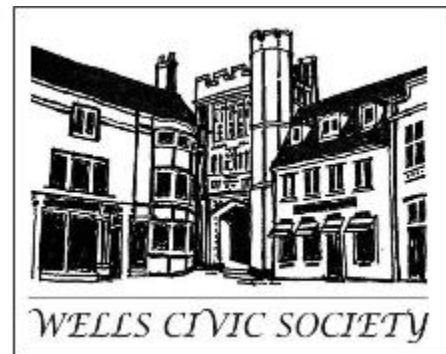


Observation Survey of Keward Brook, St Andrew's Stream and St. Thomas's Stream, located in Wells Somerset

– Conducted by Teleost Consulting on behalf of Wells Civic Society



09/05/2016

Teleost Consulting
18 West Court
South Horrington
Wells
Somerset
BA5 3DE
United Kingdom

Dr Shaun Plenty M.I.F.M.
Aquatic Consultant

shaun.plenty@teleostconsulting.co.uk
01749 672889

Contents

1	Introduction	11
2	Materials and methods	13
3	Survey results	17
3.1	Keward Brook	17
3.1.1	Survey point KB1	17
3.1.2	Survey point KB2	20
3.1.3	Survey point KB3	23
3.1.4	Survey point KB4	24
3.1.5	Survey point KB5	27
3.1.6	Survey point KB6	30
3.1.7	Survey point KB7	34
3.1.8	Survey point KB8	36
3.1.9	Survey point KB9.	38
3.1.10	Survey point KB10	41
3.1.11	Survey point KB11	43
3.1.12	Survey point KB12	46
3.1.13	Survey point KB13	47
3.1.14	Survey point KB14	49
3.1.15	Survey point KB15	51
3.1.16	Survey point KB16	53
3.1.17	Survey point KB17	56
3.1.18	Survey point KB18	59
3.1.19	Survey point KB19	61
3.1.20	Survey point KB20	62
3.1.21	Survey point KB21	64
3.2	St. Andrew's Stream	66
3.2.1	Survey point SA1	66
3.2.2	Survey point SA2	67
3.2.3	Survey point SA3	68
3.2.4	Survey point SA4	70
3.2.5	Survey point SA5	72
3.2.6	Survey point SA6a	74
3.2.7	Survey point SA6b	75
3.2.8	Survey point SA7a	76
3.2.9	Survey point SA7b	81
3.2.10	Survey point SA8	82
3.2.11	Survey point SA9	86
3.2.12	Survey point SA10	88
3.2.13	Survey point SA11	89
3.2.14	Survey point SA12	91
3.2.15	Survey point SA13	95
3.2.16	Survey point SA14	99
3.3	St. Thomas's Stream	104
3.3.1	Survey point ST1	105
3.3.2	Survey point ST2	105

3.3.3	Survey point ST3	109
3.3.4	Survey point ST4	109
3.3.5	Survey point ST5	109
3.3.6	Survey point ST6	110
3.3.7	Survey point ST7	111
3.3.8	Survey point ST8	114
3.3.9	Survey point ST9	116
3.3.10	Survey point ST10	117
3.3.11	Survey point ST11	119
3.3.12	Survey point ST12	121
3.3.13	Survey point ST13	124
3.3.14	Survey point ST14	126
3.3.15	Survey point ST15	129
3.3.16	Survey point ST16	130
3.3.17	Survey point ST17	131
3.3.18	Survey point ST18	134
3.3.19	Survey point ST19	135
4	Discussion	136

Table of Figures

Figure 1: Map of the streams flowing through the City of Wells, Somerset. Green = Keward Brook, Orange = St. Andrew's Stream, Red = St. Thomas' Stream	12
Figure 2: Map of Keward Brook that runs from Wells Moat to fields to the west of Jocelyn Drive. Numbers represent survey points spaced at 100m intervals.....	14
Figure 3: Map of St Andrew's Stream from its first visible location (Mill Street) to where it flows into Keward Brook (field west of Jocelyn Drive). Numbers represent survey points spaced at 100m intervals.	15
Figure 4: Map of St Thomas's Stream that runs from Bath Road, close to the junction with Old Frome Road, to Tor Street. Numbers represent survey points spaced at 100m intervals.	16
Figure 5: Upstream view of Keward Brook from survey point KB1.	17
Figure 6: Downstream view from view of Keward Brook from survey point KB1.	18
Figure 7: Litter in Keward Brook stream channel at survey point KB1.	18
Figure 8: Upstream view of secondary outflow from moat approximately 50m downstream of survey point KB1. Pipe diameter = 30cm.	19
Figure 9: View of stone reinforcement of right bank of Keward Brook approximately 65m downstream of survey point KB1.	19
Figure 10: View of Keward Brook from the right bank approximately 80m downstream of survey point KB1. Steam is barely visible due to overgrown vegetation.	20
Figure 11: Upstream view of Keward Brook from survey point KB2.	21
Figure 12: Downstream view of Keward Brook from survey point KB2.	21
Figure 13: Downstream view of Keward Brook approximately 20m downstream of survey point KB2. Note the metal bar wrapped in barbed wire bridging over the stream.	22
Figure 14: Main outflow from moat on the right bank of Keward Brook approximately 30m downstream of survey point KB2.	22
Figure 15: View downstream at the outflow from Wells Moat, approximately 30m downstream of survey point KB2.	23
Figure 16: Guest house at survey point KB3. Keward Brook runs immediately the other side of, and parallel to, the brick wall.	23
Figure 17: View of weir from right bank, approximately 50m downstream of survey point KB3.....	24
Figure 18: Upstream view of Keward Brook from survey point KB4.	25
Figure 19: Downstream view of Keward Brook from survey point KB4.	25
Figure 20: View of weir from the right bank at survey point KB4.	26
Figure 21: Upstream view of Keward Brook from the right bank, approximately 15m downstream of survey point KB4. Note the metal stakes along the right bank margin.	26
Figure 22: Upstream view of Keward Brook from survey point KB5.	27
Figure 23: Access to the right bank of Keward Brook, approximately 20m upstream of survey point KB5.	28
Figure 24: Downstream view of Keward Brook from survey point KB5.	29
Figure 25: Pipe under the first bridge located downstream of survey point KB5. The 15cm diameter pipe runs from the left bank and dispenses directly into Keward Brook. No odour was present, although brown residue can is clearly visible close to the exit.	29
Figure 26: Downstream view of the third bridge located downstream of survey point KB5. Note the downstream facing concrete groyne on the left bank.	30
Figure 27: Upstream view of Keward Brook from survey point KB6.	30

Figure 28: Downstream view of Keward Brook from survey point KB6.	31
Figure 29: Upstream view of bridge approximately 15m downstream of survey point KB6. Note the metal bar running across the bridge arch, a stake supporting a tyre on the right bank (left in the image) and a blue pipe running into the stream.	31
Figure 30: The streambed substrate present at survey point KB6.	32
Figure 31: Litter along the right bank of Keward Brook, approximately 30m downstream of survey point KB6.	32
Figure 32: Downstream view of Keward Brook approximately 50m downstream of survey point KB6. Note the high wall running parallel to the right bank and the pipe bridging across the channel.	33
Figure 33: Upstream view of Keward Brook approximately 70m downstream from survey point KB6. Stones have been place across the channel that will, in time, cause a pool to be created.	33
Figure 34: Upstream view of Keward Brook from survey point KB7.	34
Figure 35: A 22cm diameter discharge pipe on the left bank at survey point KB7. No odour was present and no effluent was being discharged. Minimum staining is visible on the wall beneath the pipe.	35
Figure 36: Downstream view of Keward Brook from survey point KB7.	36
Figure 37: Upstream view of Keward Brook from survey point KB8.	36
Figure 38: Downstream view of Keward Brook from survey point KB8.	37
Figure 39: Weir approximately 40m downstream of survey point KB8.	37
Figure 40: Downstream view of weir pool and tunnel that pass below a house built over Keward Brook, located approximately 40m downstream of survey point KB8.	38
Figure 41: Downstream view within the tunnel that passes below a house built over Keward Brook, located approximately 45m downstream of survey point KB8.	38
Figure 42: Upstream view of Keward Brook from survey point KB9.	39
Figure 43: Downstream view of Keward Brook from survey point KB9.	39
Figure 44: Keward Brook steam bed substrate present at survey point KB9.	40
Figure 45: Downstream view of weir located approximately 10m downstream of survey point KB9.	40
Figure 46: Discharge pipe located 10m downstream of survey point KB9 on the left bank. The 24cm diameter pipe was odourless and was not discharging effluent.	41
Figure 47: Upstream view of Keward Brook from survey point KB10.	41
Figure 48: Downstream view of Keward Brook from survey point KB10.	42
Figure 49: Keward Brook steam bed substrate present at survey point KB10.	42
Figure 50: Upstream view of Keward Brook from survey point KB11.	43
Figure 51: A 50cm diameter pipe, located on the left bank, discharging effluent into Keward Brook approximately 20m upstream of survey point KB11. The effluent was odourless and clear at the time this image was taken.	43
Figure 52: Downstream view of Keward Brook from survey point KB11.	44
Figure 53: Keward Brook streambed substrate at survey point KB11.	44
Figure 54: Substantial weed beds (<i>Ranunculus</i> sp.) that are present at survey point KB11 downstream to the end of Gate Lane.	45
Figure 55: Litter present along the left bank margin of Keward Brook, approximately 25m downstream of survey point KB11.	45
Figure 56: A 90cm diameter pipe, located on the left bank, discharging effluent into Keward Brook approximately 75m downstream of survey point KB11. The effluent was odourless and clear at the time this image was taken.	46

Figure 57: Upstream view of Keward Brook from survey point KB12.	46
Figure 58: Downstream view of Keward Brook from survey point KB12.	47
Figure 59: Keward Brook streambed substrate present at survey point KB12.	47
Figure 60: Upstream view of Keward Brook from survey point KB13.	48
Figure 61: Downstream view of Keward Brook from survey point KB13.	48
Figure 62: Keward Brook streambed substrate present at survey point KB13.	49
Figure 63: Debris behind a tree that has fallen from the left bank, approximately 50m downstream of survey point KB13.	49
Figure 64: Upstream view of Keward Brook from survey point KB14.	50
Figure 65: Downstream view of Keward Brook from survey point KB14.	50
Figure 66: Keward Brook streambed substrate present at survey point KB14.	51
Figure 67: Upstream view of Keward Brook from survey point KB15.	51
Figure 68: Downstream view of Keward Brook from survey point KB15.	52
Figure 69: Keward Brook streambed substrate present at survey point KB15.	52
Figure 70: Rock and coil rolls placed situated along the left bank of Keward Brook, approximately 50m downstream from survey point KB15.	53
Figure 71: A 50cm diameter surface water drainage discharge pipe situated on the right bank of Keward Brook, approximately 80 m downstream of survey point KB15.....	53
Figure 72: Upstream view of Keward Brook from survey point KB16.	54
Figure 73: Downstream view of Keward Brook from Point KB16.....	54
Figure 74: Upstream view of a flow deflector located on the right bank, approximately 10m downstream from survey point KB16.....	55
Figure 75: Litter along left bank of Keward Brook, approximately 15m downstream of survey point KB16.	55
Figure 76: A 15cm diameter surface water drainage discharge pipe situated on the right bank of Keward Brook, approximately 75m downstream of survey point KB16.....	56
Figure 77: Downstream view of Keward Brook approximately 80m downstream of survey point KB16. Note the litter present along the right bank.....	56
Figure 78: Upstream view of Keward Brook from survey point KB17.	57
Figure 79: Downstream view of Keward Brook from survey point KB17.	57
Figure 80: A 15cm diameter pipe located on the left bank wall of Keward Brook at survey point KB17. Note the prominent staining on the wall caused by the discharge of effluent from the pipe.	58
Figure 81: Close up view of the 15cm diameter pipe located on the left bank wall of Keward Brook at survey point KB17. Effluent is clearly visible in the pipe the pipe; a foul smelling odour was present.	58
Figure 82: Downstream view of Keward Brook, approximately 40m downstream from survey point KB17. Note the presence of several (five in total) 15cm diameter discharge pipes located along the left bank wall. No staining was visible on the wall below any of these pipes and no foul smelling odour was present.....	59
Figure 83: Upstream view of Keward Brook from survey point KB18.	59
Figure 84: Upstream view of Keward Brook from survey point KB18.	60
Figure 85: Keward Brook streambed substrate present at survey point KB18.	60
Figure 86: A 45cm diameter culvert pipe discharge pipe situated on the right bank of Keward Brook, approximately 75m downstream of survey point KB18. The pipe was discharging a constant flow of clear, odourless water, possibly flowing from St. Andrew's Stream.	61
Figure 87: Upstream view of Keward Brook from survey point KB19.	61
Figure 88: Downstream view of Keward Brook from survey point KB19.	62

Figure 89: Keward Brook streambed substrate present at survey point KB19.	62
Figure 90: Upstream view of Keward Brook from survey point KB20.	63
Figure 91: Downstream view of Keward Brook from survey point KB20.	63
Figure 92: Keward Brook streambed substrate at survey point KB20.....	64
Figure 93: Upstream view of Keward Brook from survey point KB21.	64
Figure 94: Downstream view of Keward Brook from survey point KB21.	65
Figure 95: Keward Brook streambed substrate at survey point KB21.....	65
Figure 96: Upstream view of St. Andrew's Stream from survey point SA1.	66
Figure 97: St. Andrew's Stream streambed substrate at survey point SA1.....	66
Figure 98: Weir, culvert pipes and litter at survey point SA1.	67
Figure 99: Wall at survey point SA2 behind which runs St. Andrew's Stream. The Stream runs from towards the pavement and is culverted from this point to survey point SA3	67
Figure 100: Upstream view of St. Andrew's Stream from survey point SA2.	68
Figure 101: Upstream view of St. Andrew's Stream from survey point SA3.	68
Figure 102: Downstream view of St. Andrew's Stream from survey point SA3.	69
Figure 103: St. Andrew's Stream streambed substrate at survey point SA3.....	69
Figure 104: Upstream view of St. Andrew's Stream and small weir approximately 20m downstream of survey point SA3.	70
Figure 105: Substantial weed growth in the channel of St. Andrew's Stream approximately 50m downstream of survey point SA3.	70
Figure 106: Upstream view of St. Andrew's Stream from survey point SA4.	71
Figure 107: Downstream view of St. Andrew's Stream from survey point SA4.	71
Figure 108: Substantial weed growth and litter in the channel of St. Andrew's Stream approximately 50m downstream of survey point SA4.	72
Figure 109: Upstream view of St. Andrew's Stream from survey point SA5.	72
Figure 110: Downstream view of St. Andrew's Stream from survey point SA5.	73
Figure 111: Exposed, littered and sparsely vegetated left bank of St. Andrew's Stream, located approximately 25m downstream of survey point SA5,	73
Figure 112: Discharge pipe located approximately 45m downstream of survey point SA5 on the left bank. The 30cm diameter pipe was odourless and was not discharging effluent.	74
Figure 113: Upstream view of St. Andrew's Stream from survey point SA6a.	74
Figure 114: Downstream view of St. Andrew's Stream from survey point SA6a.	75
Figure 115: Litter on the right bank approximately 20m downstream of survey point SA6a.	75
Figure 116: Culvert discharging water that passes through a screen filter at survey point SA6b. Litter is visible in the channel.	76
Figure 117: Downstream view of St. Andrew's Stream from survey point SA6b.	76
Figure 118: Upstream view of St. Andrew's Stream from survey point SA7a.	77
Figure 119: Downstream view of St. Andrew's Stream from survey point SA7a.	77
Figure 120: St. Andrew's Stream streambed substrate at survey point SA7a.	78
Figure 121: Downstream view of St. Andrew's Stream where it flows over a small weir, located approximately 25m downstream from survey point SA7a.	78
Figure 122: Upstream view of St. Andrew's Stream where it flows over a small weir, located approximately 25m downstream from survey point SA7a.	79
Figure 123: Litter visible in the right bank vegetation of St. Andrew's Stream 50m downstream from survey point SA7a.	79
Figure 124: Figure 123: Litter visible in the channel of St. Andrew's Stream 65m downstream from survey point SA7a.	80

Figure 125: 10cm diameter discharge pipe located on the left bank of St. Andrew's Stream approximately 80m downstream from survey point SA7a. No effluent was flowing from the pipe and no odour was present.	80
Figure 126: Upstream view from towards survey point SA7b (side channel) approximately 90m downstream from survey point SA7a.....	81
Figure 127: Upstream view of St. Andrew's Stream from survey point SA7b.	81
Figure 128: Downstream view of St. Andrew's Stream from survey point SA7b.	82
Figure 129: St. Andrew's Stream streambed substrate at survey point SA7b.....	82
Figure 130: Upstream view of St. Andrew's Stream from survey point SA8.	83
Figure 131: Downstream view of St. Andrew's Stream from survey point SA8.	84
Figure 132: St. Andrew's Stream streambed substrate at survey point SA8.....	84
Figure 133: Litter visible in the channel of St. Andrew's Stream 15m downstream from survey point SA8.....	85
Figure 134: 30cm discharge pipe located on the right bank of St. Andrew's Stream 15m downstream from survey point SA8. No effluent was flowing from the pipe and no odour was present.....	85
Figure 135: Upstream view of St. Andrew's Stream from survey point SA9.	86
Figure 136: Downstream view of St. Andrew's Stream from survey point SA9.	87
Figure 137: St. Andrew's Stream streambed substrate and litter at survey point SA9.	87
Figure 138: Upstream view of St. Andrew's Stream from survey point SA10.	88
Figure 139: Downstream view of St. Andrew's Stream from survey point SA10.	88
Figure 140: Upstream view of St. Andrew's Stream and a small weir located approximately 40m downstream from survey point SA910.....	89
Figure 141: Upstream view of St. Andrew's Stream from survey point SA11.	89
Figure 142: Downstream view of St. Andrew's Stream from survey point SA11.	90
Figure 143: St. Andrew's Stream streambed substrate at survey point SA11.....	90
Figure 144: Downstream view of St. Andrew's Stream 40m downstream from survey point SA11.....	91
Figure 145: Upstream view of St. Andrew's Stream from survey point SA12.	92
Figure 146: Downstream view of St. Andrew's Stream from survey point SA12.	93
Figure 147: St. Andrew's Stream streambed substrate at survey point SA12.....	93
Figure 148: Upstream view of St Andrew's Stream and a small weir approximately 20m downstream from survey point SA912.....	94
Figure 149: St. Andrew's Stream substrate covered in caddis fly larvae approximately 25m downstream from survey point SA12.....	94
Figure 150: Downstream view of St. Andrew's Stream and disused sluice system approximately 75m downstream from survey point SA12.....	95
Figure 151: View of debris and litter accumulation on the left bank of St. Andrew's Stream just before a disused sluice system located approximately 75m downstream from survey point SA12.....	95
Figure 152: Upstream view of St. Andrew's Stream from survey point SA13.	96
Figure 153: Downstream view of St. Andrew's Stream from survey point SA13.	97
Figure 154: Upstream view of St. Andrew's Stream where it passes under a bridge approximately 50m downstream from survey point SA13.....	97
Figure 155: Two 10cm diameter discharge pipes and a single 20cm pipe (behind vegetation) on the left bank of St. Andrew's Stream approximately 65m downstream from survey point SA13. The purpose of the 10cm pipes is not known although a mild foul smelling odour was present.....	98

Figure 156: Downstream view of St. Andrew's Stream approximately 65m downstream from survey point SA13.....	99
Figure 157: Upstream view of St. Andrew's Stream from survey point SA14.	100
Figure 158: Upstream view of Keward Brook at its junction with St. Andrew's Stream at survey point SA14.....	101
Figure 159: Downstream view of Keward Brook at its junction with St. Andrew's Stream at survey point SA14.....	102
Figure 160: St. Andrew's Stream streambed substrate at survey point SA14.....	103
Figure 161: Downstream view of St. Thomas's Stream from survey point ST1.....	105
Figure 162: Upstream view of St. Thomas's Stream from survey point ST2.	106
Figure 163: Downstream view of St. Thomas's Stream from survey point ST2.....	107
Figure 164: St. Thomas's Stream streambed substrate at survey point ST2.	107
Figure 165: Upstream view of St. Thomas's Stream approximately 45m downstream from survey point ST2.	108
Figure 166: Downstream view of St. Thomas's Stream approximately 45m downstream from survey point ST2. The stream cuts through the grounds of Wells Golf Club from this location.....	108
Figure 167: View towards St. Andrew's Stream survey point ST4.....	109
Figure 168: View towards St. Andrew's Stream survey point ST5 where it passes under a small footbridge.	110
Figure 169: Upstream view of St. Thomas's Stream from survey point ST6.	110
Figure 170: Downstream view of St. Thomas's Stream from survey point ST6.....	111
Figure 171: St. Thomas's Stream streambed substrate at survey point ST6.	111
Figure 172: Upstream view of St. Thomas's Stream from survey point ST7.	112
Figure 173: Downstream view of St. Thomas's Stream from survey point ST7.....	113
Figure 174: St. Thomas's Stream streambed substrate at survey point ST7.	113
Figure 175: Upstream view of St. Thomas's Stream from survey point ST8.	114
Figure 176: Downstream view of St. Thomas's Stream from survey point ST8.....	115
Figure 177: St. Thomas's Stream streambed substrate at survey point ST8.	115
Figure 178: Upstream view of St. Thomas's Stream approximately 70m downstream of survey point ST8. A culvert and a 16cm diameter pipe (on the left bank) are visible..	116
Figure 179: Close up image of sediment in a 16cm diameter pipe located approximately 70m downstream of survey point ST8. No effluent was being discharged and no odour was present	116
Figure 180: Upstream view of St. Thomas's Stream from survey point ST10.	117
Figure 181: Downstream view of St. Thomas's Stream from survey point ST10.....	118
Figure 182: St. Thomas's Stream streambed substrate at survey point ST10.	118
Figure 183: Upstream view of St. Thomas's Stream from survey point ST11.	119
Figure 184: Downstream view of St. Thomas's Stream from survey point ST11.....	120
Figure 185: St. Thomas's Stream streambed substrate at survey point ST11.	120
Figure 186: Downstream view of St. Thomas's Stream and bank modifications approximately 50m downstream of survey point ST11.....	121
Figure 187: Upstream view of St. Thomas's Stream from survey point ST12.	121
Figure 188: Downstream view of St. Thomas's Stream from survey point ST12.....	122
Figure 189: St. Thomas's Stream streambed substrate at survey point ST12.	122
Figure 190: Downstream view of St. Thomas's Stream approximately 50m downstream of survey point ST12. Note the presence of water that enters the stream from the right bank (not visible).	123

Figure 191: View towards the right bank of St. Thomas's Stream approximately 50m downstream of survey point ST12. Water is entering the stream from a spring that emerges from the right bank.....	123
Figure 192: Upstream view of St. Thomas's Stream from survey point ST13.	124
Figure 193: Downstream view of St. Thomas's Stream from survey point ST13.....	125
Figure 194: St. Thomas's Stream streambed substrate at survey point ST13.	125
Figure 195: Upstream view of St. Thomas's Stream from survey point ST14.	126
Figure 196: Downstream view of St. Thomas's Stream from survey point ST14.....	127
Figure 197: St. Thomas's Stream streambed substrate at survey point ST14.	127
Figure 198: Downstream view of St. Thomas's Stream approximately 40m downstream of survey point ST14.	128
Figure 199: Upstream view of St. Thomas's Stream approximately 40m downstream of survey point ST14.	128
Figure 200: Upstream view of St. Thomas's Stream from survey point ST15.	129
Figure 201: Downstream view of St. Thomas's Stream from survey point ST15.....	130
Figure 202: St. Thomas's Stream streambed substrate at survey point ST15.	130
Figure 203: Upstream view of St. Thomas's Stream from survey point ST16.	131
Figure 204: Downstream view of St. Thomas's Stream from survey point ST16.....	131
Figure 205: Upstream view of St. Thomas's Stream from survey point ST17.	132
Figure 206: Downstream view of St. Thomas's Stream from survey point ST17.....	133
Figure 207: St. Thomas's Stream streambed substrate at survey point ST17.	133
Figure 208: Downstream view of St. Thomas's Stream approximately 15m downstream of survey point ST17.	134
Figure 209: View across privately owned fields towards St. Thomas Stream Survey point ST18.	134
Figure 210: Upstream view of St. Thomas's Stream from survey point ST19.	135

1 Introduction

Streams, sometimes otherwise referred to as brooks, burn and creeks, provide important ecological functions and services. They provide unique habitat to a wide variety of animals and are aesthetically pleasing environments that enhance the visual appeal of the surroundings through which they pass. They play a key role in providing clean water to downstream habitats through the process of biological filtering. Biological filtering occurs when the stream water bacteria and fungi living on stream substrate (rocks and sediment). These organisms transform potentially harmful compounds, such as nitrate, nitrite and ammonia, into less harmful forms, thereby purifying the water. Streams also play a crucial in terms of flood mitigation. Due to streams having a large percentage of water in contact with substrate (especially when compared to large rivers), they are able to absorb significant amounts of rain water. This not only helps prevent downstream flooding but also helps to maintain groundwater levels.

Wells is a cathedral city located at the southern foot of Somerset's Mendip Hills. It is a historically important and visually attractive city that supports a healthy tourism industry. A total of three streams pass through Wells, all of which are fed from water that has filtered through the sedimentary limestone rock of the Mendip Hills. The three streams are Keward Brook, St. Andrew's Stream, both of which flow from Wells Moat, and St. Thomas's Stream, that flows from a separate spring before flowing Keward Brook in close proximity to the moat (Figure 1).

Where streams pass through urbanised environments there are often issues concerning riparian rights and obligations, especially with regards to access, maintenance, modifications and pollution. In order to ascertain the current physical status of the streams that pass through Wells, and to gauge enhancement possibilities, an observational survey was commissioned by the Wells Civic Society and conducted by Dr Shaun Plenty of Teleost Consulting.

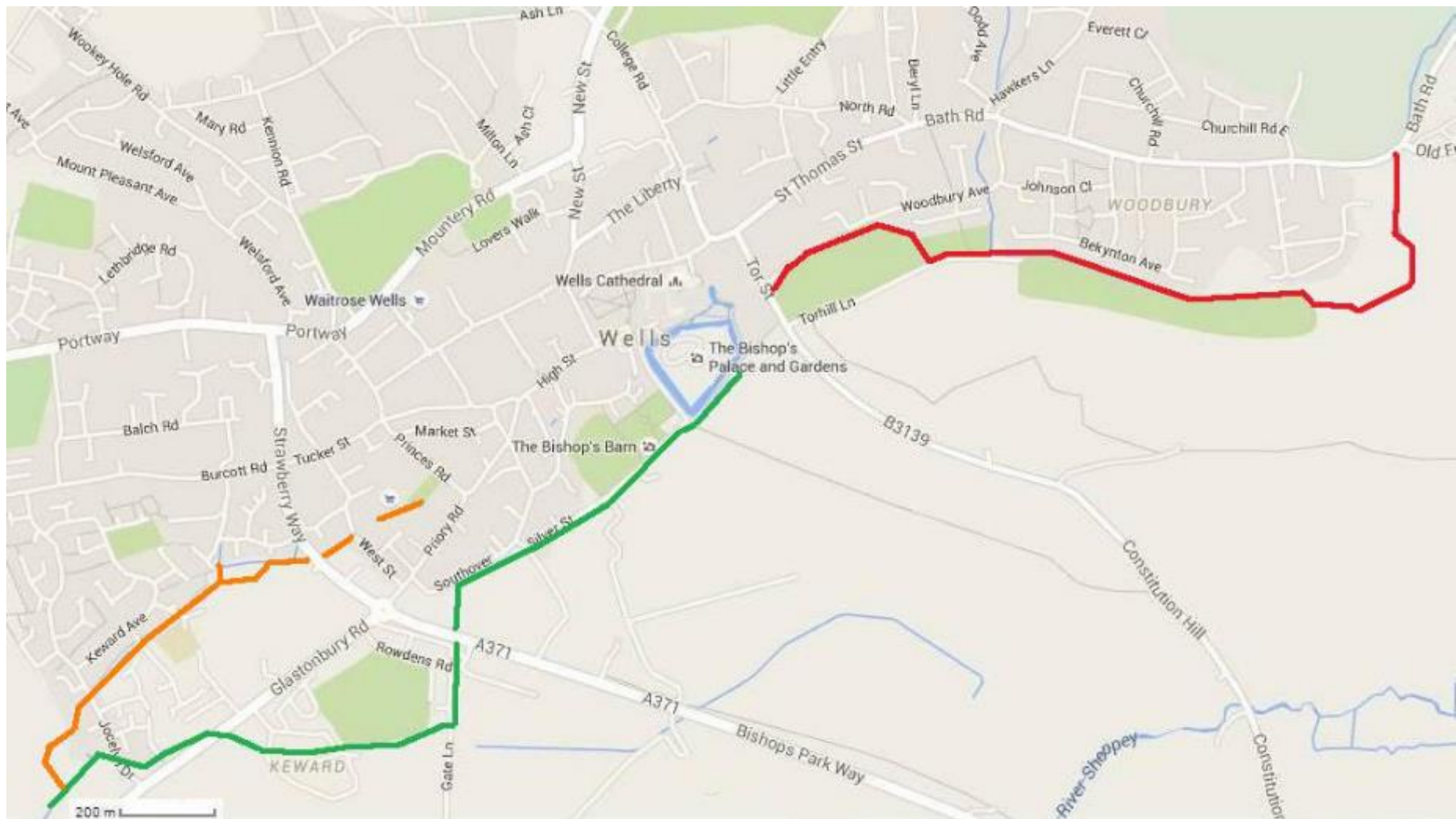


Figure 1: Map of the streams flowing through the City of Wells, Somerset. Green = Keward Brook, Orange = St. Andrew's Stream, Red = St. Thomas' Stream

2 Materials and methods

Survey points were mapped at 100m intervals along Keward Brook, St. Andrew's Stream and St Thomas's Stream (Figure 2 Figure 3 Figure 4). St. Andrew's Stream and St Thomas's Stream were surveyed in entirety, whilst Keward Brook was surveyed where it passes through the City of Wells. From this point forward survey point numbers are preceded with the corresponding stream's initials in order to differentiate between the three water bodies (KD = Keward Brook, SA = St. Andrew's Stream, ST= St. Thomas's Stream).

Survey points were located using a combination of maps and a handheld Global Positioning System (GPS). Right bank and left bank were determined by looking downstream. At each survey point the surrounding land use, bank material, bankside vegetation structure was noted. Vegetation structure is defined as the number of species present (none = bare, uniform = one, simple = two or three, complex = more than three).

At each point images were taken looking upstream, downstream and, where possible, of the substrate. Notable features (including weirs, littered areas, discharge pipes and various modifications) were also noted and photographed. Where a notable feature occurred in between survey points its location was recorded as the approximate distance from the nearest upstream survey point.

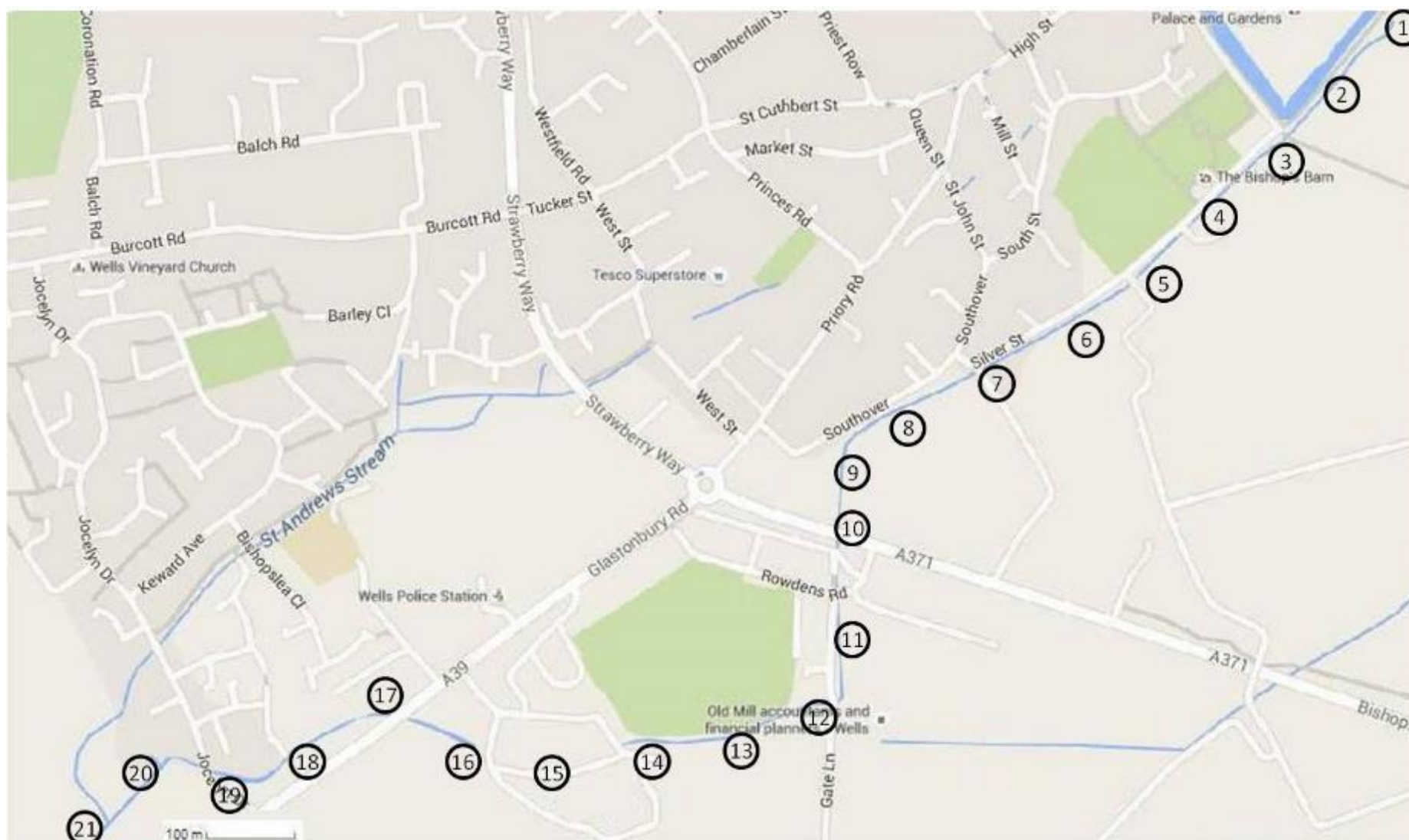


Figure 2: Map of Keward Brook that runs from Wells Moat to fields to the west of Jocelyn Drive. Numbers represent survey points spaced at 100m intervals.

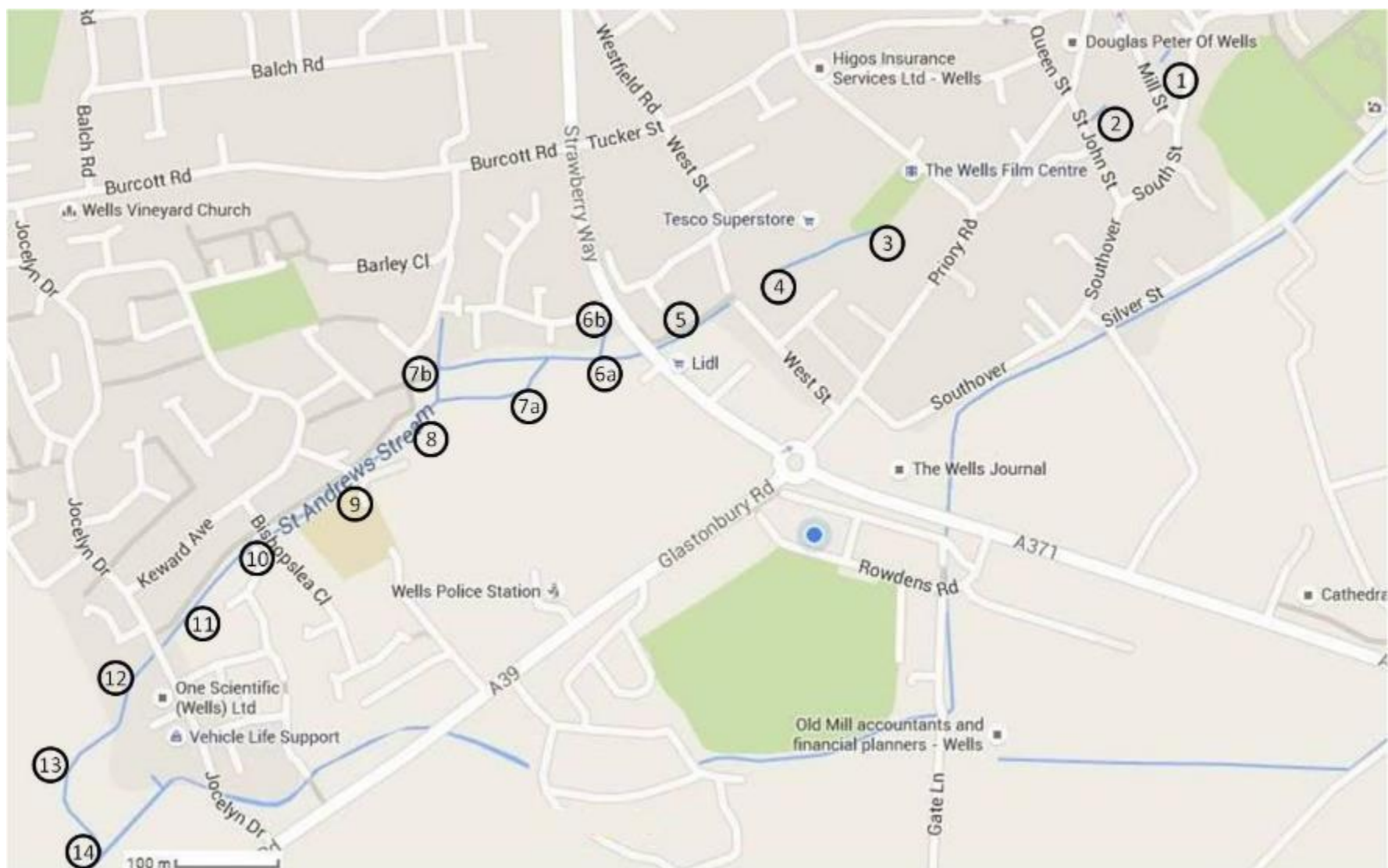


Figure 3: Map of St Andrew's Stream from its first visible location (Mill Street) to where it flows into Keward Brook (field west of Jocelyn Drive). Numbers represent survey points spaced at 100m intervals.



Figure 4: Map of St Thomas's Stream that runs from Bath Road, close to the junction with Old Frome Road, to Tor Street. Numbers represent survey points spaced at 100m intervals.

3 Survey results

3.1 Keward Brook

Land use urban/suburban unless otherwise stated

Litter small amounts unless otherwise stated.

3.1.1 Survey point KB1

The Brook begins close to Wells Moat where it appears from the tunnel displayed in Figure 5. The brook passes through a gully that is vegetated by a simple vegetation structure (Figure 6). The substrate was found to consist predominantly of cobble (Figure 7). Notable amounts of litter were present at, and downstream of, this survey point (Figure 7).

The surrounding land use is classed as sub-urban/urban (asphalt footpath) to the right bank and unimproved grassland to the left bank. Additional water enters the brook directly from the moat via the pipe displayed in Figure 8. Downstream of this pipe, modifications (stone bank reinforcement) are visible on the right bank (Figure 9). Downstream of this pipe the bankside vegetation becomes overgrown with the stream barely visible (Figure 10).



Figure 5: Upstream view of Keward Brook from survey point KB1.



Figure 6: Downstream view from view of Keward Brook from survey point KB1.



Figure 7: Litter in Keward Brook stream channel at survey point KB1.



Figure 8: Upstream view of secondary outflow from moat approximately 50m downstream of survey point KB1. Pipe diameter = 30cm.



Figure 9: View of stone reinforcement of right bank of Keward Brook approximately 65m downstream of survey point KB1.



Figure 10: View of Keward Brook from the right bank approximately 80m downstream of survey point KB1. Steam is barely visible due to overgrown vegetation.

3.1.2 Survey point KB2

The brook continues through a gully that is vegetated by a simple vegetation structure (Figure 11 and Figure 12). Notable amounts of litter were present at, and downstream of, this survey point. The surrounding land use is classed as sub-urban/urban (asphalt footpath) to the right bank and unimproved grassland to the left bank.

A metal bar wrapped in barbed wire bridges over the stream approximately 20m downstream of survey point KB2. The reason for this existence of this bar, that is visible for the public footpath, is not known.

Slightly downstream of the metal bar is the main outfall where water from Wells Moat flows into Keward Brook (Figure 14Figure 15).



Figure 11: Upstream view of Keward Brook from survey point KB2.



Figure 12: Downstream view of Keward Brook from survey point KB2.



Figure 13: Downstream view of Keward Brook approximately 20m downstream of survey point KB2. Note the metal bar wrapped in barbed wire bridging over the stream.



Figure 14: Main outflow from moat on the right bank of Keward Brook approximately 30m downstream of survey point KB2.



Figure 15: View downstream at the outflow from Wells Moat, approximately 30m downstream of survey point KB2.

3.1.3 Survey point KB3

At survey point KB3 the brook passes through the private grounds of a guest house (Figure 16).

A weir is visible over the right bank wall, located approximately 50m downstream of survey point KB3 (Figure 17). This weir is within the grounds of the guest house.

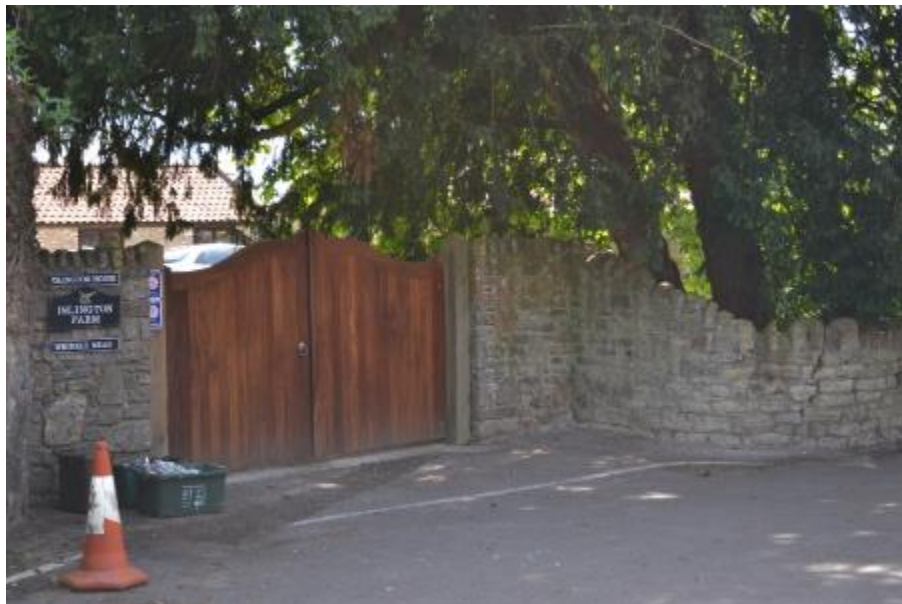


Figure 16: Guest house at survey point KB3. Keward Brook runs immediately the other side of, and parallel to, the brick wall.



Figure 17: View of weir from right bank, approximately 50m downstream of survey point KB3.

3.1.4 Survey point KB4

The brook flows through the grounds of private house situated on the left bank. Upstream of survey point KB4 the brook flows through the garden of the house where it is well maintained and visually attractive (Figure 18). Downstream the brook has a more natural appearance and flows over small riffles which occasionally flow into a pool (Figure 19).

A small weir is present at the survey point which can be found under the bridge leading to the private residence (Figure 20). Metal stakes can be seen placed along the bank approximately 15m downstream of survey point KB4 (Figure 21). The reason for their presence is unknown.

The bankside vegetation structure of the brook at this survey point is classed as complex along the right bank and simple on the left bank. The substrate was found to consist predominantly of pebble.



Figure 18: Upstream view of Keward Brook from survey point KB4.



Figure 19: Downstream view of Keward Brook from survey point KB4.



Figure 20: View of weir from the right bank at survey point KB4.



Figure 21: Upstream view of Keward Brook from the right bank, approximately 15m downstream of survey point KB4. Note the metal stakes along the right bank margin.

3.1.5 Survey point KB5

Immediately upstream the right bank forms a flat grass area comprising of a simple vegetation structure (Figure 22). This area can be accessed by the gate displayed in Figure 23 which is located approximately 20m upstream of survey point KB5. The gate is padlocked which prevents public access.

Downstream the brook passes under a series of three access bridges. An effluent discharge pipe was found to be located under the first bridge (Figure 25). The pipe points downwards and empties directly into the brook. Although no odour was present at the time of the survey it should be noted that it services agricultural operations along the left bank of the brook.

A downstream facing concrete groyne is located on the left bank in between the second and third bridges found along this section of brook (Figure 26). The deflector concentrates the current whilst pushing it towards the right bank. The result of this is a small pool where the substrate has been scoured by the increased flow.

The bankside vegetation structure of the brook at this survey point is classed as a simple. The substrate was found to consist predominantly of cobble.



Figure 22: Upstream view of Keward Brook from survey point KB5.

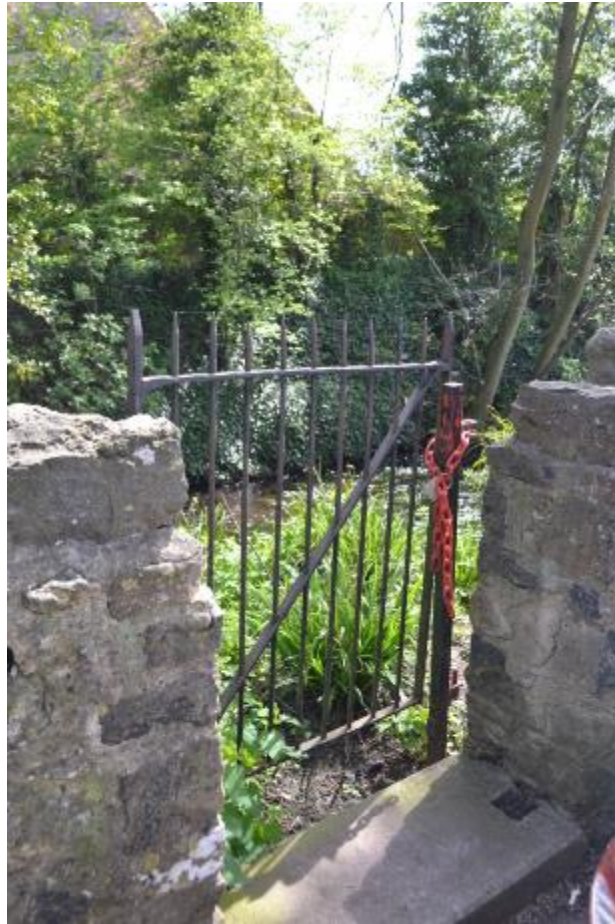


Figure 23: Access to the right bank of Keward Brook, approximately 20m upstream of survey point KB5.



Figure 24: Downstream view of Keward Brook from survey point KB5.



Figure 25: Pipe under the first bridge located downstream of survey point KB5. The 15cm diameter pipe runs from the left bank and dispenses directly into Keward Brook. No odour was present, although brown residue can be clearly visible close to the exit.



Figure 26: Downstream view of the third bridge located downstream of survey point KB5. Note the downstream facing concrete groyne on the left bank.

3.1.6 Survey point KB6



Figure 27: Upstream view of Keward Brook from survey point KB6.



Figure 28: Downstream view of Keward Brook from survey point KB6.



Figure 29: Upstream view of bridge approximately 15m downstream of survey point KB6. Note the metal bar running across the bridge arch, a stake supporting a tyre on the right bank (left in the image) and a blue pipe running into the stream.



Figure 30: The streambed substrate present at survey point KB6.



Figure 31: Litter along the right bank of Keward Brook, approximately 30m downstream of survey point KB6.



Figure 32: Downstream view of Keward Brook approximately 50m downstream of survey point KB6. Note the high wall running parallel to the right bank and the pipe bridging across the channel.



Figure 33: Upstream view of Keward Brook approximately 70m downstream from survey point KB6. Stones have been place across the channel that will, in time, cause a pool to be created.

3.1.7 Survey point KB7



Figure 34: Upstream view of Keward Brook from survey point KB7.



Figure 35: A 22cm diameter discharge pipe on the left bank at survey point KB7. No odour was present and no effluent was being discharged. Minimum staining is visible on the wall beneath the pipe.



Figure 36: Downstream view of Keward Brook from survey point KB7.

3.1.8 Survey point KB8

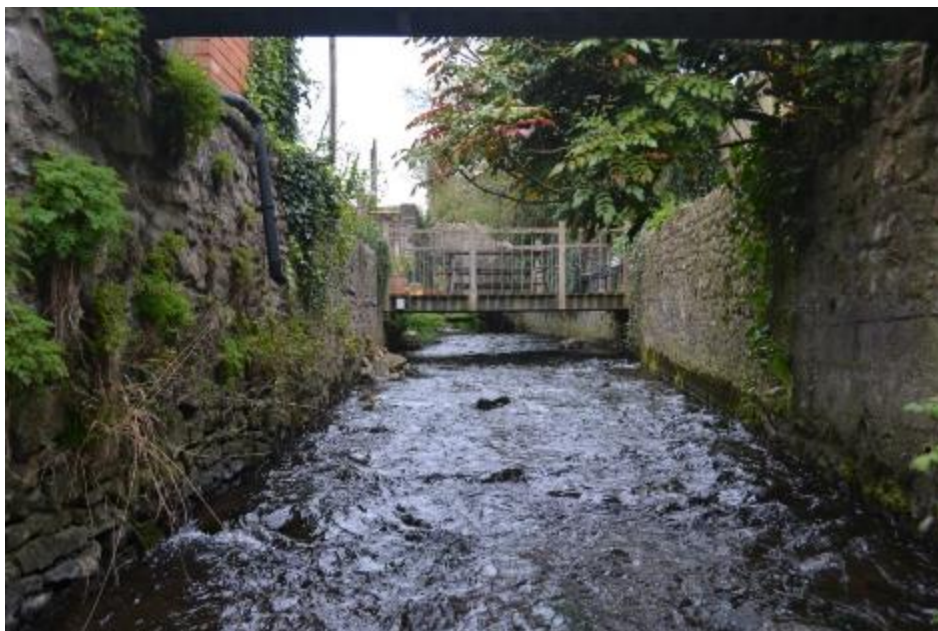


Figure 37: Upstream view of Keward Brook from survey point KB8.



Figure 38: Downstream view of Keward Brook from survey point KB8.



Figure 39: Weir approximately 40m downstream of survey point KB8.



Figure 40: Downstream view of weir pool and tunnel that pass below a house built over Keward Brook, located approximately 40m downstream of survey point KB8.



Figure 41: Downstream view within the tunnel that passes below a house built over Keward Brook, located approximately 45m downstream of survey point KB8.

3.1.9 Survey point KB9.



Figure 42: Upstream view of Keward Brook from survey point KB9.



Figure 43: Downstream view of Keward Brook from survey point KB9.



Figure 44: Keward Brook stream bed substrate present at survey point KB9.



Figure 45: Downstream view of weir located approximately 10m downstream of survey point KB9.



Figure 46: Discharge pipe located 10m downstream of survey point KB9 on the left bank. The 24cm diameter pipe was odourless and was not discharging effluent.

3.1.10 Survey point KB10



Figure 47: Upstream view of Keward Brook from survey point KB10.



Figure 48: Downstream view of Keward Brook from survey point KB10.



Figure 49: Keward Brook stream bed substrate present at survey point KB10.

3.1.11 Survey point KB11



Figure 50: Upstream view of Keward Brook from survey point KB11.



Figure 51: A 50cm diameter pipe, located on the left bank, discharging effluent into Keward Brook approximately 20m upstream of survey point KB11. The effluent was odourless and clear at the time this image was taken.



Figure 52: Downstream view of Keward Brook from survey point KB11.



Figure 53: Keward Brook streambed substrate at survey point KB11.



Figure 54: Substantial weed beds (*Ranunculus* sp.) that are present at survey point KB11 downstream to the end of Gate Lane.



Figure 55: Litter present along the left bank margin of Keward Brook, approximately 25m downstream of survey point KB11.



Figure 56: A 90cm diameter pipe, located on the left bank, discharging effluent into Keward Brook approximately 75m downstream of survey point KB11. The effluent was odourless and clear at the time this image was taken.

3.1.12 Survey point KB12



Figure 57: Upstream view of Keward Brook from survey point KB12.



Figure 58: Downstream view of Keward Brook from survey point KB12.



Figure 59: Keward Brook streambed substrate present at survey point KB12.

3.1.13 Survey point KB13



Figure 60: Upstream view of Keward Brook from survey point KB13.



Figure 61: Downstream view of Keward Brook from survey point KB13.



Figure 62: Keward Brook streambed substrate present at survey point KB13.



Figure 63: Debris behind a tree that has fallen from the left bank, approximately 50m downstream of survey point KB13.

3.1.14 Survey point KB14



Figure 64: Upstream view of Keward Brook from survey point KB14.



Figure 65: Downstream view of Keward Brook from survey point KB14.



Figure 66: Keward Brook streambed substrate present at survey point KB14.

3.1.15 Survey point KB15



Figure 67: Upstream view of Keward Brook from survey point KB15.



Figure 68: Downstream view of Keward Brook from survey point KB15.



Figure 69: Keward Brook streambed substrate present at survey point KB15.



Figure 70: Rock and coir rolls placed situated along the left bank of Keward Brook, approximately 50m downstream from survey point KB15.



Figure 71: A 50cm diameter surface water drainage discharge pipe situated on the right bank of Keward Brook, approximately 80 m downstream of survey point KB15.

3.1.16 Survey point KB16



Figure 72: Upstream view of Keward Brook from survey point KB16.



Figure 73: Downstream view of Keward Brook from Point KB16.



Figure 74: Upstream view of a flow deflector located on the right bank, approximately 10m downstream from survey point KB16.



Figure 75: Litter along left bank of Keward Brook, approximately 15m downstream of survey point KB16.



Figure 76: A 15cm diameter surface water drainage discharge pipe situated on the right bank of Keward Brook, approximately 75m downstream of survey point KB16.



Figure 77: Downstream view of Keward Brook approximately 80m downstream of survey point KB16. Note the litter present along the right bank.

3.1.17 Survey point KB17



Figure 78: Upstream view of Keward Brook from survey point KB17.



Figure 79: Downstream view of Keward Brook from survey point KB17.



Figure 80: A 15cm diameter pipe located on the left bank wall of Keward Brook at survey point KB17. Note the prominent staining on the wall caused by the discharge of effluent from the pipe.



Figure 81: Close up view of the 15cm diameter pipe located on the left bank wall of Keward Brook at survey point KB17. Effluent is clearly visible in the pipe the pipe; a foul smelling odour was present.



Figure 82: Downstream view of Keward Brook, approximately 40m downstream from survey point KB17. Note the presence of several (five in total) 15cm diameter discharge pipes located along the left bank wall. No staining was visible on the wall below any of these pipes and no foul smelling odour was present.

3.1.18 Survey point KB18



Figure 83: Upstream view of Keward Brook from survey point KB18.



Figure 84: Upstream view of Keward Brook from survey point KB18.



Figure 85: Keward Brook streambed substrate present at survey point KB18.



Figure 86: A 45cm diameter culvert pipe discharge pipe situated on the right bank of Keward Brook, approximately 75m downstream of survey point KB18. The pipe was discharging a constant flow of clear, odourless water, possibly flowing from St. Andrew's Stream.

3.1.19 Survey point KB19



Figure 87: Upstream view of Keward Brook from survey point KB19.



Figure 88: Downstream view of Keward Brook from survey point KB19.



Figure 89: Keward Brook streambed substrate present at survey point KB19.

3.1.20 Survey point KB20



Figure 90: Upstream view of Keward Brook from survey point KB20.



Figure 91: Downstream view of Keward Brook from survey point KB20.

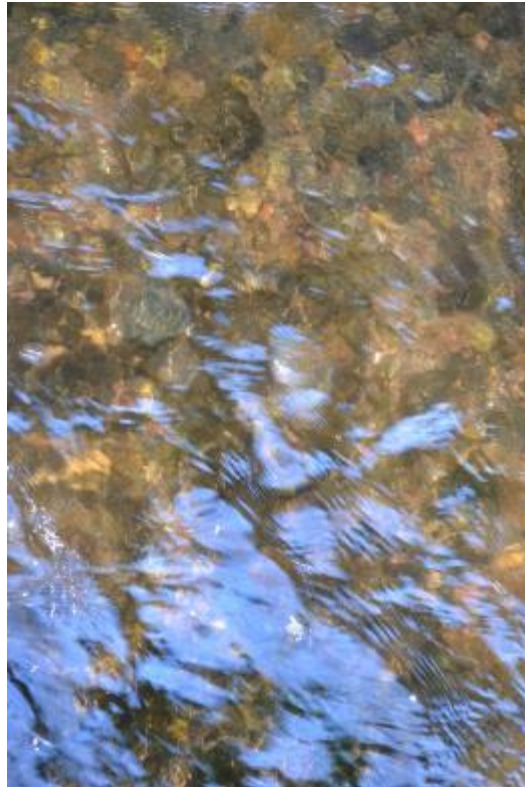


Figure 92: Keward Brook streambed substrate at survey point KB20.

3.1.21 Survey point KB21



Figure 93: Upstream view of Keward Brook from survey point KB21.



Figure 94: Downstream view of Keward Brook from survey point KB21.



Figure 95: Keward Brook streambed substrate at survey point KB21.

3.2 St. Andrew's Stream

3.2.1 Survey point SA1



Figure 96: Upstream view of St. Andrew's Stream from survey point SA1.



Figure 97: St. Andrew's Stream streambed substrate at survey point SA1.



Figure 98: Weir, culvert pipes and litter at survey point SA1.

3.2.2 Survey point SA2



Figure 99: Wall at survey point SA2 behind which runs St. Andrew's Stream. The Stream runs from towards the pavement and is culverted from this point to survey point SA3



Figure 100: Upstream view of St. Andrew's Stream from survey point SA2.

3.2.3 Survey point SA3



Figure 101: Upstream view of St. Andrew's Stream from survey point SA3.



Figure 102: Downstream view of St. Andrew's Stream from survey point SA3.



Figure 103: St. Andrew's Stream streambed substrate at survey point SA3.



Figure 104: Upstream view of St. Andrew's Stream and small weir approximately 20m downstream of survey point SA3.



Figure 105: Substantial weed growth in the channel of St. Andrew's Stream approximately 50m downstream of survey point SA3.

3.2.4 Survey point SA4



Figure 106: Upstream view of St. Andrew's Stream from survey point SA4.



Figure 107: Downstream view of St. Andrew's Stream from survey point SA4.



Figure 108: Substantial weed growth and litter in the channel of St. Andrew's Stream approximately 50m downstream of survey point SA4.

3.2.5 Survey point SA5



Figure 109: Upstream view of St. Andrew's Stream from survey point SA5.



Figure 110: Downstream view of St. Andrew's Stream from survey point SA5.



Figure 111: Exposed, littered and sparsely vegetated left bank of St. Andrew's Stream, located approximately 25m downstream of survey point SA5,



Figure 112: Discharge pipe located approximately 45m downstream of survey point SA5 on the left bank. The 30cm diameter pipe was odourless and was not discharging effluent.

3.2.6 Survey point SA6a



Figure 113: Upstream view of St. Andrew's Stream from survey point SA6a.

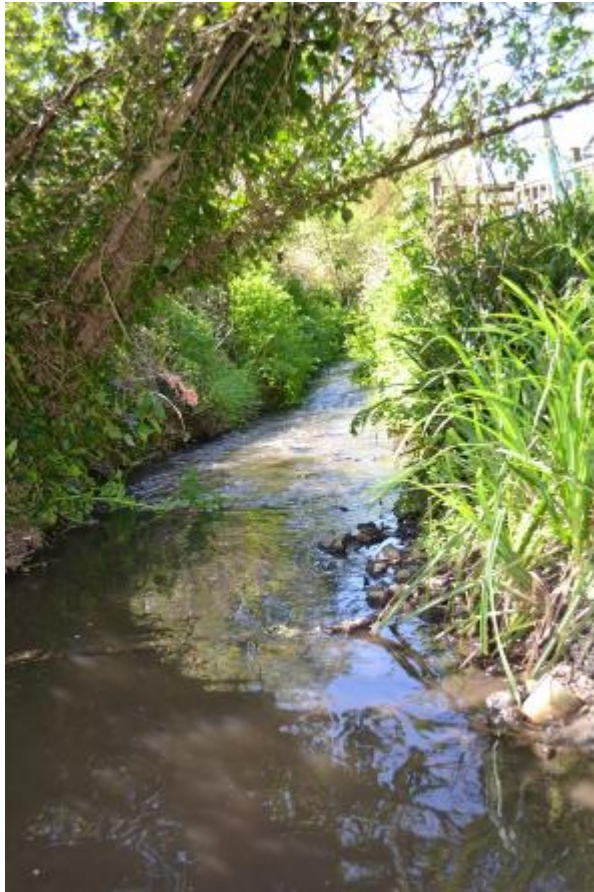


Figure 114: Downstream view of St. Andrew's Stream from survey point SA6a.



Figure 115: Litter on the right bank approximately 20m downstream of survey point SA6a.

3.2.7 Survey point SA6b



Figure 116: Culvert discharging water that passes through a screen filter at survey point SA6b. Litter is visible in the channel.



Figure 117: Downstream view of St. Andrew's Stream from survey point SA6b.

3.2.8 Survey point SA7a



Figure 118: Upstream view of St. Andrew's Stream from survey point SA7a.



Figure 119: Downstream view of St. Andrew's Stream from survey point SA7a.



Figure 120: St. Andrew's Stream streambed substrate at survey point SA7a.



Figure 121: Downstream view of St. Andrew's Stream where it flows over a small weir, located approximately 25m downstream from survey point SA7a.



Figure 122: Upstream view of St. Andrew's Stream where it flows over a small weir, located approximately 25m downstream from survey point SA7a.



Figure 123: Litter visible in the right bank vegetation of St. Andrew's Stream 50m downstream from survey point SA7a.



Figure 124: Figure 123: Litter visible in the channel of St. Andrew's Stream 65m downstream from survey point SA7a.



Figure 125: 10cm diameter discharge pipe located on the left bank of St. Andrew's Stream approximately 80m downstream from survey point SA7a. No effluent was flowing from the pipe and no odour was present.



Figure 126: Upstream view from towards survey point SA7b (side channel) approximately 90m downstream from survey point SA7a

3.2.9 Survey point SA7b



Figure 127: Upstream view of St. Andrew's Stream from survey point SA7b.



Figure 128: Downstream view of St. Andrew's Stream from survey point SA7b.



Figure 129: St. Andrew's Stream streambed substrate at survey point SA7b.

3.2.10 Survey point SA8



Figure 130: Upstream view of St. Andrew's Stream from survey point SA8.



Figure 131: Downstream view of St. Andrew's Stream from survey point SA8.



Figure 132: St. Andrew's Stream streambed substrate at survey point SA8.



Figure 133: Litter visible in the channel of St. Andrew's Stream 15m downstream from survey point SA8.



Figure 134: 30cm discharge pipe located on the right bank of St. Andrew's Stream 15m downstream from survey point SA8. No effluent was flowing from the pipe and no odour was present.

3.2.11 Survey point SA9



Figure 135: Upstream view of St. Andrew's Stream from survey point SA9.



Figure 136: Downstream view of St. Andrew's Stream from survey point SA9.



Figure 137: St. Andrew's Stream streambed substrate and litter at survey point SA9.

3.2.12 Survey point SA10



Figure 138: Upstream view of St. Andrew's Stream from survey point SA10.



Figure 139: Downstream view of St. Andrew's Stream from survey point SA10.



Figure 140: Upstream view of St. Andrew's Stream and a small weir located approximately 40m downstream from survey point SA910.

3.2.13 Survey point SA11



Figure 141: Upstream view of St. Andrew's Stream from survey point SA11.



Figure 142: Downstream view of St. Andrew's Stream from survey point SA11.



Figure 143: St. Andrew's Stream streambed substrate at survey point SA11.



Figure 144: Downstream view of St. Andrew's Stream 40m downstream from survey point SA11

3.2.14 Survey point SA12



Figure 145: Upstream view of St. Andrew's Stream from survey point SA12.



Figure 146: Downstream view of St. Andrew's Stream from survey point SA12.



Figure 147: St. Andrew's Stream streambed substrate at survey point SA12.



Figure 148: Upstream view of St Andrew's Stream and a small weir approximately 20m downstream from survey point SA912.



Figure 149: St. Andrew's Stream substrate covered in caddis fly larvae approximately 25m downstream from survey point SA12.



Figure 150: Downstream view of St. Andrew's Stream and disused sluice system approximately 75m downstream from survey point SA12.



Figure 151: View of debris and litter accumulation on the left bank of St. Andrew's Stream just before a disused sluice system located approximately 75m downstream from survey point SA12.

3.2.15 Survey point SA13



Figure 152: Upstream view of St. Andrew's Stream from survey point SA13.



Figure 153: Downstream view of St. Andrew's Stream from survey point SA13.



Figure 154: Upstream view of St. Andrew's Stream where it passes under a bridge approximately 50m downstream from survey point SA13.



Figure 155: Two 10cm diameter discharge pipes and a single 20cm pipe (behind vegetation) on the left bank of St. Andrew's Stream approximately 65m downstream from survey point SA13. The purpose of the 10cm pipes in not known although a mild foul smelling dour was present.



Figure 156: Downstream view of St. Andrew's Stream approximately 65m downstream from survey point SA13.

3.2.16 Survey point SA14



Figure 157: Upstream view of St. Andrew's Stream from survey point SA14.



Figure 158: Upstream view of Keward Brook at its junction with St. Andrew's Stream at survey point SA14.



Figure 159: Downstream view of Keward Brook at its junction with St. Andrew's Stream at survey point SA14.



Figure 160: St. Andrew's Stream streambed substrate at survey point SA14.

3.3 St. Thomas's Stream

3.3.1 Survey point ST1



Figure 161: Downstream view of St. Thomas's Stream from survey point ST1.

3.3.2 Survey point ST2



Figure 162: Upstream view of St. Thomas's Stream from survey point ST2.



Figure 163: Downstream view of St. Thomas's Stream from survey point ST2.



Figure 164: St. Thomas's Stream streambed substrate at survey point ST2.



Figure 165: Upstream view of St. Thomas's Stream approximately 45m downstream from survey point ST2.



Figure 166: Downstream view of St. Thomas's Stream approximately 45m downstream from survey point ST2. The stream cuts through the grounds of Wells Golf Club from this location.

3.3.3 Survey point ST3

Not visible in golf course

3.3.4 Survey point ST4



Figure 167: View towards St. Andrew's Stream survey point ST4.

3.3.5 Survey point ST5



Figure 168: View towards St. Andrew's Stream survey point ST5 where it passes under a small footbridge.

3.3.6 Survey point ST6



Figure 169: Upstream view of St. Thomas's Stream from survey point ST6.



Figure 170: Downstream view of St. Thomas's Stream from survey point ST6.



Figure 171: St. Thomas's Stream streambed substrate at survey point ST6.

3.3.7 Survey point ST7



Figure 172: Upstream view of St. Thomas's Stream from survey point ST7.



Figure 173: Downstream view of St. Thomas's Stream from survey point ST7.



Figure 174: St. Thomas's Stream streambed substrate at survey point ST7.

3.3.8 Survey point ST8



Figure 175: Upstream view of St. Thomas's Stream from survey point ST8.



Figure 176: Downstream view of St. Thomas's Stream from survey point ST8.



Figure 177: St. Thomas's Stream streambed substrate at survey point ST8.



Figure 178: Upstream view of St. Thomas's Stream approximately 70m downstream of survey point ST8. A culvert and a 16cm diameter pipe (on the left bank) are visible.



Figure 179: Close up image of sediment in a 16cm diameter pipe located approximately 70m downstream of survey point ST8. No effluent was being discharged and no odour was present

3.3.9 Survey point ST9

Stream not visible – passes through gardens

3.3.10 Survey point ST10



Figure 180: Upstream view of St. Thomas's Stream from survey point ST10.

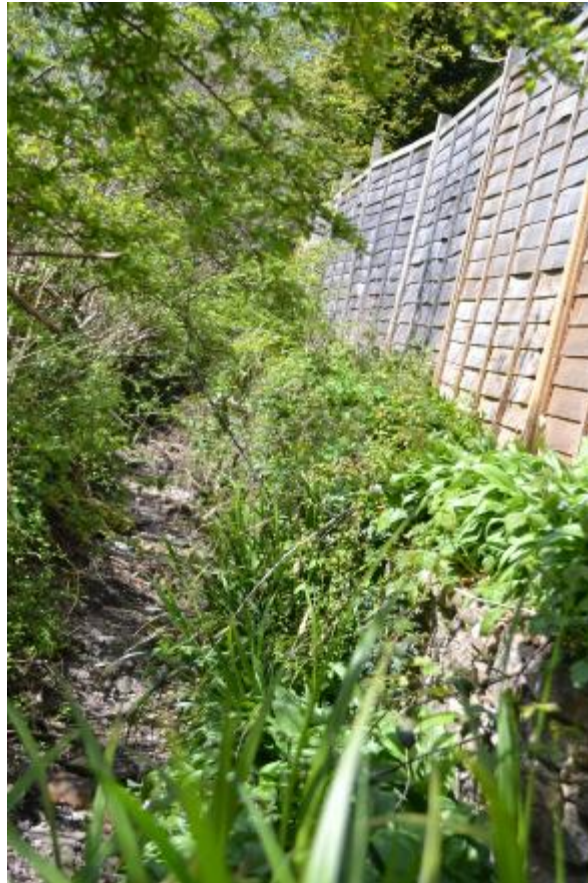


Figure 181: Downstream view of St. Thomas's Stream from survey point ST10.



Figure 182: St. Thomas's Stream streambed substrate at survey point ST10.

3.3.11 Survey point ST11



Figure 183: Upstream view of St. Thomas's Stream from survey point ST11.



Figure 184: Downstream view of St. Thomas's Stream from survey point ST11.



Figure 185: St. Thomas's Stream streambed substrate at survey point ST11.



Figure 186: Downstream view of St. Thomas's Stream and bank modifications approximately 50m downstream of survey point ST11.

3.3.12 Survey point ST12



Figure 187: Upstream view of St. Thomas's Stream from survey point ST12.



Figure 188: Downstream view of St. Thomas's Stream from survey point ST12.



Figure 189: St. Thomas's Stream streambed substrate at survey point ST12.



Figure 190: Downstream view of St. Thomas's Stream approximately 50m downstream of survey point ST12. Note the presence of water that enters the stream from the right bank (not visible).



Figure 191: View towards the right bank of St. Thomas's Stream approximately 50m downstream of survey point ST12. Water is entering the stream from a spring that emerges from the right bank.

3.3.13 Survey point ST13



Figure 192: Upstream view of St. Thomas's Stream from survey point ST13.



Figure 193: Downstream view of St. Thomas's Stream from survey point ST13.



Figure 194: St. Thomas's Stream streambed substrate at survey point ST13.

3.3.14 Survey point ST14



Figure 195: Upstream view of St. Thomas's Stream from survey point ST14.



Figure 196: Downstream view of St. Thomas's Stream from survey point ST14.



Figure 197: St. Thomas's Stream streambed substrate at survey point ST14.



Figure 198: Downstream view of St. Thomas's Stream approximately 40m downstream of survey point ST14.



Figure 199: Upstream view of St. Thomas's Stream approximately 40m downstream of survey point ST14.

3.3.15 Survey point ST15



Figure 200: Upstream view of St. Thomas's Stream from survey point ST15.



Figure 201: Downstream view of St. Thomas's Stream from survey point ST15.



Figure 202: St. Thomas's Stream streambed substrate at survey point ST15.

3.3.16 Survey point ST16



Figure 203: Upstream view of St. Thomas's Stream from survey point ST16.



Figure 204: Downstream view of St. Thomas's Stream from survey point ST16.

3.3.17 Survey point ST17



Figure 205: Upstream view of St. Thomas's Stream from survey point ST17.



Figure 206: Downstream view of St. Thomas's Stream from survey point ST17.



Figure 207: St. Thomas's Stream streambed substrate at survey point ST17.



Figure 208: Downstream view of St. Thomas's Stream approximately 15m downstream of survey point ST17.

3.3.18 Survey point ST18



Figure 209: View across privately owned fields towards St. Thomas Stream Survey point ST18.

3.3.19 Survey point ST19



Figure 210: Upstream view of St. Thomas's Stream from survey point ST19.

4 Discussion

References

Andrews, C., Excell, A. and Carrington, N. 2005. *The interpret manual of fish health*. Dorking, Surrey: Interpret Ltd.