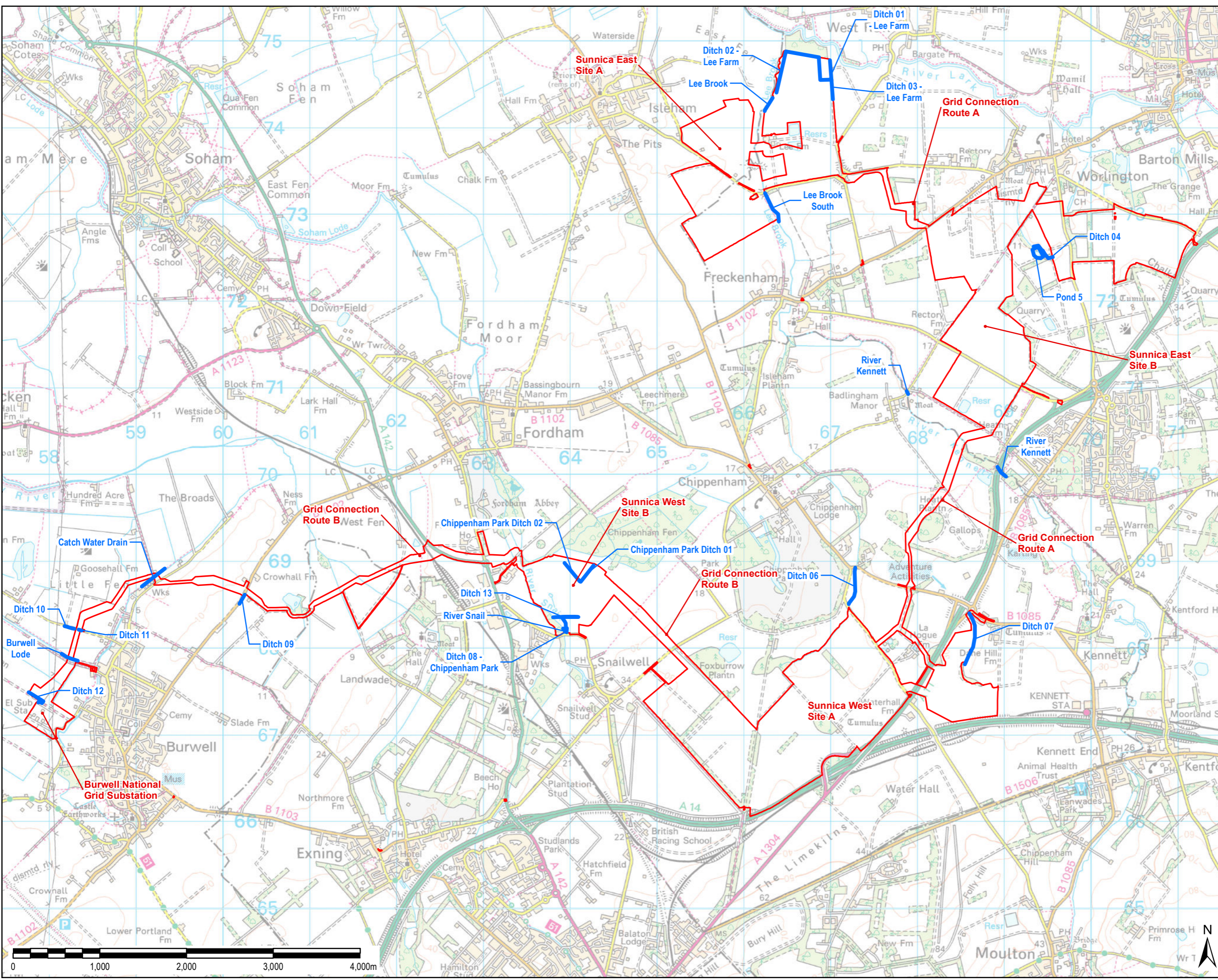


Drawing Number 60589004_ES_ECO_003	Rev 0
---------------------------------------	----------

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- The Order Limits
- Aquatic Ecology Survey Area



Document Reference: EN010106/APP/?
APFP Regulation: 5(2)(a)

Copyright: Reproduced from Ordnance Survey digital map data © Crown copyright 2021. All rights reserved. Licence number 010031673.

Purpose of Issue: **FOR DCO SUBMISSION**

Client: **SUNNICA LTD**



Drawing Title: **FIGURE 2:
AQUATIC ECOLOGY
SURVEY AREAS**

Drawn AD	Checked LL	Approved NC	Date 21/10/2021
AECOM Internal Project No. 60589004		Scale @ A3 1:40,000	

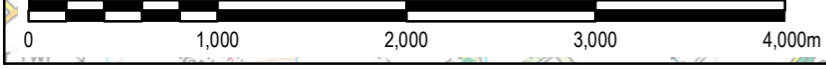
THIS DOCUMENT HAS BEEN PREPARED PURSUANT TO AND SUBJECT TO THE TERMS OF AECOM'S APPOINTMENT BY ITS CLIENT. AECOM ACCEPTS NO LIABILITY FOR ANY USE OF THIS DOCUMENT OTHER THAN BY ITS ORIGINAL CLIENT OR FOLLOWING AECOM'S EXPRESS AGREEMENT TO SUCH USE, AND ONLY FOR THE PURPOSES FOR WHICH IT WAS PREPARED AND PROVIDED.

AECOM
Unit 1 Wellbrook Court,
Gilton
Cambridge, CB3 0NA
United Kingdom
Telephone (01223) 488000
www.aecom.com



Drawing Number 60589004_ES_ECO_007	Rev 0
--	-----------------

File Name: W:\Active Projects\Solar Associates\GIS\02_Maps\SEF_007_AquaticEcologySurveyAreas.mxd



Annex B Whalley, Hawkes, Paisley and Trigg (WHPT) Metric

- B.1.1.1 There are approximately 4,000 species of aquatic macroinvertebrates in the British Isles. To simplify the analysis of the samples and the data we do not identify individual species but only the major types (taxa), mostly at the family taxonomic level. A key piece of information is the number of different taxa at a site. A fall in the number of taxa indicates ecological damage, including pollution (organic, toxic and physical pollution such as siltation, and damage to habitats or the river channel).
- B.1.1.2 The WHPT scoring system (WFD-UKTAG, 2014) is based upon the sensitivity of macroinvertebrate families to organic pollution. It replaces the Biological Monitoring Working Party (BMWP) system (Hawkes, 1997) previously used in the UK.
- B.1.1.3 The WHPT system assigns a numerical value to about 100 different taxa (known as the WHPT-scoring taxa) according to their sensitivity to organic pollution. In addition to the presence of macroinvertebrate taxa at a sampling site, as in the BMWP scoring system, the WHPT system also uses another type of information, this being the abundances of different scoring taxa.
- B.1.1.4 Taxa abundances are classified in four categories (Class 1: 1 to 10 individuals, Class 2: 11 to 100 individuals, Class 3: 101 to 1,000 individuals, and Class 4: > 1,000 individuals). A score (Pressure Sensitivity Scores (PSs)) is then assigned to each taxa, depending of the taxa sensitivity and abundances recorded.
- B.1.1.5 The total WHPT score for a sample corresponds to the sum of PSs of scoring taxa recorded. The Average Score Per Taxon (ASPT) values are calculated as the Sum PSs divided by the number of scoring taxa (NTAXA). As such, three metrics are calculated:
- WHPT score
 - NTAXA
 - ASPT
- B.1.1.6 Some animals are more susceptible to organic pollution than others, and the presence of sensitive species indicates good water quality. This fact is taken into account by the WHPT metrics.
- B.1.1.7 The most useful way of summarising the biological data was found to be one that combined the number of taxa and the ASPT. The best quality is indicated by a diverse variety of taxa, especially those that are sensitive to pollution. Poorer quality is indicated by a smaller than expected number of taxa, particularly those that are sensitive to pollution. Organic pollution sometimes encourages an increased abundance of the few taxa that can tolerate it. However, maximum achievable values will vary between geological regions. For example, pristine lowland streams in East Anglia will always score lower than pristine Welsh mountain streams because they are unable to support many of the high-scoring taxa associated with fast flowing habitat. WHPT scores and ASPT for different types watercourse are dependent on the quality and diversity of habitat, natural

water chemistry (associated with geology, distance from source etc.), altitude, gradient, time of year the sample was taken and other factors.

Annex C Community Conservation Index (CCI)

C.1.1.1 The Community Conservation Index (Chadd & Extence, 2004⁸) allows a classification of the nature conservation value associated with a macroinvertebrate community. The CCI score for one sample is derived from individual Conservation Scores (CS), assigned to some species of aquatic macroinvertebrates and relating closely to the available published Red Data Books (Bratton, 1991a, 1991b; Shirt, 1987). Conservation Scores assigned to individual species vary from 1 to 10, as detailed in Table C-1. The derived CCI scores generally vary from 0 to > 20, as detailed in Table C-2. Table C-2 below provides a guide to interpreting CCI scores.

Table C-1: Conservation Scores from the Community Conservation Index (from Chadd & Extence, 2004)

Conservation Score	Relation to Red Data Books
10	RDB1 (Endangered)
9	RDB2 (Vulnerable)
8	RDB3 (Rare)
7	Notable (but not RDB status)
6	Regionally notable
5	Local
4	Occasional (species not in categories 10-5, which occur in up to 10% of all samples from similar habitats)
3	Frequent (species not in categories 10-5, which occur in up to >10-25% of all samples from similar habitats)
2	Common (species not in categories 10-5, which occur in up to >25-50% of all samples from similar habitats)
1	Very common (species not in categories 10-5, which occur in up to >50-100 % of all samples from similar habitats)

Table C-2: General guide to CCI scores (from Chadd & Extence, 2004)

CCI Score	Description	Interpretation
0 to 5.0	Sites supporting only common species and/or community of low taxon richness	Low conservation value
> 5.0 to 10.0	Sites supporting at least one species of restricted distribution and/or a community of moderate taxon richness	Moderate conservation value
> 10.0 to 15.0	Sites supporting at least one uncommon species, or several species of restricted distribution and/or a community of high taxon richness	Fairly high conservation value
> 15.0 to 20.0	Sites supporting several uncommon species, at least one of which may be nationally rare and/or a community of high taxon richness	High conservation value
> 20.0	Sites supporting several rarities, including species of national importance and/or a community of very high taxon richness	Very high conservation value

⁸ Chadd, R. & Extence, C. (2004) The conservation of freshwater macroinvertebrate populations: a community-based classification scheme. *Aquatic Conservation: Marine and Freshwater Ecosystems* 14: 597-624

Annex D Lotic-Invertebrate Index for Flow Evaluation (LIFE)

D.1.1.1 The Lotic-Invertebrate Index for Flow Evaluation (LIFE) provides an assessment of the impact of variable flows on benthic macroinvertebrate communities. Under the assessment, individual species of aquatic macroinvertebrates are assigned to a flow group varying from I to VI, as detailed in Table D-3. The LIFE score for a macroinvertebrate sample is then derived (mean of individual scores) from individual species scores and abundances, as detailed in Table D-4. LIFE scores for a macroinvertebrate sample ranges from 1 to 12, where highest scores describe communities adapted to rapid flows.

Table D-3: Flow groups used to derive LIFE scores (from Extence, Balbi and Chadd, 1999)

Life score Group	Description	Mean current velocity
I	Taxa primarily associated with rapid flows	Typically > 100 cm.s-1
II	Taxa primarily associated with moderate to fast flows	Typically 20 to 100 cm.s-1
III	Taxa primarily associated with slow or sluggish flows	Typically < 20 cm.s-1
IV	Taxa primarily associated with (usually slow) and standing waters	
V	Taxa primarily associated with standing waters	
VI	Taxa frequently associated with drying or drought impacted sites	

Table D-4: Abundance categories used to derive LIFE scores (from Extence, Balbi and Chadd, 1999)

Abundance category	Description
A	1 to 9
B	10 to 99
C	100 to 999
D	1000 to 9999
E	> 10000

Table D-5: A guide to interpreting LIFE scores (from Extence, Balbi and Chadd, 1999)

Flow groups	Abundance categories			
	A	B	C	D/E
I	9	10	11	12
II	8	9	10	11
III	7	7	7	7
IV	6	5	4	3
V	5	4	3	2
VI	4	3	2	1

Annex E Proportion of sediment-sensitive invertebrates (PSI)

- E.1.1.1 The Proportion of Sediment-sensitive Invertebrates (PSI) index (Extence et. Al, 2013⁹) provides an assessment of the extent to which the river bed is composed of, or covered by, fine sediments.
- E.1.1.2 Under the assessment, individual species of aquatic macroinvertebrates are assigned a Fine Sediment Sensitivity Rating (FSSR) ranging from A to D, as detailed in Table E-6. The PSI score for a macroinvertebrate sample is then derived from individual species scores and abundances, as detailed in Table E-7. The PSI score corresponds to the percentage of fine sediment-sensitive taxa present in a sample. PSI score for a sample ranges from 0 to 100 where lowest scores correspond to watercourses with high fine sediment cover.

Table E-6: Fine Sediment Sensitivity Rating (FSSR) groups used to derive PSI scores (from Extence et al., 2013)

FSSR group	Description
A	Highly sensitive
B	Moderately insensitive
C	Moderately insensitive
D	Highly insensitive

Table E-7: Abundance categories used to derive PSI scores (from Extence, et al., 2013)

Flow groups	Abundance			
	1-9	10-99	100-999	>999
A	2	3	4	5
B	1	2	3	4
C	1	2	3	4
D	2	3	4	5

Table E-8: Interpretation of PSI scores (from Extence et al., 2013)

PSI	Description
81-100	Minimally sedimented
61-80	Slightly sedimented
41-60	Moderately sedimented
21-40	Sedimented
0-20	Heavily sedimented

⁹ Extence, C. Chadd, R. England, J. Dunbar, M. Wood, P. & Taylor, E. (2013) The assessment of fine sediment accumulation in rivers using macro-invertebrate community response. River Research and Applications 29: 17–55.

Annex F Photographs



Photo 1: Lee Brook at Beck Bridge gauging station



Photo 2: Lee Brook downstream of gauging station









Photo 3: Ditch 01 at Lee Farm



Photo 4: Ditch 01 at Lee Farm



<p>Photo 5: Ditch 02 at Lee Farm</p>	<p>Photo 6: Ditch 02 at Lee Farm</p>
 A close-up photograph of a ditch bank. The bank is heavily overgrown with dense, tangled vegetation, including several large, gnarled tree trunks and thick, leafy bushes. The ground is covered in fallen leaves and twigs.	 A wide-angle photograph of a ditch cutting through a grassy field. The ditch is filled with water and surrounded by tall grasses and various wildflowers. The background shows a line of trees under a cloudy sky.
<p>Photo 7: Ditch 03 at Lee Farm</p>	<p>Photo 8: Ditch 03 at Lee Farm</p>
 A photograph of a ditch in a wooded area. The ditch is narrow and filled with water, surrounded by a dense forest of trees. The ground is covered in fallen leaves and twigs.	 A photograph of a ditch in a grassy field. The ditch is narrow and filled with water, surrounded by tall grasses and various wildflowers. The background shows a line of trees under a cloudy sky.
<p>Photo 9: Ditch 06 on La Hogue Land</p>	<p>Photo 10: River Snail</p>
 A photograph of a ditch with a concrete structure. The ditch is filled with water and surrounded by trees and vegetation. A concrete structure, possibly a weir or a gate, is visible in the foreground.	 A photograph of a grassy field. The field is filled with tall grasses and various wildflowers. The background shows a line of trees under a cloudy sky.
<p>Photo 11: River Snail</p>	<p>Photo 12: Ditch 08 at Chippenham Park</p>

	
<p>Photo 13: River Kennett upstream of Grid Connection Route A</p>	<p>Photo 14: River Kennett downstream of Grid Connection Route A</p>
	
<p>Photo 15: Burwell Lode at the Grid Connection Route B crossing</p>	<p>Photo 16: Catchwater Drain at Grid Connection Route B crossing point</p>
	
<p>Photo 17: Ditch 09 on Ness Road</p>	<p>Photo 18: Ditch 10 on Factory Road</p>
	
<p>Photo 19: Ditch 12 on Newnham Drive</p>	

Annex G Data

Aquatic Macroinvertebrate

Table G-9: Aquatic Macroinvertebrate Data

Family	Species	BMWP score	WHPT score (presence only)	Conservation Score	Flow group	FSSR Score	Lee Farm Ditch 01A	Lee Farm Ditch 01B	Lee Farm Ditch 2	Chippenham park Ditch 2
Flatworms								2		
Dendrocoelidae	<i>Dendrocoelum lacteum</i>	5	3.0	2	IV		1	9		
Planariidae	<i>Polycelis sp.</i>	5	4.9			D		1		
Dugesiidae	<i>Dugesia lugubris/polychroa</i>	5	2.9	2	IV	D		1		
Snails										
Lymnaeidae	<i>Stagnicola sp.</i>	3	3.3		VI	D	4	3		4
Lymnaeidae	<i>Lymnaea stagnalis</i>	3	3.3	1	IV	D	55	3	60	
Lymnaeidae	<i>Radix balthica</i>	3	3.3	1	IV	D	189		70	
Lymnaeidae	<i>Radix peregra</i>							61		
Bithyniidae	<i>Bithynia tentaculata</i>	3	3.7	1	IV	D	3	23	80	
Bithyniidae	<i>Bithynia leachi</i>	3	3.7	5	IV	D		4		
Physidae	Physidae (juvenile / damaged)	3	2.4		IV	D	7			
Physidae	<i>Physa sp.</i>	3	2.4			D			2	
Physidae	<i>Physa fontinalis</i>	3	2.4	1	III	D		9		4
Physidae	<i>Physella sp.</i>	3	2.4			D	14			
Succineidae	<i>Succinea sp.</i>	-	-							70
Planorbidae	<i>Planorbarius corneus</i>	3	3.1	4	IV	D	15			
Planorbidae	<i>Planorbis sp.</i>	3	3.1			D	21	4		
Planorbidae	<i>Planorbis carinatus</i>	3	3.1	1	IV	D		4	30	
Planorbidae	<i>Planorbis planorbis</i>	3	3.1	1	IV	D	31			
Planorbidae	<i>Anisus vortex</i>	3	3.1	1	IV	D	1	2	50	205
Planorbidae	<i>Bathyomphalus contortus</i>	3	3.1	2	IV	D				5
Limpets and mussels										

Family	Species	BMWP score	WHPT score (presence only)	Conservation Score	Flow group	FSSR Score	Lee Farm Ditch 01A	Lee Farm Ditch 01B	Lee Farm Ditch 2	Chippenham park Ditch 2
Acroloxiidae	<i>Acroloxus lacustris</i>	6	3.6	2	IV				2	
Sphaeriidae	<i>Pisidium sp.</i>	3	3.9			D	1	30	15	10
Worms										
Oligochaeta		1	2.7			D		13		
Leeches										
Glossiphoniidae	Glossiphoniidae (juvenile / damaged)	3	3.2		IV	C				1
Glossiphoniidae	<i>Glossiphonia complanata</i>	3	3.2	1	IV	C				2
Glossiphoniidae	<i>Helobdella stagnalis</i>	3	3.2	1	IV	C			2	
Erpobdellidae	Erpobdellidae (juvenile / damaged)	3	3.1		IV	C				1
Mites										
Hydracarina		-	-				1			
Crustaceans										
Cladocera		-	-					9		
Gammaridae	Gammaridae	6	4.4		II	B	1			
Gammaridae	<i>Gammarus sp.</i>	6	4.4			B				9
Gammaridae	<i>Gammarus pulex</i>	6	4.4	1	II	B	6			5
Crangonyctidae	<i>Crangonyx sp.</i>	6	3.9				24	207	100	
Asellidae	<i>Asellus sp.</i>	3	2.8			D				10
Asellidae	<i>Asellus aquaticus</i>	3	2.8	1	IV	D	33	270	40	110
Mayflies										
Baetidae	<i>Cloeon dipterum</i>	4	5.5	1	IV	D			1	
Damselflies										
Coenagrionidae	Coenagrionidae (juvenile / damaged)	6	3.5		IV	D	26	1	50	25

Family	Species	BMWP score	WHPT score (presence only)	Conservation Score	Flow group	FSSR Score	Lee Farm Ditch 01A	Lee Farm Ditch 01B	Lee Farm Ditch 2	Chippenham park Ditch 2
Coenagrionidae	<i>Pyrhosoma nymphula</i>	6	3.5	3						10
Dragonflies										
Aeshnidae	<i>Brachytron pratense</i>	8	4.7	5	IV	C	2		1	
Aeshnidae	<i>Aeshna grandis</i>	8	4.7	2	V	C	1		2	
True bugs										
Nepidae	<i>Nepa cinerea</i>	5	2.9	3	V	D	1			
Corixidae	<i>Sigara fossarum</i>	5	3.8	4	IV	D		1		
Notonectidae	<i>Notonecta glauca</i>	5	3.4	1	IV		3		4	
Beetles										
Haliplidae	<i>Haliplus obliquus</i>	5	3.6	4	IV			4		
Dytiscidae	Dytiscidae (larvae / damaged)	5	4.5		IV	D			2	
Dytiscidae	<i>Hydroporus ovatus</i>	5	4.5			D			5	
Dytiscidae	<i>Agabus didymus</i>	5	4.5	1	III	C	1			
Dytiscidae	<i>Agabus paludosus</i>	5	4.5	1	II	C				1
Dytiscidae	<i>Ilybius quadriguttatus</i>	5	4.5	5	V	D				1
Noteridae	<i>Noterus clavicornis</i>	5	3.2	2		D			7	
Hydrophilidae	Hydrophilidae (larvae / damaged)	5	6.2		IV	D				1
Hydrophilidae	<i>Anacaena globulus</i>	5	6.2	1	IV	C		1		1
Hydrophilidae	<i>Anacaena limbata</i>	5	6.2	1	IV	D		3		
Scirtidae	Scirtidae (larvae / damaged)	5	6.9		IV	B				3
Alderflies										
Sialidae	Sialidae (juvenile / damaged)	4	4.3		IV	D				
Sialidae	<i>Sialis lutaria</i>	4	4.3	1	IV	D	2		1	6
Caddisflies										

Family	Species	BMWP score	WHPT score (presence only)	Conservation Score	Flow group	FSSR Score	Lee Farm Ditch 01A	Lee Farm Ditch 01B	Lee Farm Ditch 2	Chippenham park Ditch 2
Polycentropodidae	<i>Holocentropus dubius</i>	7	8.1	4	V				15	
Phryganeidae	<i>Phryganea bipunctata</i>	10	5.5	2	IV	D			1	
Phryganeidae	<i>Agrypnia sp.</i>	10	5.5		V	D		3		
Phryganeidae	<i>Agrypnia pagetana</i>	10	5.5	5	V	D			3	
Phryganeidae	<i>Agrypnia pagetana/picta</i>	10	5.5		V	D	5			
Limnephilidae	Limnephilidae (juvenile / damaged)	7	6.2		IV	B		1		
Limnephilidae	<i>Limnephilus marmoratus</i>	7	6.9	2	V	C		16		
Limnephilidae	<i>Limnephilus lunatus</i>	7	6.9	1	IV	C	13	8		2
Trichoptera pupae/Trichoptera non ID		-	-					2		1
Trueflies										
Chironomidae	Chironomidae (damaged / pupae)	2	1.1					1	20	
Chironomidae	Tanypodinae	2	1.1					4		40
Chironomidae	Orthocladiinae	2	1.1				1			20
Chironomidae	Chironomini	2	1.1					6		10
Chironomidae	Tanytarsini	2	1.1				2	1		20
Limoniidae	Limoniidae	5	5.9			B		1		
Dixidae	<i>Dixella sp.</i>	-	7.0				2	13		
Psychodidae		-	4.4			D				35
Chaoboridae		-	3.0		V			2		
Other Taxa										
Lepidoptera		-	-						20	1
Collembola		-	-							2

Family	Species	BMWP score	WHPT score (presence only)	Conservation Score	Flow group	FSSR Score	Lee Farm Ditch 01A	Lee Farm Ditch 01B	Lee Farm Ditch 2	Chippenham park Ditch 2
Diptera	Longchopteridae	-	-							1
WHPT score							71.8	78.5	69.4	59.9
ASPT (WHPT)							3.8	3.7	3.7	3.7
PSI Score (species)							2.4	0.0	0.0	6.7
LIFE Score (species)							5.5	5.6	5.4	5.8
CCI Score							8.4	10.0	9.4	7.9
Total number of taxa							29	33	25	31
Total Number of species							17	15	19	12
Total Number of genus / above					12	18	6	19		