A47/A11 Thickthorn Junction

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APFP Regulation 5(2)(a)

Planning Act 2008

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

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Infrastructure Planning

Planning Act 2008

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

The A47/A11 Thickthorn Junction Development Consent Order 202[x]

ENVIRONMENTAL STATEMENT APPENDICES
Appendix 8.3 – Aquatic Macroinvertebrate Survey Report

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A47/A11 Thickthorn Junction

Aquatic macroinvertebrate survey report 2020

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1 Summary

Abrehart Ecology Ltd was commissioned to undertake an aquatic macroinvertebrate survey of four sites around the proposed A47/A11 Thickthorn Junction scheme. The study aimed to update the records and status of macroinvertebrate species across the four waterbodies at the site, a repeat of the AECOM 2017 report.

Samples were taken from the four sites in both June and August 2020, allowing for a direct comparison with the 2017 report (AECOM).

Summary of overall biodiversity value:

In total, 100 taxa of vertebrate and invertebrate were recorded, of which 63 were identified to species.

Table I -Summary of rare species diversity and abundance

Status	Notable b	Notable a	Locally common	Local
Number of species	3	1	1	6

Twenty species of beetle were recorded of which, three species were Notable b, one Notable a, and six local species.

The Notable b species were *Chaetarthria seminulum, Helocares lividus*, and *Rhantus grapii*.

The Notable a species was *Helophorus alternans*.

The local species were *Donacia simplex, Enochrus coarctatus, Scirtes hemisphericus, Plea minutissima, Ilyocoris cimicoides*, and *Gyraulus laevis*.

The only locally common species was the invasive freshwater shrimp *Crangonyx pseudogracilis*.

2 Introduction

The proposed scheme

The following aquatic macroinvertebrate surveys have been undertaken as part of the proposed scheme at the A47/A11 Thickthorn Junction. The purpose of the surveys was to characterise and assess the conservation value of aquatic macroinvertebrate communities at four freshwater sites (the location of the sites is provided within the report). These surveys assessed the current state of the water bodies, to determine if there have been any significant changes to the quality of the habitats since the previous surveys undertaken in 2017 (AECOM).

The aquatic macroinvertebrate surveys act as water and habitat quality indicators, as well as offering the potential to determine the conservation value of the sites. Different compositions of species indicate different tolerances to a variety of conditions, help identify changes in the development of a new water body, and also provide the potential to assess pollution effects.

The methods employed to undertake the surveys will allow aquatic macroinvertebrate communities to be characterised and can determine whether rare or notable species are present.

Previous work: The 2017 survey (AECOM)

The 2017 surveys showed that the four water bodies have only a four species of conservation interest. The Balancing Pond had *Planaria torva*, the Fishing Lake had *Gyraulus laevis* and Meadow Farm Meadow pond had *Helocares lividus* and *Odontomyia ornata*.

3 Methods

3.1 Sample point locations

Sampling points were to be as previously used in the 2017 AECOM report. Data and sample collection were undertaken by two surveyors, including an experienced on-site surveyor ([redacted] MCIEEM FLS) and a second team member responsible for recording abiotics, health and safety, and assisting with sample collection [redacted] BSc (Hons) MSc Grad CIEEM). All of the sampling was undertaken during summer 2020 (June to August). The sample sites were four waterbodies originally identifies by AECOM.

The study areas include the balancing pond to the north (TG1901505682) of the A11, Cantley Stream (TQ1834104836) to the south east of the A11, the fishing lakes (TQ1876204851) to the west of the A47 and the Meadow Farm Meadow pond (TQ1929504918) to the east of the A47.

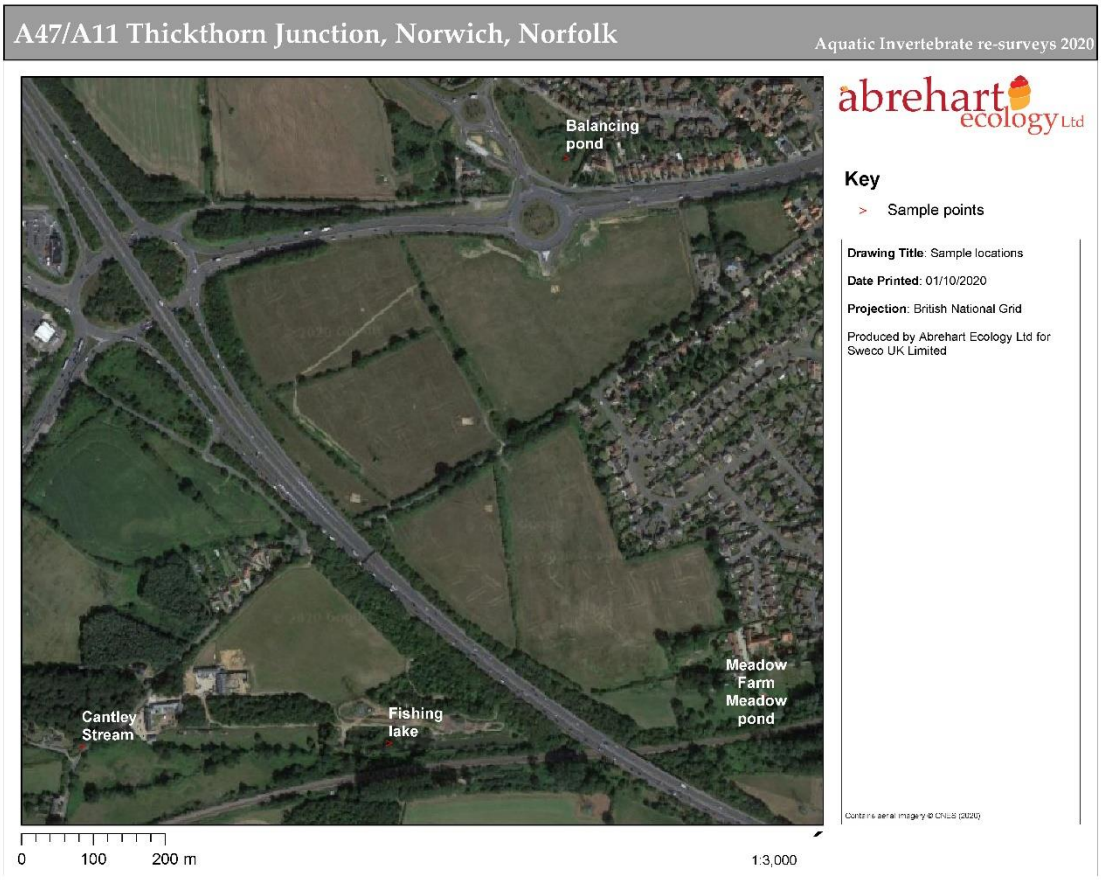

Figure 1. Sample point locations.

3.2 Aquatic invertebrate sampling

Samples were collected using ten-second sweeps with a net with 0.5mm mesh. Sweeps were repeated three times in different sections of the waterbody profile, that is, floating vegetation (where present), the benthic layer, and the submerged edge of the nearside bank. Once collected each sample was placed into a 5-litre bucket and preserved in 99.9% ethanol for long-term storage.

For identification, all invertebrates were separated from the retained sediment, detritus and vegetation under 40 - 80x stereo binocular microscopes. All specimens were then separated into major taxonomic groups, preserved in fresh 99.9% ethanol, and referred to an appropriate taxonomist for identification. Where possible, all specimens were identified to species level. Exceptions to this are groups that require specialist, time-consuming preparatory techniques such as head capsule dissection for chironomid larvae and prolonged clearing procedures for oligochaetes species. Any terrestrial beetles found within the samples were separated and sent away for identification by Dr Ross Piper. Caddisfly and mayfly larvae were similarly separated and identified by Sharon Flint.

3.3 Water chemistry sampling

At each sample location, waterbody characteristics and a range of other environmental features were recorded. These included exposed and submerged bank profiles, channel width and depth, and levels of grazing, poaching, and shelving. Abiotic parameters were recorded in the surface 10cm of water including pH, conductivity, total dissolved solids, temperature (all measured using a Hanna HI83303 Aquaculture Photometer). Each sample point was recorded on an Archer2 sub-metre DGPS unit.

Water samples were taken using a five-litre bucket within the surface 15cm of water. These were generally taken from banksides, as these areas were most accessible during survey visits and prevented excessive disturbance which would have been caused through entering the waterbodies.

3.4 Biocontrol

As sampling comprised moving from one system to another, the check, clean, and dry methods were employed as standard. However, protocol also included changing of nets and trays from one site to another. Prior to entering a new waterbody, the net and trays from one site were washed in a solution of Virkon and left to dry. A clean and dry set was then used in the new waterbody. This prevented species or pathogens being transmitted from one area to another. On return to the laboratory the nets were washed again in Virkon solution and left to dry for at least one day before being taken into the field.

On site, in addition to the nets, only waterproof boots enter the waterbody, and these too are washed in Virkon at the end of sampling effort within a marsh system.

3.5 Laboratory methods

Samples were treated as recommended by the Environment Agency (Murray-Bligh, 1999). Each sample was sorted a little at a time in a white tray. Most samples required at least 10 trays' worth of detritus to be sorted. All beetles, bugs and fly larvae were removed as well as representative specimens of other macroinvertebrate groups (for example, gammarids, mayflies). The abundance of groups not removed from the tray was estimated on a three-point scale. Most molluscs sank during the washing procedure and were recovered at the end. Usually there were vast numbers of snails, so a subsample was taken of between one twelfth and a half (but usually a third to a quarter) of the mollusc sample collected. The subsample was dried and the whole subsample identified under a microscope at low magnification. Many Succineids were kept in spirit rather than dried since they needed to be dissected for accurate identification. Dissected vouchers were sent to an independent authority (Sharon Flint) for verification.

All adult water beetles and molluscs were identified to species. Water beetles in the samples comprised the families Gyrinidae (whirligigs), Haliplidae, Hygrobiidae (screech beetles), Noteridae, Dytiscidae (diving beetles), Hydraenidae, Helophoridae, Hydrochidae, Hydrophilidae (crawling water beetles), Scirtidae, Elmidae (riffle beetles), and Dryopidae. Several groups within other families were also identified - Donacinae (reed beetles) in Chrysomelidae, Stenus within Staphylinidae (rove beetles), and Coccinellidae (ladybirds).

Abundances were estimated or converted from actual counts to an approximately geometric scale:

- 1-9, 10-29, 30-99, 100-299, 300-999, 1,000 or more.

3.6 SAFIS analysis

Data collected during the surveys were processed using SAFIS analysis (Site Analysis for Freshwater Invertebrate Surveys v.30.0, (Adrian Chalkley)). The SAFIS routine uses an inbuilt species dictionary to automate the calculation of metrics relating to conservation values and water quality, outlined below. The SAFIS analysis allowed an assessment of conservation value and water quality and also highlighted any species of conservation interest present. For each of the four sample sites, six standard measurements or metrics have been calculated allowing an assessment of the condition of the watercourse as revealed by the invertebrate community it supports. These metrics are:

- The Biological Monitoring Working Party Score (BMWP) (Hawkes, H.A (1998))
- The Average Score Per Taxon (ASPT) (Hawkes, H.A (1998))
- The Community Conservation Index (CCI) (Chad, R. (2004)

For a full explanation of these methods the original research papers should be consulted. However, to interpret the results shown within the current analysis, the following may be a useful summary:

BMWP is a measure of the water quality (oxygenation and cleanliness). BMWP scores are industry standard and reflect the sensitivity of the aquatic invertebrate families to pollution. The higher the family score, the more sensitive to oxygen depletion the family is and therefore their presence indicates a cleaner or less impacted site. The effects of pollution generally are to impose a Biological Oxygen Demand upon the receiving waters and so sensitive families are progressively excluded as the BOD increases. The revised BMWP system (2007) was used for this survey and the following classification may be used as a guide:

BMWP score	
< 25	poor water conditions
26-50	moderate
51-100	good
101-150	very good
more than 150	exceptional

ASPT is based on the BMWP score and so is also a measure of water quality. The BMWP score for each family present is totalled to give a site score. A high score can be achieved through a large number of low scoring families as well as a small number of high scoring families. Therefore, an Average Score Per Taxa (ASPT) is also calculated which allows further interpretation of the results. The higher the ASPT, the greater the proportion of more sensitive families in the sample and therefore the better the site condition. It is a useful criterion for showing year to year changes and trends in the invertebrate population supported by the water body. Being an average score, the higher its value, the more ecologically valuable the

population should be. Any value greater than four generally indicates good water quality but productive water bodies with large and varied populations will usually have an ASPT value between 4.5 and 5.0.

ASPT value	
<4	poor water quality
>4	moderate quality
>5	good quality
>6	very good.

CCI is based on the rarity of the individual invertebrates living in the water. It gives a numerical value to the conservation importance of the aquatic community. The higher the CCI value the greater the conservation interest. CCI values can range from less than five for a site with little or no conservation value to a score greater than 20 for sites with very high conservation interest. This group of highest CCI values often indicate a site that is of national importance and of potential SSSI status.

3.7 Limitations

Species within the orders Hirundinea (leeches) and Tricladida (flatworms) can be affected by preservation in ethanol (damage to eyes and genital pores – often key features of identification). During the survey these species were found and identified in the field and released. The remainder of the specimens were preserved as normal in isopropanol alcohol as above.

The surveys were carried out in non-optimal conditions due to access issues, meaning that the surveys were carried out on predetermined days rather than optimal ones. This may have reduced the diversity recorded.

4 Results

4.1 Species list

BMWP group	Family	Species	Balancing Pond		Cantley Stream		Fishing Lake		Meadow Farm Meadow Pond	
			Jun-20	Aug-20	Jun-20	Aug-20	Jun-20	Aug-20	Jun-20	Aug-20
Flatworms										
Tricladida										
	Planariidae									
		Polycelis group (damaged)		2						
Snails										
Gastropoda										
	Acroloxidae									
		Acroloxus lacustris						2		
	Bithyniidae									
		Bithynia tentaculata	1		7	8	1			
	Hydrobiidae									
		Potamopyrgus antipodarum			1					
	Lymnaeidae									
		Galba truncatula				1				
		Lymnaea stagnalis				1	1			
		Radix balthica			1	9				
	Oxychilidae									
		Oxychillus sp. (young)	2		1					
	Physidae									
		Physa fontinalis			1	3				
	Planorbidae									
		Anisus vortex			5	19				
		Bathyomphalus contortus			3	3				
		Gyraulus laevis			1		3			
		Hippeutis complanatus					1			
		Planorbis carinatus			1					
		Planorbis planorbis				13	2	28	18	41

BMWP group	Family	Species	Balancing Pond		Cantley Stream		Fishing Lake		Meadow Farm Meadow Pond	
			Jun-20	Aug-20	Jun-20	Aug-20	Jun-20	Aug-20	Jun-20	Aug-20
	Valvatidae									
		Valvata cristata				1			15	73
		Valvata piscinalis			3	2				
	Vertiginidae									
		Vertigo antivertigo	1							
Limpets and mussels										
Bivalvia										
	Sphaeriidae									
		Pisidium henslowanum			3	4				
		Pisidium nitidum	5		22					
		Sphaerium corneum			3					
Worms										
Oligochaetidae										
		Oligochaeta group	3		3					6
Leeches										
Hirudinea										
	Erpobdellidae									
		Erpobdella octoculata		25	3					
		Erpobdella sp. (small/damaged)	13							
	Glossiphoniidae									
		Alboglossiphonia heteroclita			2					
		Helobdella stagnalis			1					
Crustaceans										
Amphipoda										
	Asellidae									
		Asellus aquaticus	240		28		2			
	Crangonyctidae									
		Crangonyx pseudogracilis	148		1		3		12	
	Gammaridae									
		Gammarus pulex		97	64					
	Podonidae									

BMWP group	Family	Species	Balancing Pond		Cantley Stream		Fishing Lake		Meadow Farm Meadow Pond	
			Jun-20	Aug-20	Jun-20	Aug-20	Jun-20	Aug-20	Jun-20	Aug-20
		Cladocera	5				30	5		
		Cladocera group	5				30	5		
		Isopoda	240		28		2			
Mayflies										
Ephemeroptera										
	Baetidae									
		Baetis rhodani				31				
		Cloeon dipterum	5			2	32			32
		Cloeon sp. (early instar/damaged)						9		
	Ephemeridae									
		Ephemera danica			1					
		Ephemera vulgata			1					
Dragonflies and damselfies										
Odonata	Aeshnidae									
		Aeshna grandis		1						
	Calopterygidae				5	5				
		Calopteryx splendens			5	5				
	Coenagrionidae									
		Coenagrionidae	2	1			25			
		Coenagrionidae sp (damaged)					1			
		Coenagrionidae sp (early instar)		1			10			
		Coenagrionidae sp.	2							
		Ischnura elegans					14			
True bugs										
Hemiptera										
	Corixidae									
		Corixinae group (juv/damaged)	4				23			
		Cymatia coleoptrata					4	4		
		Hesperocorixa sahlbergi			5					
		Sigara dorsalis					1			

BMWP group	Family	Species	Balancing Pond		Cantley Stream		Fishing Lake		Meadow Farm Meadow Pond	
			Jun-20	Aug-20	Jun-20	Aug-20	Jun-20	Aug-20	Jun-20	Aug-20
		Sigara sp. (juv/damaged)					1			
		Sigara striata/dorsalis						1		
	Gerridae									
		Gerris group (juv/damaged)						6		
		Gerris lacustris					3	3		
		Gerris paladin						1		
		Gerris sp. (juv/damaged)					9			
	Naucoridae									
		Ilyocoris cimicoides			1					
	Nepidae									
		Nepa cinerea			2	2				
	Notonectidae									
		Notonecta sp. (juv/damaged)		1	1		6			
	Pleidae									
		Plea minutissima					2	2		
Beetles Coleoptera										
	Chrysomelidae									
		Donacia simplex					3			
		Galerucella nymphaeae					1			
	Corixidae									
		Hesperocorixa sahlbergi				4				
	Curculionidae									
		Phyllobius pomaceus			1					
	Dytiscidae									
		Dytiscus sp. (larvae)	1	2				2	5	
		Hygrotus inaequalis								1
		Platambus maculatus				2				
		Rhantus grapii		1						
	Elmidae									
		Elmis aenea			1					

BMWP group	Family	Species	Balancing Pond		Cantley Stream		Fishing Lake		Meadow Farm Meadow Pond	
			Jun-20	Aug-20	Jun-20	Aug-20	Jun-20	Aug-20	Jun-20	Aug-20
		Limnius volckmari			3	2				
	Hydraenidae									
		Ochthebius minimus				1				
		Anacaena limbata	11							
		Chaetarthria seminulum				1				
		Coelostoma orbiculare							1	
		Enochrus coarctatus		5						
		Helochares lividus							1	1
		Helophorus alternans							1	
		Helophorus sp. (damaged)	1							
		Hydrobius fuscipes	1	1		3				
		Hydrobius sp. (larvae)	9	1			1		3	
		Laccobius striolatus	1					6		
	Nitidulidae									
		Meligethes aeneus					1			
	Scirtidae									
		Scirtes hemisphaericus							1	
Caddisfly Trichoptera										
	Goeridae									
		Goera pilosa			1					
	Hydropsychidae									
		Hydropsyche siltalai			3					
	Limnephilidae									
		Halesus radiatus					1			1
		Limnephilus lunatus			9	29				
Trueflies Diptera										
	Chironomidae									
		Chironomidae	124	16	329		60	126		
		Orthocladiinae		11	21		32			

BMWP group	Family	Species	Balancing Pond		Cantley Stream		Fishing Lake		Meadow Farm Meadow Pond	
			Jun-20	Aug-20	Jun-20	Aug-20	Jun-20	Aug-20	Jun-20	Aug-20
	Culicidae									
		Culicidae	3							
	Chaoboridae									
		Chaoboridae	3							
	Diptera									
		Diptera								2
	Ptychopteridae									
		Ptychoptera sp.								2
	Dixidae									
		Dixidae	1	1	2		1	1		
		Dixidae	1	1	2		1	1		
	Simuliidae									
		Simulidae			3	5				
		Simulidae (damaged/lavae)			3	5				
	Tipulidae group									
		Tipulidae group			11	1			6	2
	Atherixidae									
		Atherixidae			11	1				
	Limoniidae									
		Limoniidae							3	1
	Tipulidae									
		Tipulidae							3	1
Other taxa										
Amphibia										
	Salamandridae									
		Lissotriton vulgaris	1		1					
Fish										
		Fish species fry					3			
	Gasterosteidae									
		Gasterosteiformes				11				
		Gasterosteus aculeatus				8				

BMWP group	Family	Species	Balancing Pond		Cantley Stream		Fishing Lake		Meadow Farm Meadow Pond	
			Jun-20	Aug-20	Jun-20	Aug-20	Jun-20	Aug-20	Jun-20	Aug-20
		Pungitius pungitius				3				
Lepidoptera	Lepidoptera									
		Crambidae sp. (early larvae)							3	
Grand Total			582	165	555	163	252	195	66	159
		Number of Taxa	23	14	39	23	27	14	12	10
		Number of Species Contributing to Scores	13	8	30	22	18	9	9	8
		Specimen Count	423	165	540	147	239	177	66	159
		BMWP Score	33	27	98.8	60.9	52.3	34.6	27	38.8
		ASPT	4.13	4.5	4.49	4.35	4.02	4.33	4.5	4.85
		CCI Score	5.33	19.83	8.79	13.36	10.67	12	25	17.5

4.2 Cantley Stream

This was small stream running in an east-west direction, passing beneath the A47 that eventually joins the River Yare near Norwich. The stream was low at the time of both sampling days, with 3cm depth of water running at the sample location (bridge on Cantley lane South). To the south of the bridge the silt was 20cm deep with clear water running over it. There were small amounts of *Nasturtium officinale* in the channel.

The basic water chemistry was pH of 7.1, conductivity of 380µS/267ppm with a temperature of 18.5°C.

Weather at the time of the first survey was dull, cool and damp and accordingly few flying aquatic invertebrates were recorded, and a small number were seen on the surface of the water during the two sampling periods. The second surveying period was bright but cool and windy.

4.3 Balancing pond

This is a man-made pond within a newly created basin to the south of Cringleford and to the north of the A11 as it heads towards Norwich (TG18980568). There was only one area of open water at the time of the two visits, this was the water body to the east of the attenuation basin. The pond was dominated with *Phragmites australis* and *Glyceria maxima*. There was a wide hover margin leading out into the open water which sank as it was walked on. Within the basin were areas of *Salix cinerea* and *Alnus glutinosa* and a wider landscape of unmanaged semi-improved grasslands leading out of the basin into the higher ground and the surrounding roads.

The water depth was difficult to assess due to the unstable hover margin, but the sampling net reached down over 1m deep. There was considerable silt (0.25 -0.5m) in the pond with slight turbidity water above, with limited aquatic macrophytes and a low-density cover of *Lemna minor*. The aquatic macrophytes were dominated with filamentous algae and a small leaved *Potamogeton* sp.

The basic water chemistry was pH of 6.2, conductivity of 70µS/ 59ppm with a temperature of 16.7°C.

Weather at the time of the first survey was dull, cool and damp and accordingly few flying aquatic invertebrates were recorded, and a small number were seen on the surface of the water during the two sampling periods. The second surveying period was bright but cool and windy.

4.4 Fishing lakes

This was a pair of man-made fishing lakes located to the south - west of the A47; the lake to the west was sampled, in accordance with the previous survey. The western lake was more turbid and had a less diverse flora. The margins of the lake were steep-sided all around, there was a peninsular in the middle, and numerous fishing platforms around the edge. The water level was low at the two sampling periods and could be accessed across its width (wearing waders) for sampling. The water depth was around 1m deep with very little silt (the base consisting mainly of loose sands and gravels), the water turbidity was moderate, there were areas with white waterlily, a sparse amount of a small leaved *Potamogeton* species, and emergents of *Sparganium erectum* and *Typha latifolia*.

The basic water chemistry was pH of 7.8, conductivity of 440µS/315ppm with a temperature of 27.8°C.

Weather at the time of the first survey was dull, cool and damp and accordingly few flying aquatic invertebrates were recorded, and a small number were seen on the surface of the water during the two sampling periods. The second surveying period was bright but cool and windy.

4.5 Meadow Farm Meadow pond

This was a man-made pond within the garden at Meadow Farm Meadow county wildlife site (CWS) (TG19290491). The CWS holds a number of uncommon marsh and fen species and has a tributary to the River Yare on the southern boundary (Cantley Stream). The pond was the only waterbody present at the time of the survey. The edges of the pond were horse and goat grazed and accordingly poached (trampling margins creating diverse microhabitats). The water depth was measured as 0.15m deep, with a considerable amount of silt (0.75m) in the pond and slightly turbid water above. It had a dense cover of *Lemna minor* with rare *Lemna trisulca*. The northern section of the pond was covered with an ornamental water lily. The pond was stagnant and there were no aquatic macrophytes.

The basic water chemistry was pH of 7.1, conductivity of 320µS/234ppm with a temperature of 28.5°C.

Weather at the time of the first survey was dull, cool and damp and accordingly few flying aquatic invertebrates were recorded, and a small number were seen on the surface of the water during the two sampling periods. The second surveying period was bright but cool and windy.

5 Discussion

5.1 Nature conservation evaluation

In total, 100 taxa of aquatic invertebrates were recorded within the study area, of these, 63 were identified to species level, with three species of vertebrate - two fish and one amphibian.

5.2 Cantley Stream (tributary of the River Yare)

The species community of the Cantley Stream was generally typical for the habitat. Within the samples taken in June and August 2020, 39 and 23 taxa were recorded respectively. None of the species recorded were rare. There was one notable beetle *Chaetarthria seminulum* (Nb) found in August 2020 and in June 2020, two local species were found - the aquatic bug *Ilyocoris cimicoides* and the mollusc *Gyraulus laevis*.

There were a combined 43 species of 51 taxa recorded over the two survey dates, with the highest CCI score for the August sampling of 13.36. The APST was fairly even at 4.49 and 4.35. The BMWP was highest in the June sampling at 98.8 (August was 60.9), showing good water quality.

The June CCI score of 13.36 indicates a fairly high conservation value, with one uncommon beetle one mollusc and bug species contributing to the score.

5.3 Balancing pond

The species community of the balancing pond was generally typical for the habitat. Twenty-three taxa were recorded in June 2020 and 14 in August 2020. None of the species recorded were rare. There was one notable beetle (*Rhantus grapii* (Nb)) found in August and one local species of beetle (*Enochrus coarctatus*) in June.

There were 16 species of 33 taxa recorded over the two survey dates, with the highest CCI score for the August sampling of 19.83. The APST was recorded at 4.13 and 4.5. The BMWP was highest in the June 2020 sampling at 33 (in August 2020 this was 27), showing moderate water quality.

The June CCI score of 19.83 indicates a high conservation value, with two uncommon beetle species collected.

5.4 Fishing lakes

The species community of the fishing lakes was generally typical for the habitat within the samples taken in June and August 2020. Twenty-seven and 13 taxa were recorded respectively. None of the species recorded were rare or Notable. However, there were three local species identified - the mollusc *Gyraulus laevis*, the beetle *Donacia simplex*, and the hemiptera *Plea minutissima*.

There were 20 species of 35 taxa recorded over the two survey dates, with the highest CCI score of 12 for the August sampling. The APST was recorded at 4.02 and 4.33. The BMWP was highest in the June 2020 sampling at 52.3 (in August 2020 this was 34.6), showing between good and moderate water quality.

The August CCI score of 12 indicates a fairy high conservation value, with three uncommon species collected.

5.5 Meadow Farm Meadow pond

The species community of Meadow Farm Meadow pond was generally typical for the habitat. Within the samples taken in June and August 2020, 12 and 10 taxa were recorded. None of the species recorded were rare; however, there was one Notable b beetle (*Helochares lividus*) found in both sampling periods, and a Notable a beetle (*Helophorus alternans*) and a local beetle species (*Scirtes hemisphericus*) in June 2020 only.

There were 13 species of 22 taxa recorded over the two survey dates, with the highest CCI score for the June sampling of 25. The APST was fairly even at 4.5 and 4.85. The BMWP was highest in the June sampling at 25 (August was 17.5), showing poor water quality.

The June CCI score of 25 indicates a very high conservation value. As this is within a CWS the sites protection should be maintained.

6 References

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Appendix A– Site photos

Photos 1 and 2 - Meadow Farm Pond CWS

Photos 3 and 4 – Western fishing lake

Photos 5 and 6 - Balancing pond

Photo 7 – Cantley Stream at sample location