West Norfolk Bathing Water Quality

Adam Worley
Coastal Catchment Manager

What affects bathing water quality?

love every drop
anglianwater
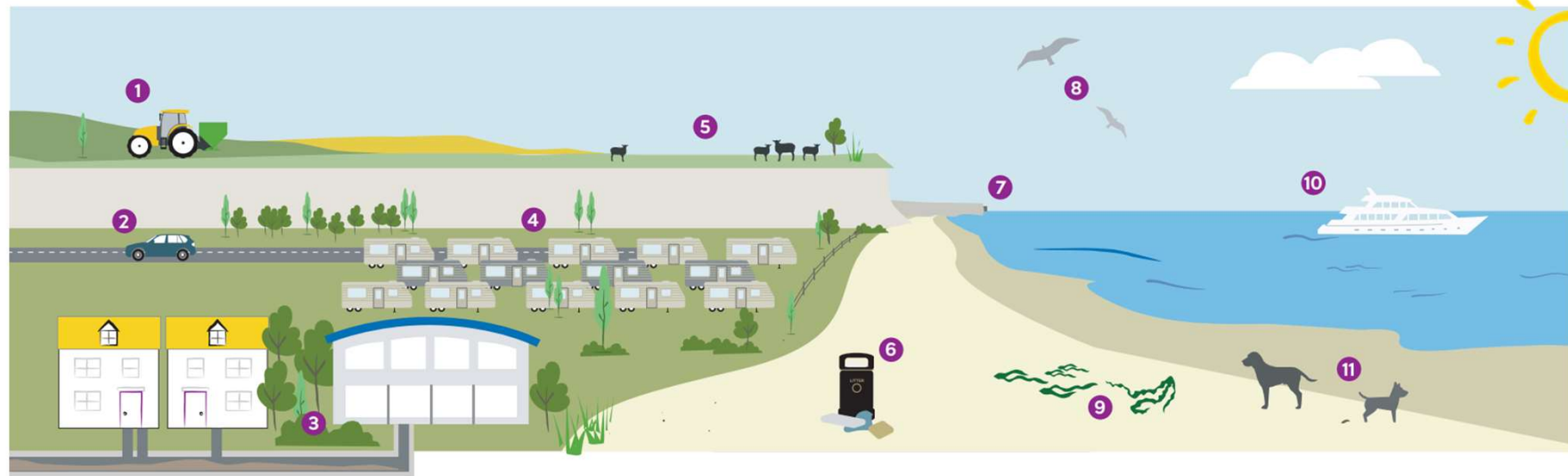
1 Agriculture

Muck spreading or the presence of manure heaps or chemicals and fertilisers can wash into rivers from farmland when it rains.

2 Highways

Pollution can come from highways drainage. Run off from roads during wet weather washes chemicals, traces of oil, dirt and other pollutants into the sea.

3 Sewer capacity

Sudden increases in seasonal holiday makers can put extra pressure on sewer capacity. Couple this with a reduction in sewer capacity due to a build up of fats, oils and grease, and sewers and water recycling centres can struggle to cope.

4 Private overflows

Discharges from private sewer systems, such as private pumping stations owned by caravan parks or privately owned cess pits, could result in untreated sewage entering the bathing water.

5 Grazing animals

Excrement from grazing animals can wash off fields into bathing waters during periods of heavy rainfall.

6 Litter

Litter encourages vermin which carry disease. Their excrement gets washed into the bathing water along with the litter.

7 Overflows

To protect properties from flooding during heavy rainfall, combined storm overflows and emergency overflows can lead to diluted sewage entering the bathing water.

8 Bird droppings

Bird droppings contain harmful bacteria and can wash down from rooftops into the bathing water when it rains. Droppings from large populations of birds under piers and other coastal structures can also be a problem.

9 Seaweed and sediment

Bacteria growing in seaweed can pollute bathing water. Disturbed sand and sediment on the sea bed can release trapped bacteria.

10 Boats

Boats can flush their bilge tanks and discharge onboard toilets directly into the sea.

11 Dog poo

Dog poo contains some nasty parasites and bacteria and any fouling on the beach that's not picked up gets washed into the sea.

Heacham WRC

- The works were finished in 1990 with UV treatment added in 1998.

- The works was designed to serve a population equivalent of 54,000 and currently we have a connected population equivalent of approximately 23,500.

- In summer we do on occasion see a population equivalent which exceeds the design criteria, but we have plans in place which mitigates this and we prevent it breaching permit limits.

- It is also important to confirm that no storm flows leave site as the 'storm tanks' are blind.
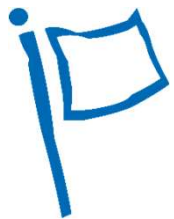
Summary of 2023 Bathing Water Season

Average Bacteria Concentrations

Bathing Water	E.Coli (Average cfu/100ml)		I.E. (Average cfu/100ml)	
	2023	2018-2022	2023	2018-2022
Heacham	41.2	101.1	46.15	93
Hunstanton Main	78.7	71.1	19.3	84.6
Old Hunstanton	90.9	100	74.6	70

Single year classification

Bathing Water	E.Coli (95%ile)	I.E. (95%ile)	Classification
Heacham	122.17	138.57	Good
Hunstanton Main	191.28	44.29	Excellent
Old Hunstanton	316	241.36	Sufficient

Percentage of Excellent Results

Bathing Water	2023	2019	2021	2022
West Norfolk	86.66%	72.88%	76.66%	66.67%

Summary of 2023 Bathing Water Season

Bathing Water	Date	Findings
Heacham & Old Hunstanton	06/06/2023	No heavy rainfall or AWS asset activity. Samples were collected during a Spring Tide.
Hunstanton Main & Old Hunstanton	24/07/2023	Some heavy rain in preceding days. No AWS asset activity. Samples collected on Pollution Risk Forecast.
Old Hunstanton	04/08/2023	Sample was collected within 1 day of a Spring Tide. In addition, sea foam has been identified by a member of public. Though not previously identified as an issue in West Norfolk, the presence of algal blooms have resulted in elevated results further round the coast in North Norfolk. Heavy rainfall will have resulted in discharges from Hunstanton surface water lines, however, limited impacts have been identified at nearby Hunstanton Main. It is therefore concluded that whilst there has been heavy rainfall on the proceeding days, impact is likely due to the presence of a delaying algal bloom and a Spring Tide. Sample collected on Pollution Risk Forecast.
Heacham	10/08/2023	No heavy rainfall or asset activity. No root cause identified.
Hunstanton Main & Old Hunstanton	03/09/2023	Limited rainfall on the 01/09/2023 to a maximum intensity of 1.90 mm/hr. Samples were collected during a Spring Tide.

Summary of 2023 Bathing Water Season

| PRFs	BeachAware
PRFs are based on measurements of Rain, Time, Tide, Sunlight (UV), Wind. Not linked to sewage / storm overflow	BeachAware uses a coastal model to predict the movement of plumes and whether this will result in impact to bathing water quality.
EA only issue these during the bathing water season (May to September)	AWS issue BeachAware alerts throughout the year
EA prediction tool is run every morning and any forecast remain in place for 24 hours (can get forecast for several days on the trot)	BeachAware alerts only generated when there has been asset activity and model predicts impact to a bathing water. Alerts remain in place 24 hours after a model predicts no further impact.
PRFs are issued to Local Authorities who display signage warning that swimming is not advised that day	BeachAware alerts are issued to Local Authority, EA and SAS. Signage can be displayed warning against swimming.
The EA do not make these forecasts for all bathing waters as 'not all are at risk from these issues'	BeachAware alerts cover a wider number of beaches and are in place for any bathing waters where CSOs can impact water quality

2022 & 2023 EDM Data

Anglian water discharges from pumping stations 2022 and 23

Environment Agency

Legend

◆ Bathing Water Compliance
▦ Bathing Water areas

Smuggler's Lane pumping station

2022 11 times, 8.9hrs
(2 times, 4.1 hrs in bathing water season)

2023 (to 30/9/23) 17 times 14.2 hrs
(14 times, 12.37hrs in bathing water season)

South End pumping station

2022 7 times 1.56hrs
(2 times, 0.2hrs in bathing water season)

2023 (to 30/9/23) 4 times 5.6hrs
(all in bathing water season)

1 : 50,000

0   1,250

Metres

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AMP7 – Work Completed

▶ Historic Report Phase I Desk Study

▶ Seagate Surface Water Catchment Misconnection Survey

▶ Gymkhana Way Surface Water Catchment Misconnection Survey

▶ CREH Sediment Study

▶ CREH DNA Study

▶ Intertek Source Apportionment Study

▶ Optimisation work at South End Road TPS

▶ Study into impacts from brine discharges from Water Treatment Works

▶ Behavioural change work
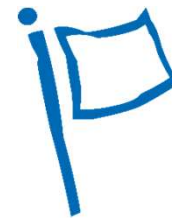
Source Apportionment Study

Bathing Water	E.Coli		Intestinal Enterococci	
	Source	Percentage	Source	Percentage
Heacham	Birds	60%	Birds	79%
	River Heacham	30%	River Heacham	10%
Hunstanton Main	South End Road TPS – LSO	65%	Birds	69%
	South End Road TPS - SSO	11%	South End Road TPS – LSO	16%
Old Hunstanton	South End Road TPS - LSO	40%	Seagate SWS	33%
	Seagate SWS	30%	Birds	29%
			South End Road TPS – LSO	12%

Sewage Vs Diffuse Pollution

- Daily loading from 35 gulls is equivalent to crude sewage from 1 person
- Daily loading from 1 Gull is equivalent as loading from secondary treated sewage of 6 people.
- Therefore, loading from 1000 Gulls is the same loading as that from a non-UV secondary treatment works with a population equivalence of 6000 people
- Heacham WRC has a Population Equivalence of approximately 54k and has a UV plant with a 3-log reduction. The daily loading from Heacham WRC is equivalent to the daily loading from 9-10 Gulls

Scenario	Published Data
Human load per day	1.05E+10
Gull load per day	3.00E+8
Gulls per Human (Crude 1PE)	35
Human (secondary Treatment PE) per Gull	6
Human (UV treatment 2 log reduction PE log reduction) per Gull	571
Human (UV treatment 3 log reduction PE log reduction) per Gull	5714

AMP8 – our plans for the future

Further Spill Reduction at South End Road TPS

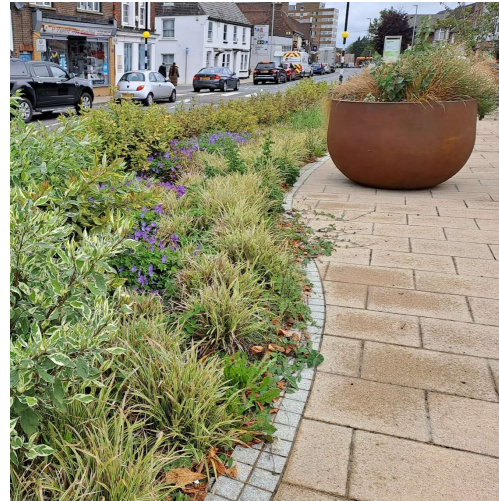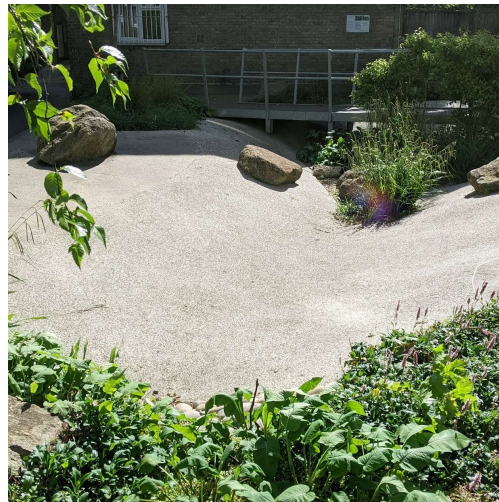☑ Further optimisation may be required following review of current spill frequencies

Reduction of Impacts from Seagate SWS

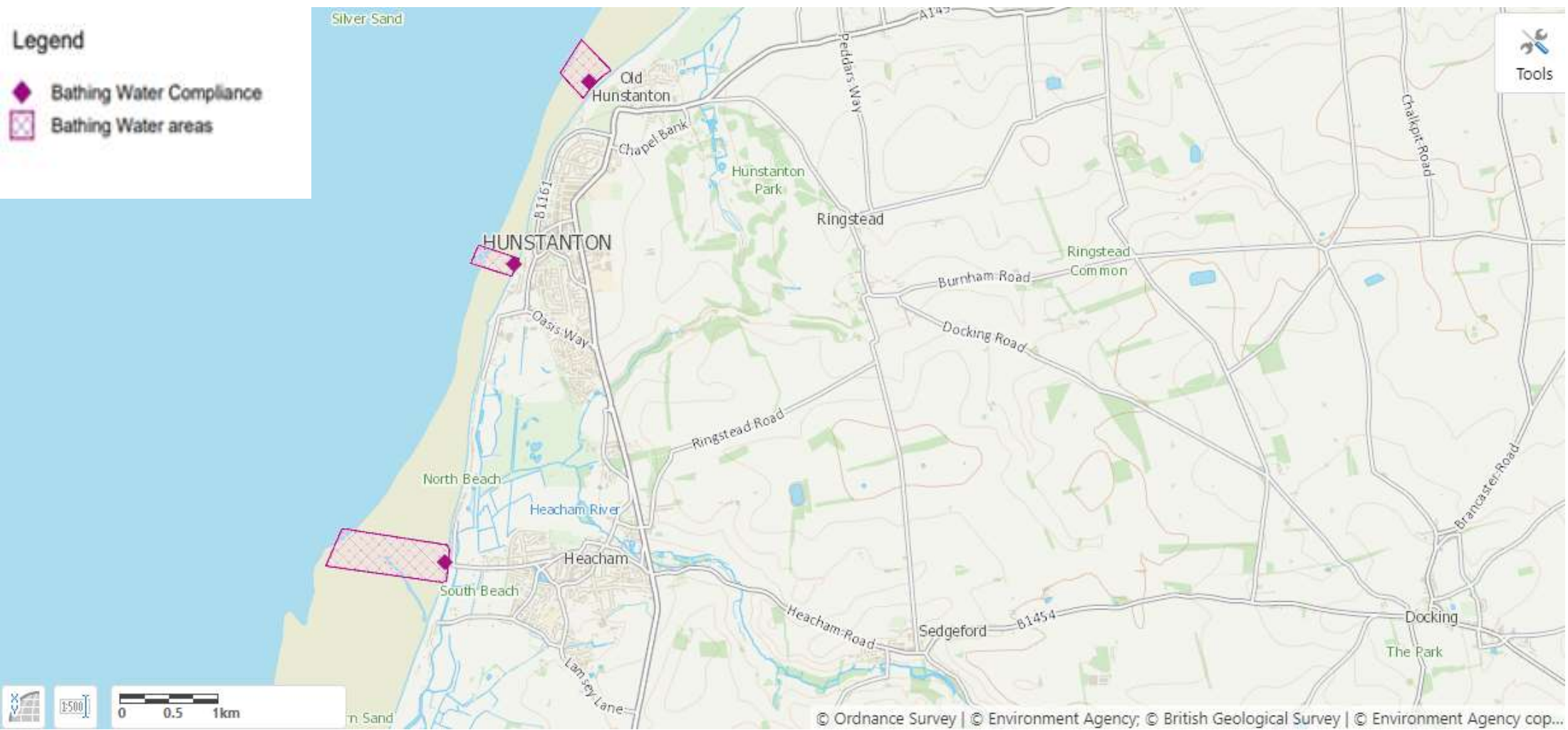☑ A SuDS scheme has been proposed to reduce loading from Seagate SWS

SuDs Examples

**Corporate Performance Meeting
Andrew Raine – Environment Manager**

Location of bathing waters – October 2023

Microbial Source Tracking Analysis

Heacham

Data to date is not sufficient to draw firm conclusions as to definitive cause of poor water quality.

However:-

1. There appears to be multiple sources of faecal indicator bacteria.

2. Indication that the UV treated effluent from the Heacham STW is present some of the time, but not contributing to viable bacteria.

3. Possible link between bacteria numbers and MST markers for:
   - Birds – increased intestinal enterococci but not e.coli. Seabird marker detected consistently and at high concentrations
   - Dogs – too few data points but seems there's a link between presence of dogs and increased intestinal enterococci

4. Further Research:-
   Possible link between bacteria and environmental variables:
   - Suspended solids being mobilised
   - Wind speeds and associated turbidity

Environment Agency

Heacham 2022

Table showing bacterial and MST marker results

Determinand	Unit	Sample date						
		05/07/2022	31/07/2022	13/08/2022	01/09/2022	04/09/2022	11/09/2022	20/09/2022
confirmed Intestinal Enterococci	CFU/0.1l	210	420	220	270	250	350	720
confirmed E. Coli	No/100ml	100	250	320	18	110	45	64
Catellicoccus marker (Seabird)	lgN/0.1l	5	4.7	5.4	5.6	5.7	4.7	5.3
Mitochondrial Marker: Human	lgN/0.1l	2.6	2.9	2.7	2.7	<2	<2	2.6
Mitochondrial Marker: Dog	lgN/0.1l	<2	<2	not found	not found	<2	<2	not found
Bacteroidetes Marker: Ruminant	lgN/0.1l	not found	not found	not present	not found	not found	not found	not found
Bacteroidetes Marker: Human	lgN/0.1l	<2	<2	<2	<2	not found	<2	<2
Bacteroidetes Marker: All	lgN/0.1l	6.4	6.4	6	6.3	6.5	5.9	6.4

■ Excellent
■ Good
■ Sufficient
■ Poor

Notes:
Intestinal Enterococci and E. Coli have been colour coded to show where, individually, they might fall within a Bathing Water classification. This is a crude match as the standards are based on differing percentiles.

Hunstanton Main 2022

Table showing bacterial and MST marker results

Determinand	Unit	Sample date 2022				
		05/06/2022	30/06/2022	31/07/2022	27/08/2022	11/09/2022
confirmed Intestinal Enterococci	CFU/0.1l	160	240	450	100	420
confirmed E. Coli	No/100ml	150	120	440	82	45
Catellicoccus marker (Seabird)	lgN/0.1l	4.4	4.8	5	4.5	4.8
Mitochondrial Marker: Human	lgN/0.1l	2.6	3.1	2.5	2.4	2.7
Mitochondrial Marker: Dog	lgN/0.1l	not found	not found	2.8	not found	not found
Bacteroidetes Marker: Ruminant	lgN/0.1l	not found	not found	not found	not found	not found
Bacteroidetes Marker: Human	lgN/0.1l	<2	<2	<2	<2	<2
Bacteroidetes Marker: All	lgN/0.1l	6.3	6.2	6.4	5.8	6.1

- Excellent
- Good
- Sufficient
- Poor

Notes:

Intestinal Enterococci and E. Coli have been colour coded to show where, individually, they might fall within a Bathing Water classification. This is a crude match as the standards are based on differing percentiles.

Old Hunstanton 2022

Table showing bacterial and MST marker results

Determinand	Unit	Sample date 2022			
		30/06/2022	31/07/2022	13/08/2022	11/09/2022
confirmed Intestinal Enterococci	CFU/0.1l	100	170	380	320
confirmed E. Coli	No/100ml	18	310	200	330
Catellicoccus marker (Seabird)	lgN/0.1l	4.1	4.9	4.5	4.4
Mitochondrial Marker: Human	lgN/0.1l	<2	3.5	2.4	<2 (not found)
Mitochondrial Marker: Dog	lgN/0.1l	not found	not found	not found	<2
Bacteroidetes Marker: Ruminant	lgN/0.1l	not found	not found	not found	not found
Bacteroidetes Marker: Human	lgN/0.1l	<2	<2	<2	<2
Bacteroidetes Marker: All	lgN/0.1l	6	6.3	6.2	6.2

- Excellent
- Good
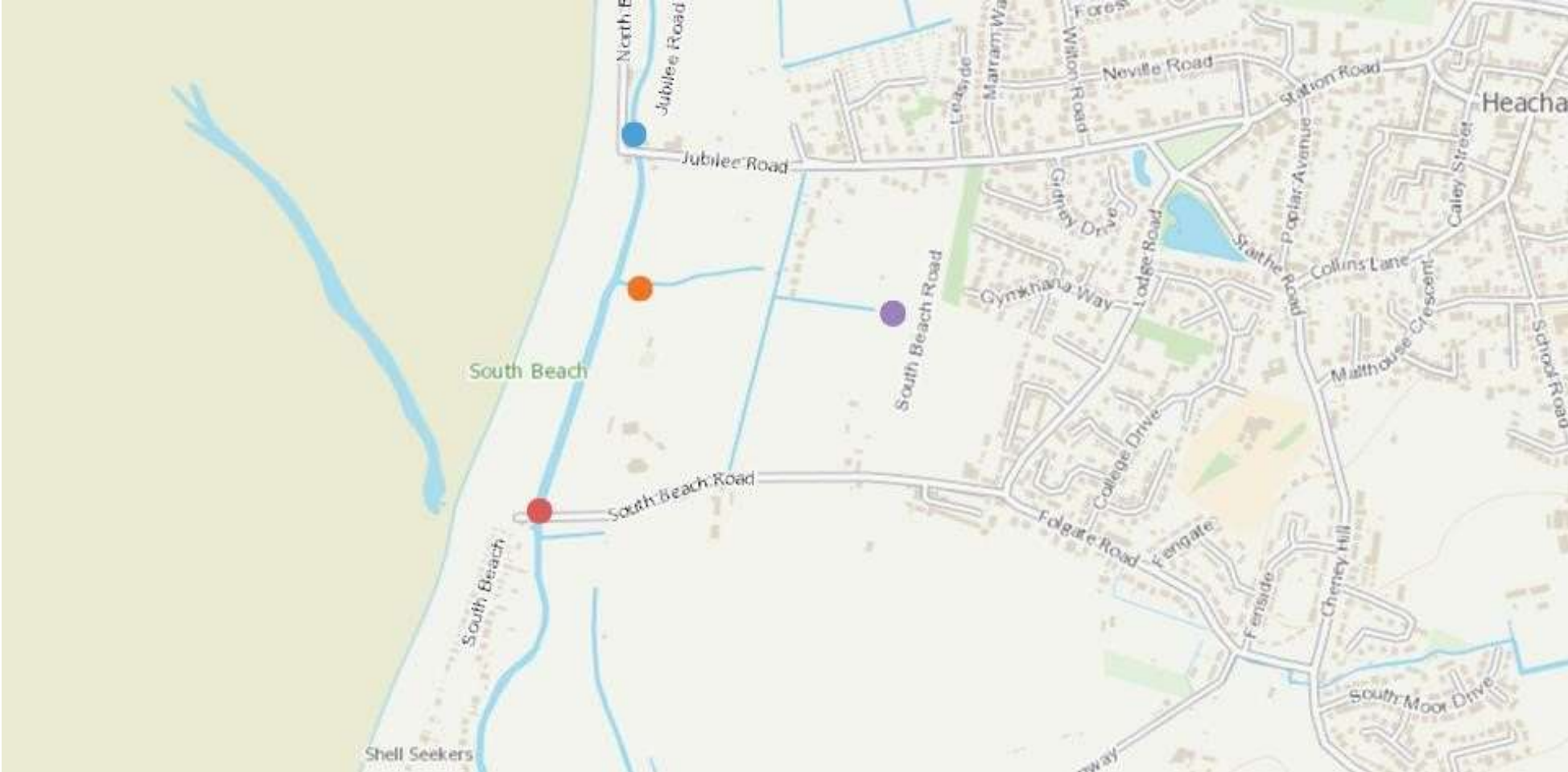- Sufficient
- Poor

Notes:
Intestinal Enterococci and E. Coli have been colour coded to show where, individually, they might fall within a Bathing Water classification. This is a crude match as the standards are based on differing percentiles.

Heacham 2023

Table showing bacterial and MST marker results

Determinand	Unit	Sample date 2023			
		06/06/2023	10/08/2023 at 13:35	10/08/2023 at 15:54	25/09/2023
confirmed Intestinal Enterococci	CFU/0.1l	200	270	650	Awaiting results
confirmed E. Coli	No/100ml	55	18	73	
Catellicoccus marker (Seabird)	lgN/0.1l	4.4	5.2	5.1	
Mitochondrial Marker: Human	lgN/0.1l	3.2	3.2	3	
Mitochondrial Marker: Dog	lgN/0.1l	not found	not found	<2	
Bacteroidetes Marker: Ruminant	lgN/0.1l	not found	not found	not found	
Bacteroidetes Marker: Human	lgN/0.1l	<2	<2	<2	
Bacteroidetes Marker: All	lgN/0.1l	6.8	7	7	

- Excellent
- Good
- Sufficient
- Poor

Notes:

Intestinal Enterococci and E. Coli have been colour coded to show where, individually, they might fall within a Bathing Water classification. This is a crude match as the standards are based on differing percentiles.
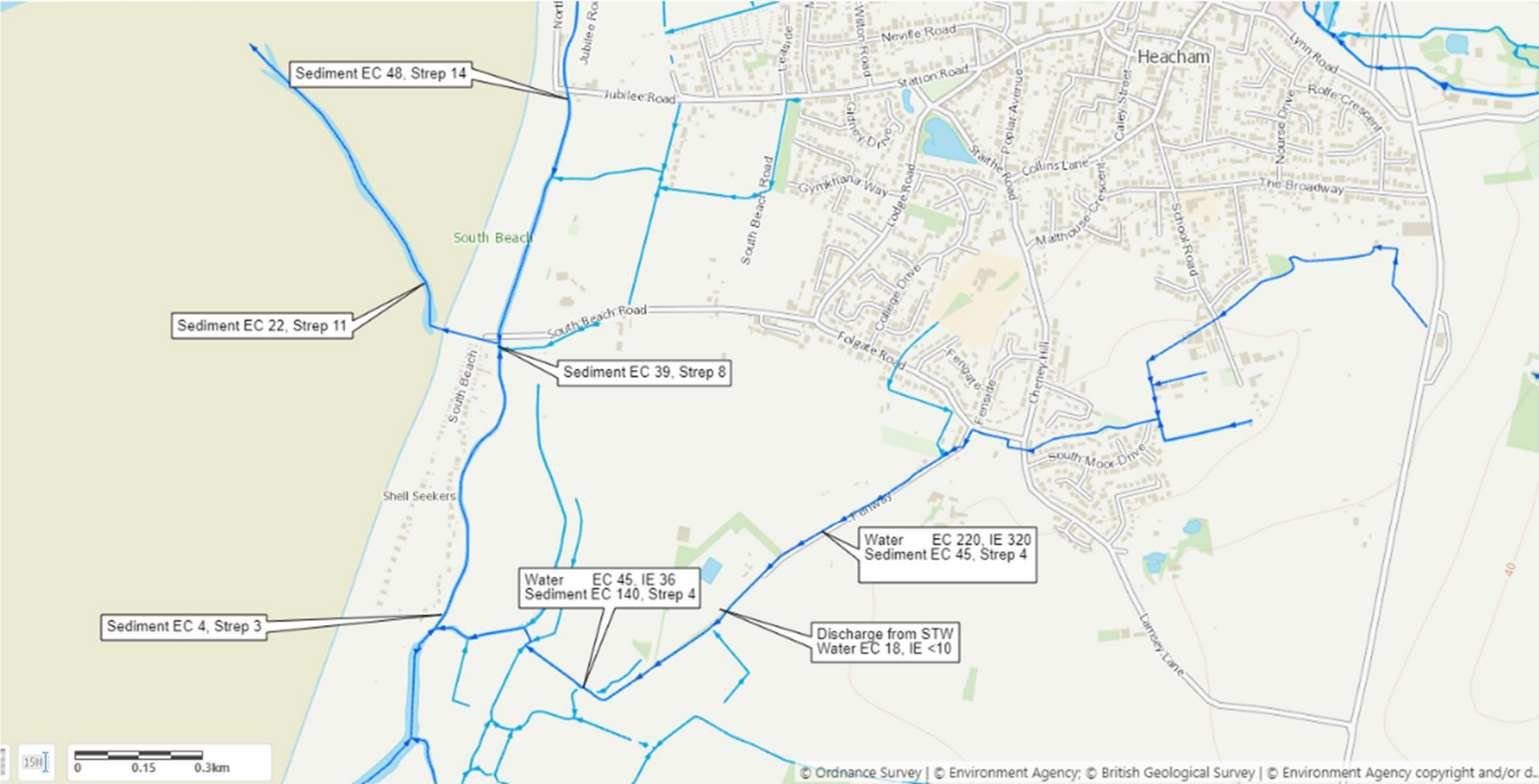
Bathing Water Regulations Classification Thresholds.

Classification	Thresholds (percentile)
Coastal Bathing Waters	
Excellent	EC: ≤250 cfu/100ml ; IE: ≤100 cfu/100ml (95th percentile)
Good	EC: ≤500 cfu/100ml ; IE: ≤200 cfu/100ml (95th percentile)
Sufficient	EC: ≤500 cfu/100ml ; IE: ≤185 cfu/100ml (90th percentile)
Poor	means that the values are worse than the sufficient
Inland Bathing Waters	
Excellent	EC: ≤500 cfu/100ml ; IE: ≤200 cfu/100ml (95th percentile)
Good	EC: ≤1000 cfu/100ml ; IE: ≤400 cfu/100ml (95th percentile)
Sufficient	EC: ≤900 cfu/100ml ; IE: ≤330 cfu/100ml (90th percentile)
Poor	means that the values are worse than the sufficient

Key EC: Escherichia coli, IE: Intestinal enterococci, cfu: Colony Forming Units

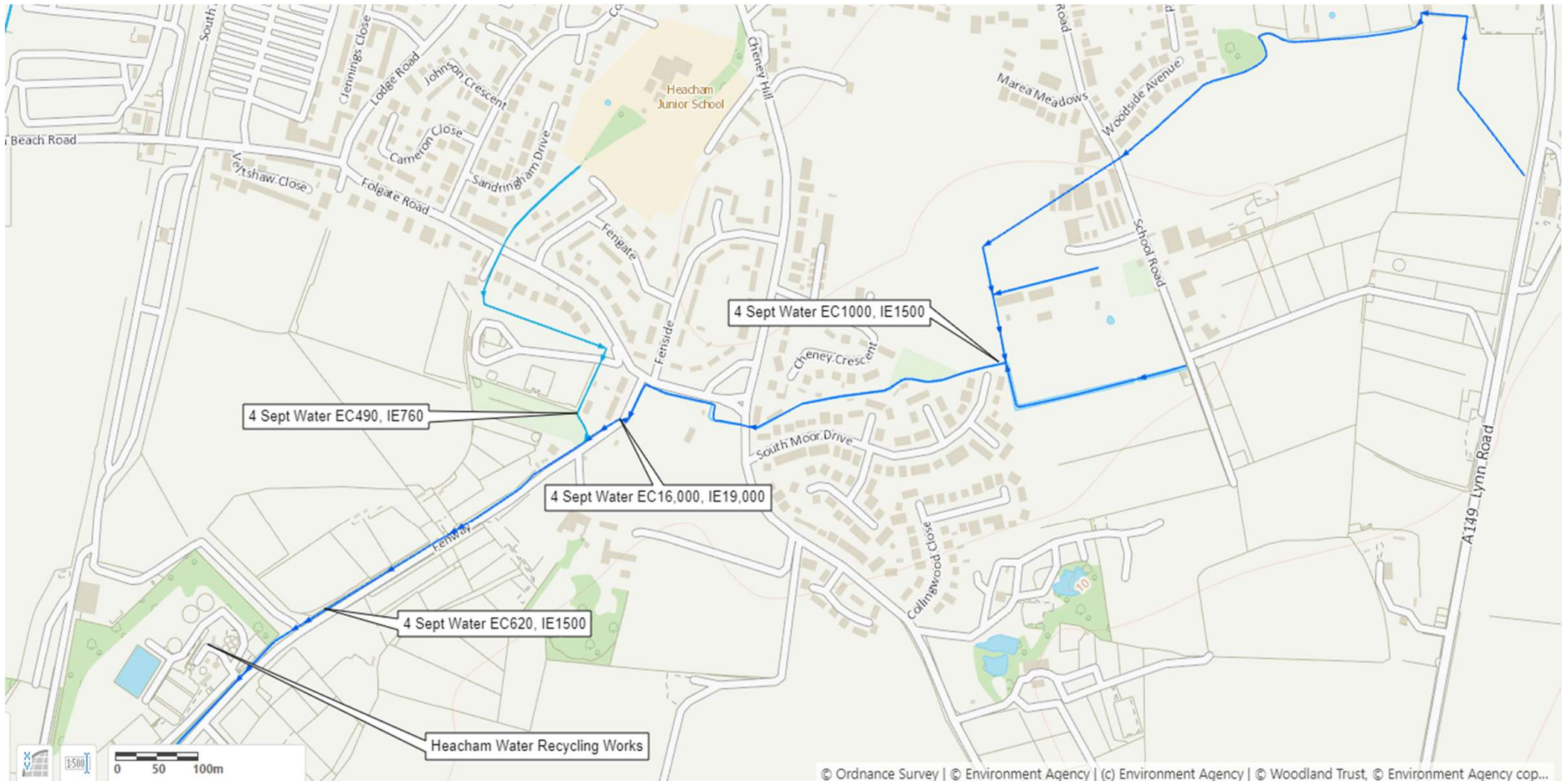# Additional monthly sampling of Heacham River

22nd August 2023 - Extra sampling results

Sediment EC 48, Strep 14

Sediment EC 22, Strep 11

Sediment EC 39, Strep 8

Water   EC 220, IE 320
Sediment EC 45, Strep 4

Water   EC 45, IE 36
Sediment EC 140, Strep 4

Sediment EC 4, Strep 3

Discharge from STW
Water EC 18, IE <10

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4th September 2023 – Extra sampling results

4 Sept Water EC1000, IE1500

4 Sept Water EC490, IE760

4 Sept Water EC16,000, IE19,000

4 Sept Water EC620, IE1500

Heacham Water Recycling Works
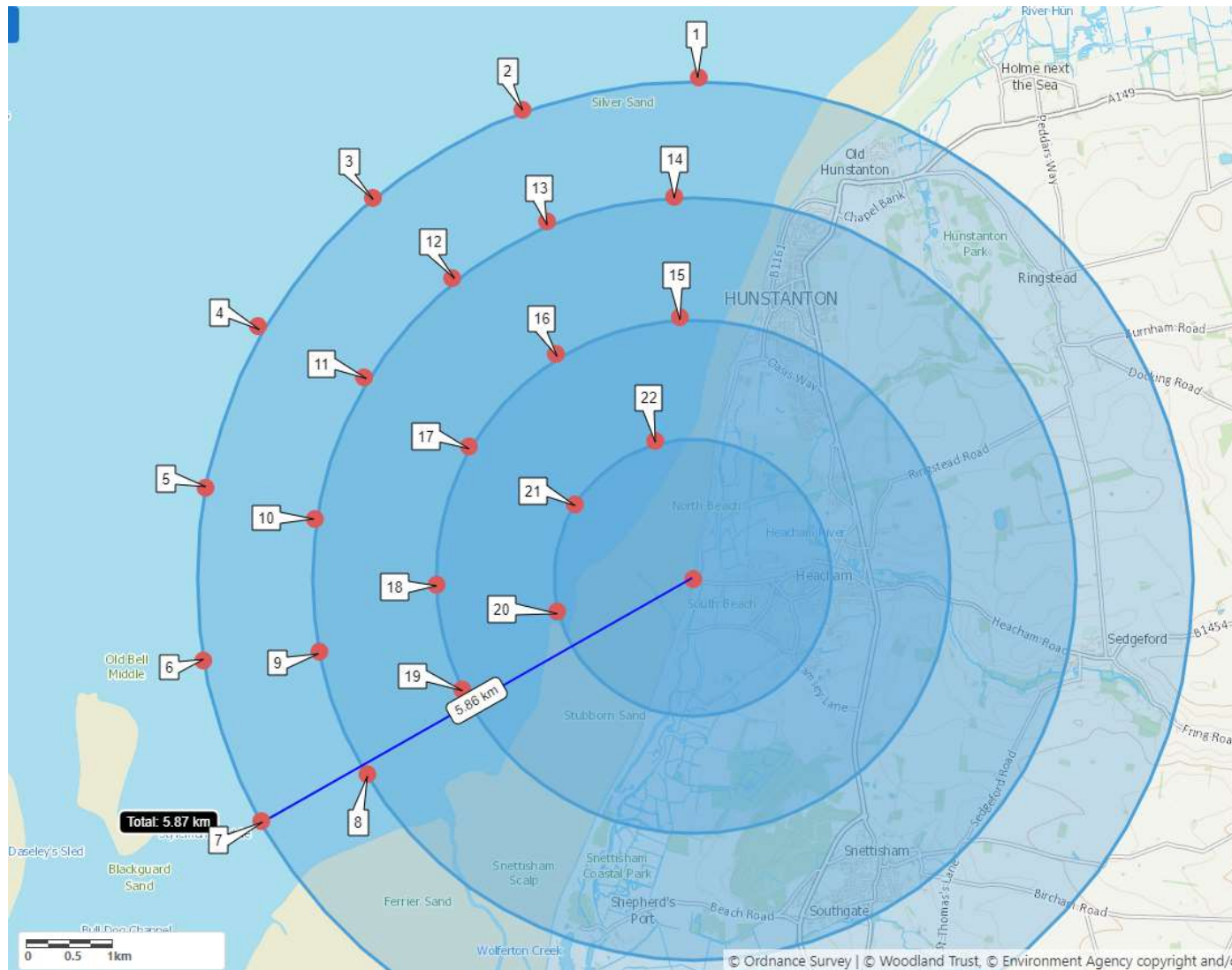
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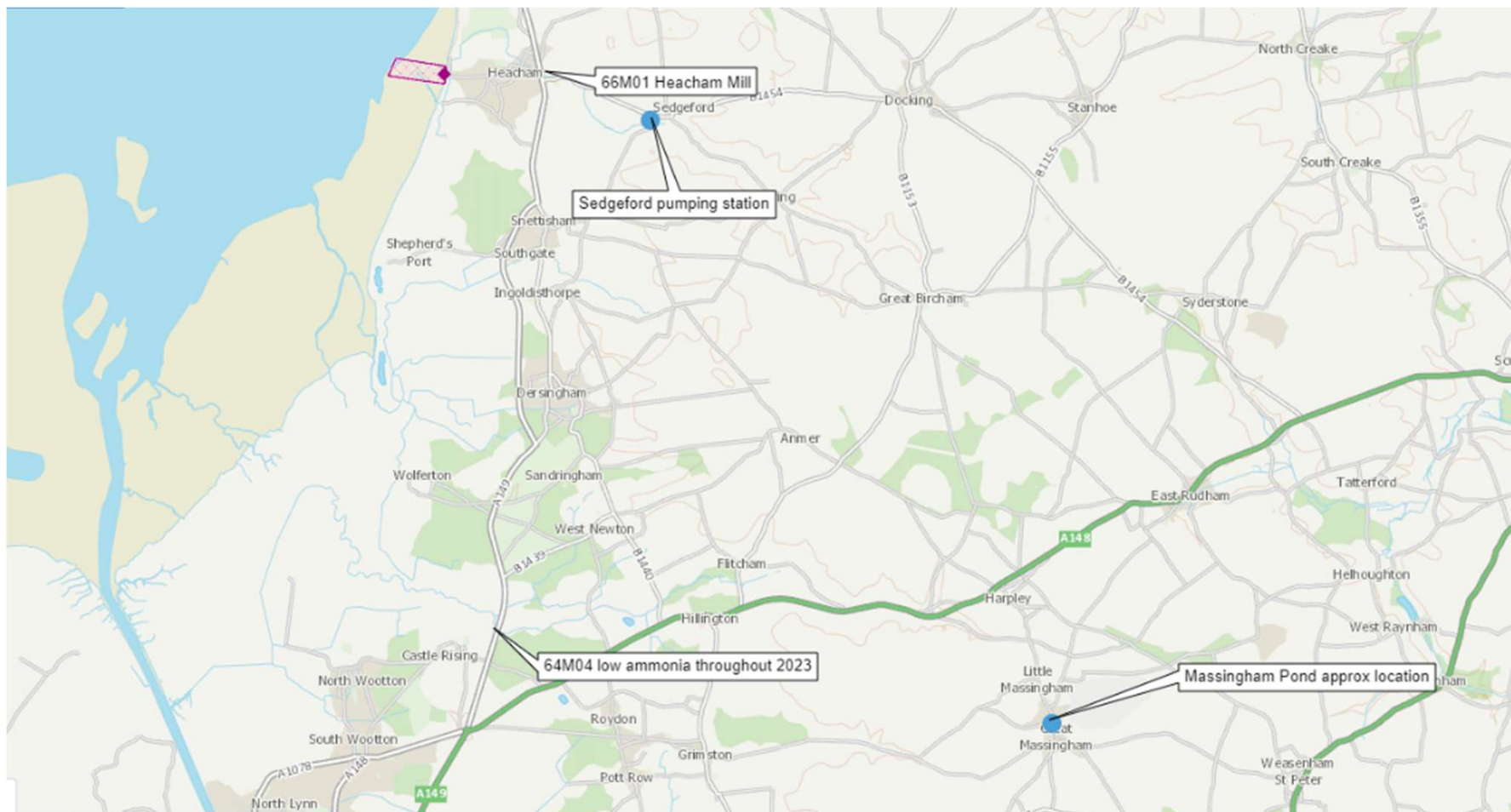Environment Agency

Further Wash Contribution
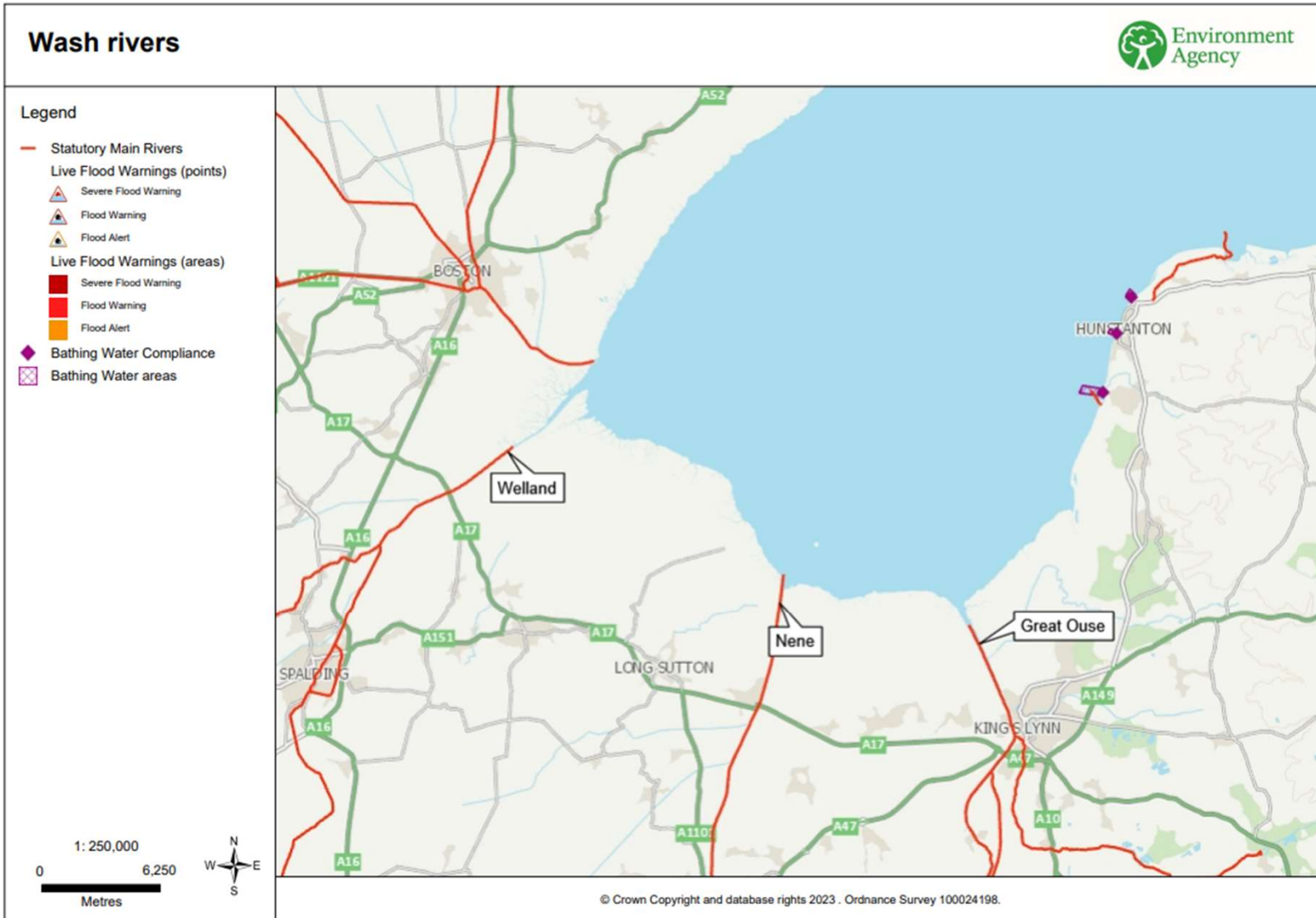
Heacham concentric ring bacti sampling 22/09/23

Additional actions undertaken – 7 Agriculture Visits, Sedgeford Pumping Station & Massingham Pond

Non-mains drainage investigation

FAQ document

Heacham Bathing Water - September 2023

What is the Bathing water season?

The Bathing Water Regulations 2013 set out the bathing water season, which runs from 15 May to 30 September inclusive each year. The Environment Agency is responsible for sampling for 2 types of bacteria at designated bathing waters during the season. Sampling must start just before the season and include some weekend and bank holiday samples, when the largest number of bathers are often present.

What does a bathing water designation mean?

This means that the water has been designated by Defra as a bathing water– it will therefore be tested by the Environment Agency during the bathing water season and given a classification. Designation does not mean that the site meets water quality standards or is safe to swim in. More info on the designation process can be found at: https://www.gov.uk/government/publications/bathing-waters-apply-to-designate-or-de-designate/designate-a-bathing-water-guidance-on-how-to-apply

When and how does the Environment Agency sample?

The regulations dictate that the Environment Agency must set a program before the beginning of the season and stick to it as much as possible, taking each water sample at 30cm depth after wading into 1 metre of water then analyse within 4 hours, or within 24 hours if refrigerated (Environment Agency vans are refrigerated). The results are then available 2-5 days later as the bacteria have to be plated up and grown before being counted.

There is a set protocol for the sampling, including sterile bottles and aseptic techniques. Heacham bathing water is sampled 20 times each season.

Where is Heacham bathing water?

Location of Heacham bathing water and the Heacham river

How do I find out about bathing water quality?

The Swimfo site (link below) contains lots of useful info about bathing water quality – you can see all the data through the years with maps and details of investigations. If there is a known relevant pollution incident ongoing this will be flagged on this site too: https://environment.data.gov.uk/bwq/profiles/

If the beach, like Heacham, has Pollution Risk Forecasting (see below), the bathing water status is also flagged daily by the Environment Agency in a 24-hour cycle by automatic national modelling which considers different parameters at each location. This forecasting is not driven by actual samples but by algorithms that shows when the bacteria might be higher by looking at things such as rain, tide, sunlight, and wind.

What do you sample for?

Samples are analysed by set protocol for *Escherichia Coli* (E.C) and Intestinal Enterococci (I.E), 2 bacteria found in the gut of many animals such as humans, birds, dogs, and seals. These are used as faecal indicator organisms for other pathogens such as viruses.

Classification of bathing water

The bathing water bacterial counts taken over the last 4 years are put through a complicated calculation which is set out in the regulations to get a figure which is then compared with the table below to give the classification.

Future Actions

- Continue with agricultural visits in the area.

- Further visits to Heacham this winter to look for septic tanks/pollution in southern trib.

- Further work upstream of Heacham STW following joint visit with AWS.

- Further contact to be made with each of Heacham's caravan parks regarding sewage disposal and pollution prevention measures.

- Wash meetings and potential for more sampling at Ouse and Nene.

- Extra sampling and sites reviewed on River Heacham - application to the Water Quality Commission Report.

- We will continue to send out monthly updates on the joint action plan.

Environment Agency

Any questions?

Thank you for listening