Sanitary Survey - Review

Exe Estuary – 2021

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A sanitary survey relevant to the bivalve mollusc beds in Exe Estuary was undertaken in 2013 in accordance with Regulation (EC) 854/2004 (which was replaced by retained EU Law Regulation (EU) 2017/625, with sanitary survey requirements now specified in retained EU Law Regulation (EU) 2019/627). This provided appropriate hygiene classification zoning and monitoring plan based on the best available information with detailed supporting evidence. In line with regulatory requirements, the Food Standards Agency undertakes targeted sanitary survey reviews to ensure public health protection measures continue to be appropriate. This report provides a review of information and recommendations for a revised sampling plan if required. Carcinus Ltd (Carcinus) undertook this work on behalf of the FSA. Carcinus accepts no liability for any costs, losses or liabilities arising from the reliance upon or use of the contents of this report other than by its client.

Dissemination

Food Standards Agency, East Devon DC, Teignbridge DC. The report is publicly available via the Carcinus Ltd. website.

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1 Introduction

1.1 Background

In line with Article 58 of retained EU Law (EC) Regulation 2019/627 and the EU Good Practice Guide (European Commission, 2017), Carcinus is contracted to undertake reviews of sanitary surveys on behalf of the Food Standards Agency. The FSA undertake targeted sanitary survey reviews to ensure public health protection measures continue to be appropriate.

The report considers changes to bacterial contamination sources (primarily from faecal origin) and the associated loads of the faecal indicator organism *Escherichia coli* (*E. coli*) that may have taken place since the original sanitary survey was undertaken. It does not assess chemical contamination, or the risks associated with biotoxins. The assessment also determines the necessity and extent of a shoreline survey based on complexity and risk. The desktop assessment is completed through analysis and interpretation of publicly available information, in addition to consultation with stakeholders.

1.2 Exe Estuary Review

This report reviews information and makes recommendations for a revised sampling for existing Mussel (*Mytilus sp.*), Pacific oyster (*Crassostrea gigas*) and surf clam (*Spisula solida*) classification zones in the Exe Estuary (Figure 1.1). This review explores any changes to the main microbiological contamination sources that have taken place since the original sanitary survey was conducted. Data for this review was gathered through a desk based study and consultation with stakeholders.

An **initial consultation** with the Local Authorities (LAs) and Environment Agency responsible for the production area was undertaken in July 2020. This supporting local evidence is valuable to assist with the review and was incorporated in the assessment process.

Following production of a draft report, a wider **external second round of consultation** with LAs and Local Action Group (LAG) members was undertaken in November 2020. It is recognised that dissemination and inclusion of a wider stakeholder group, including local industry, is essential to sense-check findings and strengthen available evidence. The draft report is reviewed taking into account the feedback received.

The review updates the assessment originally conducted in 2013 and sampling plan as necessary and the report should be read in conjunction with the previous survey, which is presented in Appendix I.

Specifically, this review considers:

(a) Changes to the shellfisheries (if any);
(b) Changes in microbiological monitoring results;
(c) Changes in sources of pollution impacting the production area or new evidence relating to the actual or potential impact of sources;
(d) Changes in land use of the area; and
(e) Change in environmental conditions.

Figure 1.1: Location of Exe Estuary

Sections 2 - 6 detail the changes that have occurred to the shellfishery, environmental conditions and pollution sources within the catchment since the publication of the original sanitary survey. A summary of the changes is presented in section 7 and recommendations for an updated sampling plan are described in section 8.

1.3 Assumptions and limitations

This desktop assessment is subject to certain limitations and has been made based on several assumptions, namely:

- Accuracy of local intelligence provided by the Local Authorities and the Environment Agency;
- The findings of this report are based on information up to and including September 2020;
- Only information that may impact on the microbial contamination was considered for this review; and
- Official Control monitoring data has been taken directly from the Cefas data hub[1], with no additional verification of the data undertaken. Results up to and including September 2020 have been used within this study. Any subsequent samples have not been included.

2 Shellfisheries

2.1 Description of Shellfishery

The 2013 sanitary survey made recommendations for dividing the Exe estuary mussel fishery into three zones, *Exe approaches*, *Dawlish Warren to Starcross* and *Starcross to Powderham*. All three zones possess a current classification, though consultation with the Local Authorities (LAs) under whose jurisdiction the Exe estuary falls indicated that current commercial mussel fishing is focussed on the *Exe Approaches* and *Dawlish Warren to Starcross* classification zones following the classification of the *Starcross to Powderham* zone as prohibited.

The 2019 mussel stock assessment of the Exe estuary conducted by the Devon and Severn Inshore Fisheries and Conservation Authority (D&S IFCA) (Thomas, 2019) indicated that the naturally occurring mussel stock in the estuary has declined from approximately 20 ha / 2000 tonnes in 2013 to approximately 2.5 ha / <1 tonne in June 2019. The severe storms over the winter of 2013/14 scoured the existing stable populations of mussels within the estuary. The occurrence of Harmful Algal Blooms (HABs) in recent years has been said to have caused further decline of populations in the estuary. The author of the IFCA report suggests that recovery of mussel stocks to pre-2013 levels are unlikely. A temporary closure of the public shellfish beds in the Exe Estuary has been imposed by D&S IFCA since 1st May 2019 given the severely depleted mussel stocks (Devon & Severn IFCA, 2019) Figure 2.1.).

[1] Cefas bacteriological monitoring data hub: https://www.cefas.co.uk/data-and-publications/shellfish-classification-and-microbiological-monitoring/england-and-wales/.

Figure 2.1. Approximate boundary of Devon & Severn IFCA's temporary closure of the Exe public mussel fishery (Devon & Severn IFCA, 2019).

The fall of naturally occurring mussel stocks in the estuary has coincided with a proliferation of Pacific oyster (*Crassostrea gigas*) beds. The scientific consensus is that this is not a causal relationship where Pacific oyster outcompete mussels for available resources, but rather that Pacific oyster are more able to cope with the changing environmental conditions within the estuary (Thomas, 2019). The original sanitary survey stated that there were two Pacific oyster trestle sites within the estuary. The *Dawlish to Starcross* classification zone is the only current zone classified for harvesting of Pacific oysters, though culture of this species was not mentioned in consultation responses from the Local Authorities.

Plans to establish culture sites for native oysters (*Ostrea edulis*) and palourdes (clams) (*Tapes spp.*) were described in the original sanitary survey. Proposed classification zones for these species, as well as one for a naturally occurring cockle bed north of Exmouth on the eastern bank of the estuary were proposed. No information was available at the time of this review as to the progression of these plans, nor are any monitoring data available.

Sampling with the aim of lifting the prohibition of the *Starcross to Powderham* CZ is underway using mussels. It is understood that there is industry desire to classify the zone (or parts of it) for mussels, Pacific and native oysters. However, at the time of this review the zone remains prohibited. Consultation with harvesters indicated that there are plans to request a classification of an area across the estuary to harvest wild Pacific oysters and establish a Pacific oyster culture site at the southern end of the Prohibited Zone.

There is a wild surf clam (*Spisula solida*) bed in Sandy Bay, approximately 1.5 km from the mouth of the estuary. Shellfish flesh monitoring within this bed began in June 2018, and the expected yield is 15 tonnes of surf clams per annum.

No changes to harvesting methods for any of the currently active beds were reported by the LAs. The mussel and surf clam beds are both harvested via dredge.

2.2 Classification History

The original sanitary survey proposed three classification zones (CZs) for mussel harvesting within the Exe estuary, two on the western side and one on the eastern side. All three CZs currently hold a classification (the Starcross to Powderham CZ is currently prohibited) and the boundaries have not changed. The boundary of the Pacific oyster classification zone, originally intended to cover the area between Cockwood and Dawlish Warren, has since been expanded to match the Dawlish to Starcross mussel classification zone. None of the zones proposed for cockles, native oyster or *Tapes spp*. are currently classified. The Sandy Bay CZ was first classified in 2018 (Carcinus Ltd., 2018) for the harvesting of surf clams (*Spisula solida*).

Figure 2.2 presents the locations of current classification zones within the Exe estuary. The *Dawlish to Starcross* classification zone holds the same long-term 'B' classification for both mussels and Pacific oyster. Bivalve mollusc harvesting in the *Starcross to Powderham* classification zone is currently prohibited and no monitoring took place at the RMP for this zone, River Kenn (B26BC) from December 2015 – August 2020, once the zone was designated as prohibited. However, renewed industry interest due to planned upgrades to the sewage network (see section 3.2) led to sampling restarting in August 2020 from the same location. Monitoring at the Sandy Bay classification zone commenced in June 2018. The zone currently holds a 'B' classification.

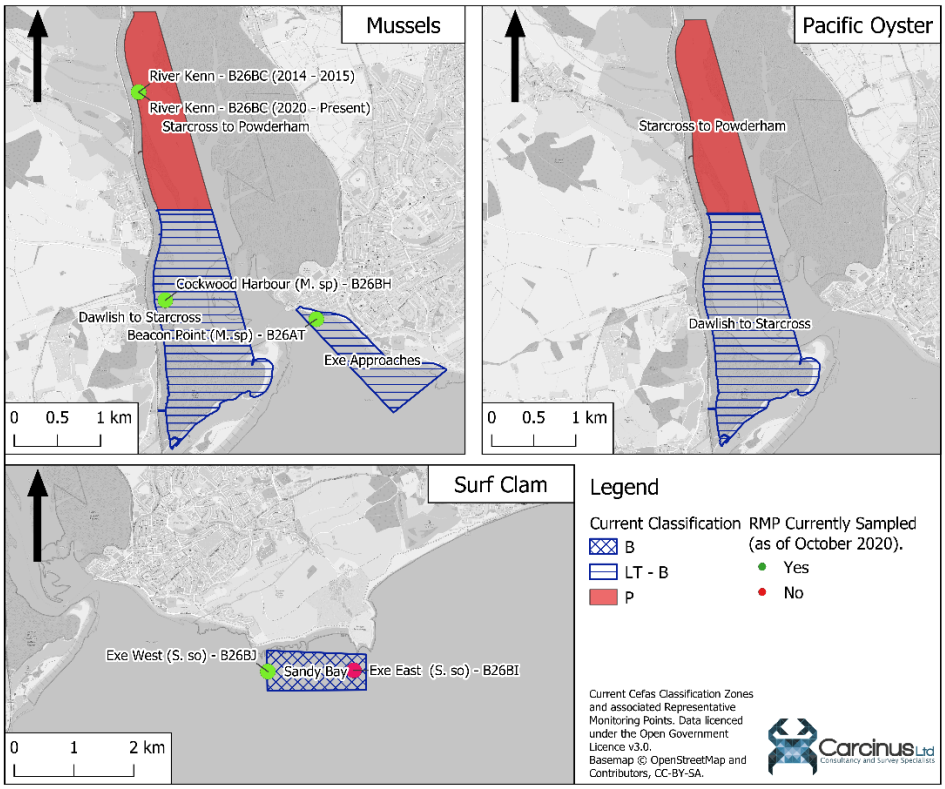

Figure 2.2 Current classification zones and their associated RMPs within the Exe Estuary. P denotes a prohibited area; LT - denotes a long-term classification.

3 Pollution sources

3.1 Human Population

The most recently available population data to the authors of the 2013 Exe Estuary Sanitary Survey was that of the 2011 Census. No freely available census data covering the catchment was available at the time of this review; the next full census of the United Kingdom is scheduled to take place in 2021. The original sanitary survey stated that the total population of the catchment was approximately 377,000 at the time of the 2011 Census and the UK government estimate that the national population will have increased 6.6% by the next census. An increase of this amount would bring the population resident within the catchment to 401,882. Figure 3.1 shows the change in land cover within the Exe catchment from 2012 - 2018; predominantly rural in nature with a few dense urban areas that have remained similar in size. Most of the built-up areas within the catchment are located on the banks of the River Exe or its estuary and so will continue to contribute contamination to the shellfisheries through urban run-off. Impacts from sewage will depend on the specific locations and nature of the discharges, changes to which are discussed in Section 3.2.

The south Devon coastline remains a popular tourist destination, particularly the towns of Dawlish Warren and Exmouth, which are found on the western and eastern mouths of the estuary, respectively. Tourists will increase the population in the catchment during the summer months, though this increase is mitigated by the fact that Exeter possesses a significant student population (22,685 in 2019/20), many of which will leave the catchment during summer months and other holiday periods and therefore contribute less to the load on the sewage system. This follows a similar pattern as in the previous survey.

Whilst there is no recently available population data for the catchment, it is likely that the population will have increased since the last sanitary survey. However, the distribution of the main population centres in the catchment have not changed, and thus the recommendations for positions of RMPs outlined in the original sanitary survey are still valid.

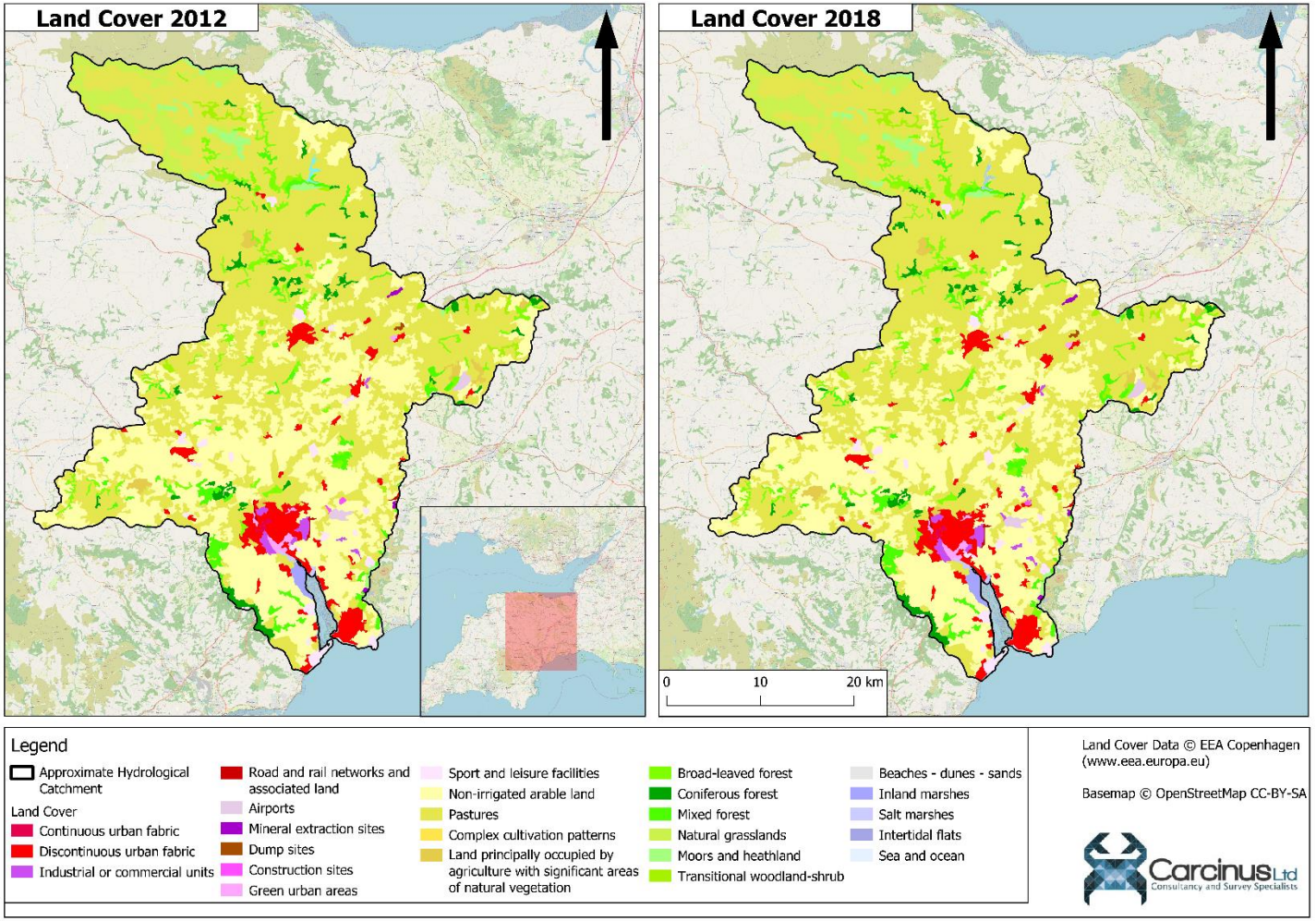

Figure 3.1. Land cover change within the Exe Estuary catchment from 2012 - 2018.

3.2 Sewage

Details of all consented discharges within the Exe estuary catchment were taken from the most recent update to the Environment Agency's national permit database at the time of sampling (October 2020). The locations of these discharges are shown in Figure 3.2.

The original sanitary survey identified a total of 80 continuous discharges contained within the Exe estuary catchment (p 51, Figure II.1; p 52 – 54, table II.1), most of which are small sewage works discharging to small watercourses that ultimately drain to the Rivers Clyst and Exe at the head of the estuary. The Countess Wear WWTW was the largest sewage works identified, which had a permitted dry weather flow of 40,486 m^3/day (over half the total DWF of all continuous discharges) and employed UV treatment. No change to this discharge was identified. Upgrades to the final treatment at the Kenn and Kennford STW are scheduled for completion in the middle of 2021, however it is unclear what upgrades are planned to take place and at the time of this review, secondary treatment is still employed. Five continuous discharges were identified in this review that were not identified at the time of the original sanitary survey. Four of these have had permits granted since the original survey was published, and employ either biological filtration or UV disinfection (Table 3.1). The largest of these, Buckland WWTW, has a consented DWF of 21,818 m^3/day, but discharges into the English Channel and so is unlikely to have significant impacts on the bacterial loading experienced by shellfish within the Production Area. A further three discharges were identified in the original sanitary survey but were not found in the permit database used for this review. All three discharges were small sewage works in the upper reaches of the catchment.

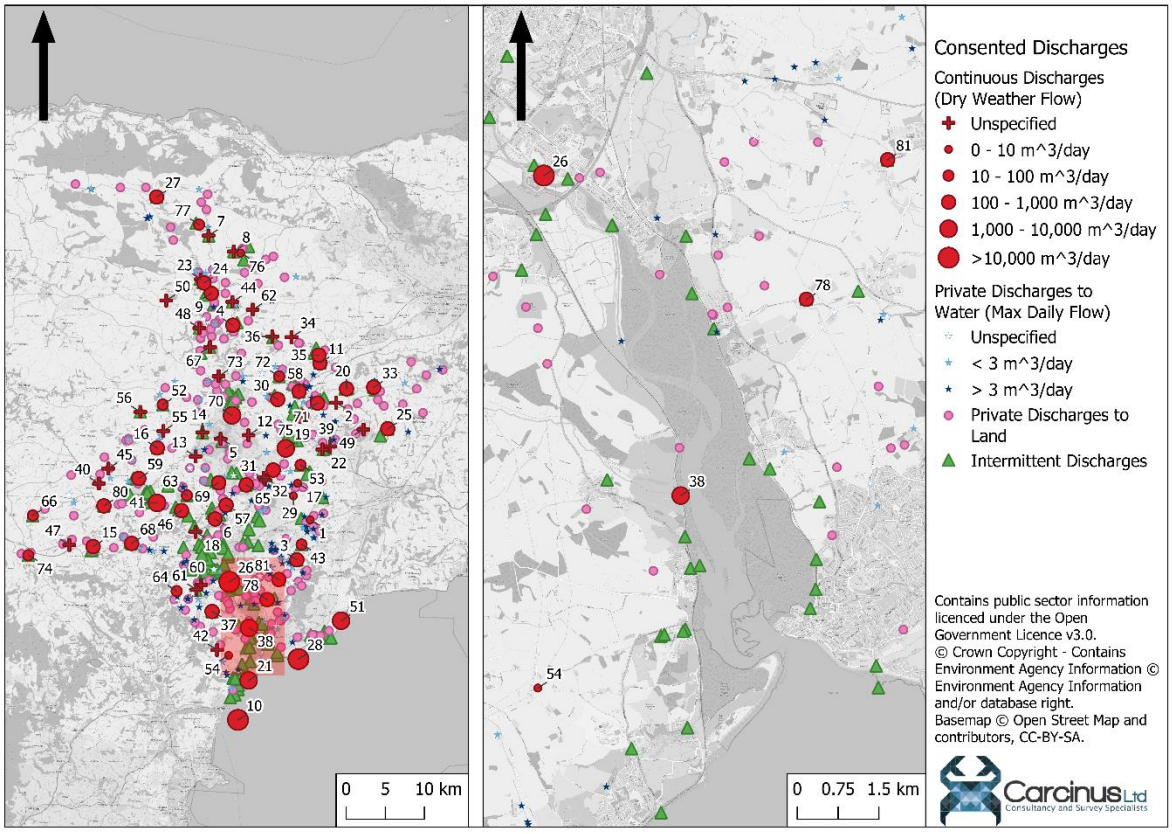

Figure 3.2. Locations of all consented discharges within the Exe Estuary catchment. Labels refer to continuous discharges, details of which can be found in Table 3.1.

Table 3.1. Details of all continuous discharges within the Exe Estuary catchment. Discharges not identified in the original sanitary survey are highlighted in yellow.

No.	Sewage Works	NGR	Treatment	DWF (m^3/day)
1	ALLER GROVE STW	SY0529096950	BIOLOGICAL FILTRATION	9
2	ASHILL STW	ST0860011900	Unspecified	Unspecified
3	AYLESBEARE STW	SY0358091860	BIOLOGICAL FILTRATION	103
4	BAMPTON WWTW	SS9541021790	BIOLOGICAL FILTRATION	230
5	BICKLEIGH STW	SS9385007300	Unspecified	Unspecified
6	BRAMPFORD SPEKE STW	SX9314097070	BIOLOGICAL FILTRATION	104.54
7	BRIDGETOWN WWTW PS	SS9230033230	BIOLOGICAL FILTRATION	Unspecified
8	BROMPTON REGIS STW	SS9553031200	Unspecified	Unspecified
9	BRUSHFORD WWTW	SS9267025860	BIOLOGICAL FILTRATION	124
10	BUCKLAND WASTEWATER TREATMENT WORKS	SX9606071430	BIOLOGICAL FILTRATION	21818
11	BURLESCOMBE WWTW	ST0653016970	BIOLOGICAL FILTRATION	155
12	BUTTERLEIGH STW	SS9740007750	Unspecified	Unspecified
13	CADBURY CROSS STW	SS9065005050	Unspecified	Unspecified
14	CADELEIGH STW	SS9153008120	Unspecified	Unspecified
15	CHERITON BISHOP STW	SX7757093550	BIOLOGICAL FILTRATION	144
16	CHERITON FITZPAINE WWTW	SS8576006130	BIOLOGICAL FILTRATION	115
17	CLYST HYDON STW	ST0367001620	BIOLOGICAL FILTRATION	7.13
18	COWLEY BRIDGE STW	SX9064095420	Unspecified	Unspecified
19	CULLOMPTON WWTW	ST0216006080	BIOLOGICAL FILTRATION	2955
20	CULMSTOCK SEWAGE TREATMENT WORKS	ST0992013680	BIOLOGICAL FILTRATION	118
21	DAWLISH SEWAGE TREATMENT WORKS	SX9742076470	UV DISINFECTION	4856
22	DULFORD STW	ST0685005950	Unspecified	Unspecified
23	DULVERTON (RECREATION) SEPTIC TANK	SS9133027640	SEPTIC TANK	Unspecified
24	DULVERTON WWTW	SS9172027190	BIOLOGICAL FILTRATION	468
25	DUNKESWELL STW	ST1519008580	BIOLOGICAL FILTRATION / REED BED	314

No.	Sewage Works	NGR	Treatment	DWF (m^3/day)
26	EXETER (COUNTESS WEAR) STW	SX9497089050	UV DISINFECTION	40486
27	EXFORD STW	SS8567038160	BIOLOGICAL FILTRATION	120
28	EXMOUTH SEWAGE TREATMENT WORKS	SY0379079190	UV DISINFECTION	11825
29	FORETOWN STW	ST0315000010	BIOLOGICAL FILTRATION	4.8
30	HALBERTON STW	ST0113012320	BIOLOGICAL FILTRATION	208
31	HELE (WHITEWAYS) STW	SS9955002050	Unspecified	Unspecified
32	HELE VILLAGE	SS9935002350	Unspecified	Unspecified
33	HEMYOCK WASTEWATER TREATMENT WORKS	ST1339013880	ACTIVATED SLUDGE	446
34	HOCKWORTHY SEWAGE TREATMENT WORKS	ST0290020270	BIOLOGICAL FILTRATION	Unspecified
35	HOLCOMBE ROGUS WWTW	ST0639017980	BIOLOGICAL FILTRATION	119
36	HUNTSHAM STW	ST0045020350	Unspecified	Unspecified
37	KENN & KENNFORD STW	SX9276085270	BIOLOGICAL FILTRATION	262
38	KENTON AND STARCROSS STW	SX9748283180	UV DISINFECTION	1750
39	KERSWELL STW	ST0782006330	BIOLOGICAL FILTRATION	Unspecified
40	KNOWLE STW	SS7831001590	Unspecified	Unspecified
41	LORDS MEADOW WWTW	SX8572099120	CHEMICAL - PHOSPHATE STRIPPING	4100
42	MAMHEAD STW	SX9340080350	Unspecified	Unspecified
43	MARSH GREEN WASTEWATER TRTMNT WORKS	SY0419093810	REEDBED	28
44	MOREBATH STW	SS9535024770	Unspecified	Unspecified
45	NEWBUILDINGS STW	SS7950003500	Unspecified	Unspecified
46	NEWTON ST CYRES STW	SX8885098140	ACTIVATED SLUDGE	300
47	NORTH BOVEY STW	SX7452093750	Unspecified	Unspecified
48	OAKFORD STW	SS9113021420	Unspecified	Unspecified
49	OAKLEIGH WWTW	ST1209008480	BIOLOGICAL FILTRATION	Unspecified
50	OLDWAY END STW	SS8690024950	Unspecified	Unspecified
51	OTTERTON SEWAGE TREATMENT WORKS	SY0923084090	UV DISINFECTION	1643
52	PENNYMOOR SEWAGE TREATMENT WORKS	SS8646011670	BIOLOGICAL FILTRATION	34

No.	Sewage Works	NGR	Treatment	DWF (m^3/day)
53	PLYMTREE STW	ST0406003960	BIOLOGICAL FILTRATION	96.8
54	PORT ROAD WWTW	SX9486079650	BIOLOGICAL FILTRATION	3.6
55	POUGHILL STW	SS8653008290	PACKAGE TREATMENT PLANT	Unspecified
56	PUDDINGTON STW	SS8360010730	Unspecified	Unspecified
57	REWE WASTEWATER TREATMENT WORKS	SX9455098840	BIOLOGICAL FILTRATION	429
58	SAMPFORD PEVERELL WWTW	ST0387013360	BIOLOGICAL FILTRATION	296
59	SANDFORD WASTEWATER TREATMENT WORKS	SS8339002240	BIOLOGICAL FILTRATION	118
60	SHILLINGFORD ABBOT STW	SX9135088650	Unspecified	Unspecified
61	SHILLINGFORD ST GEORGE WWTW CSO	SX9075088050	Unspecified	Unspecified
62	SHILLINGFORD STW	SS9794023780	Unspecified	Unspecified
63	SHUTE WWTW	SS8954000080	BIOLOGICAL FILTRATION	12.3
64	SIDELING CLOSE STW	SX8823087870	PACKAGE TREATMENT PLANT	13.5
65	SILVERTON WWTW	SS9712001420	ACTIVATED SLUDGE	563.64
66	SPREYTON STW	SX6987097530	BIOLOGICAL FILTRATION	34
67	STOODLEIGH STW	SS9250019000	Unspecified	Unspecified
68	TEDBURN ST MARY STW	SX8248093950	BIOLOGICAL FILTRATION	383
69	THORVERTON WWTW	SS9359001680	BIOLOGICAL FILTRATION	309
70	TIVERTON STW	SS9530010300	BIOLOGICAL FILTRATION / CHEMICAL - PHOSPHATE STRIPPING	6900
71	UFFCULME WWTW	ST0622011860	BIOLOGICAL FILTRATION	564
72	UPLOWMAN STW	ST0132015270	BIOLOGICAL FILTRATION	42
73	WASHFIELD STW	SS9360015300	Unspecified	Unspecified
74	WHIDDON DOWN STW	SX6929092440	BIOLOGICAL FILTRATION	41
75	WILLAND WASTEWATER TREATMENT WORKS	ST0420010160	BIOLOGICAL FILTRATION	613
76	WIMBLEBALL RESERVOIR WWTW	SS9640031000	SEPTIC TANK	6.3
77	WINSFORD STW	SS9110034630	BIOLOGICAL FILTRATION	84
78	WOODBURY WWTW	SX9979086780	BIOLOGICAL FILTRATION	408

No.	Sewage Works	NGR	Treatment	DWF (m^3/day)
79	WWTW AT BRADNINCH	ST0057003310	PRIMARY SETTLEMENT	404
80	YEOFORD WASTEWATER TREATMENT WORKS	SX7894098740	BIOLOGICAL FILTRATION	493
81	OLD WOODBURY SALTERTON STW CSO	SY0128089340	BIOLOGICAL FILTRATION	201

There were 50 intermittent discharges identified within 2 km of the Exe estuary. Intermittent discharges comprise Combined Storm Overflows (CSOs), storm tank overflows and pumping station emergency overflows. These were distributed ubiquitously across the catchment. No additional intermittent discharges were identified at the time of this review. Consultation with the local authorities indicated that significant upgrades to the Countess Weir SSO became operational in 2018. This involved installing UV treatment, which it was hoped would reduce bacterial loading by a factor of 100. In addition, upgrades to other CSOs in Exeter and two pumping stations (Maer Road PS and Phear Park PS) are scheduled to be completed by 2022. Consultation with the Environment Agency indicated that during AMP 6 (2015 – 2020), upgrades to the Exeter CSO network were designed to ensure that no more than 10 spills per annum of > 430 m^3 (excluding Countess Wear CSO) occurred. Additionally, aggregation of Ham Lane CSO and Woodbury STW SSO as well as all CSOs draining to Exmouth STW, with a planned average of no more than 10 spills per annum >50 m^3 for each of the two aggregations took place in 2017/2018. No updated spill event monitoring for these discharges is available, however the frequencies of spill events are predicted to be similar as the patterns of rainfall in the catchment have not changed significantly (Section 5). Accordingly, the impact on bacterial loading in the estuary as a result of spills is not expected to have got worse, given the upgrades to some intermittent discharges, particularly the Countess Weir SSO is thought to contribute 42% of the bacterial loading from CSOs in the catchment (Pateman *et al.*, 2018). Further upgrades to the intermittent discharge network are planned for AMP 7 (2020 – 2025), but none are yet operational and so any corresponding improvements to the water quality of the estuary will not have occurred.

In addition to the water company owned discharges, there are still a number of privately owned discharges within the catchment. Few of these discharge directly to water bodies near any of the classification zones (Figure 3.2), and so will have limited impact on the bacterial loading experienced by the classification zones.

The most at-risk areas to this source of bacteriological contamination remain the upper estuary waters, and those at the mouth of the River Kenn.

Several upgrades to the intermittent discharges within the Exe estuary have occurred since the publication of the original sanitary survey. The most significant upgrade is likely to be the installation of UV disinfection at the Countess Wear STW SSO, which was expected to have reduced the bacterial loading at the outfall by a factor of 100. However, no monitoring data is available close to this outfall, and as the closest RMP (Cockwood Harbour) is approximately 9.5 km downstream, any reduction in loading is likely to be spread out over the estuary. Additionally, planned upgrades to the Kenn and Kennford STW are not scheduled to take place until mid-2021. Accordingly, the recommendations made in the original sanitary survey for RMP position are still valid.

3.3 Agricultural Sources

Most of the Exe Estuary catchment remains rural (Figure 3.1), particularly in the northern sections of the catchment. Figure 3.3 and Table 3.2 show the changes in livestock populations within Local Authorities wholly or partially contained within the Exe Estuary catchment from 2013 to 2016 (no more recent data are available) (DEFRA, 2018). As only a small proportion of some of the districts fall within the catchment, the livestock data have been adjusted to reflect the proportion of each district that is contained within total catchment. This assumes that livestock are distributed uniformly throughout each district, and therefore some inaccuracies in the data may be present.

The total livestock population within the catchment increased by 2.64% between 2013 and 2016. West Somerset (+ 15.3%) and Taunton Deane (+ 36%) both showed the greatest increase. The livestock group that showed the largest increase was poultry with a 4.86% increase. Several districts within the catchment showed a decrease, the greatest decrease in the Mid Devon district (-12%). Only a very small proportion of the Taunton Deane (6.32%), West Devon (1.05%) and North Devon (1.71%) districts are within the catchment and they also make up a small proportion of the total catchment area (collectively 4%) and so changes in districts such as East and Mid Devon, Exeter and West Somerset may more accurately represent changes in livestock within the catchment.

Livestock-borne pollution causes contamination of shellfish waters principally through run-off. As much of the area of pasture remain in the upper-reaches of the catchment (Figure 3.1), higher impacts will likely be seen in upper-estuary areas. Peak concentrations of faecal indicator bacteria in watercourses receiving substantial run-off will be greatest when significant rain follows a dry period. Most watercourses in the catchment will be impacted by some extent by agriculture, though no livestock were seen on pastures adjacent to the estuary during the 2013 shoreline survey, which took place in July 2013. Additionally, there will probably be a seasonal nature to the pollution arising from agricultural sources. Agricultural numbers will be greatest in spring, after the calving and lambing seasons, and lowest in autumn when animals are sent to market.

Since the publication of the original sanitary survey, no significant changes to the livestock populations (and associated faecal loading to the estuary) have taken place. Accordingly, the recommendations made in the original sanitary survey to capture this source of contamination remain valid.

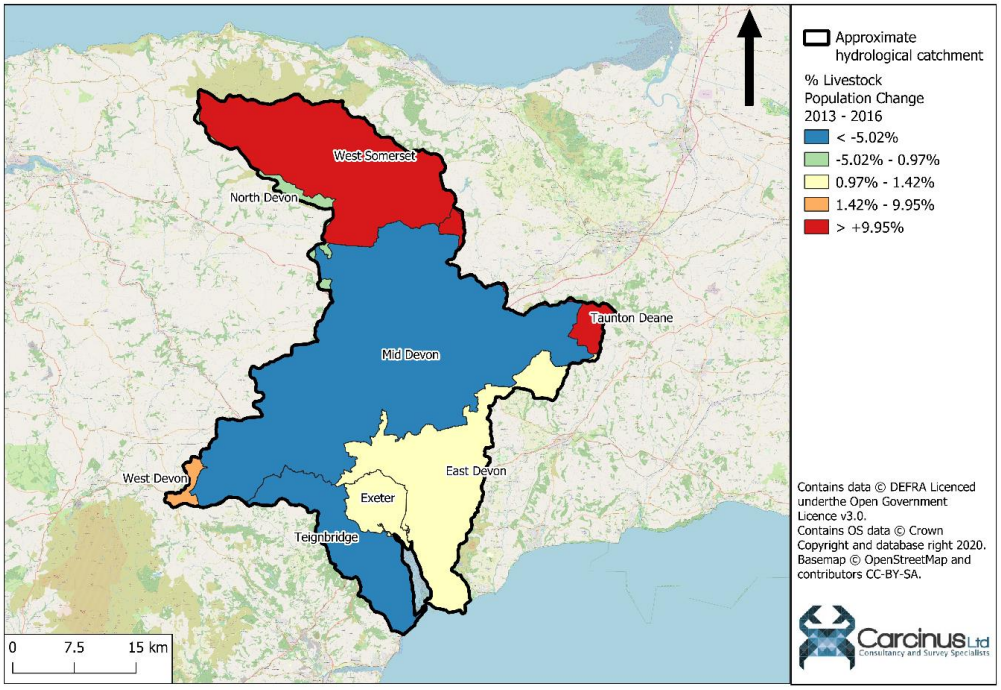

Figure 3.3. Livestock population change in Local Authorities (2017 boundaries) within or partially within the Exe estuary catchment.

Table 3.2. Summary of changes to livestock populations in Local Authorities wholly or partially within the Exe Estuary Catchment. Population numbers have been rounded to the nearest whole number.

Local Authority	Area within catchment (Ha)	% of total LA area	% of catchment area	Number of livestock (adjusted)											
				Cattle			Sheep			Pigs			Poultry		
				2013	2016	% difference	2013	2016	% difference	2013	2016	% difference	2013	2016	% difference
East Devon	60834	29.57%	26.25%	22739	22477	-1.15%	21088	19558	-7.26%	9718	8334	-14.24%	215451	222130	3.10%
Exeter	11810	98.92%	5.10%	14769	14599	-1.15%	13697	12703	-7.26%	6312	5413	-14.24%	139934	144273	3.10%
Exeter & East Devon	72644	33.37%	31.35%	30647	30294	-1.15%	28421	26359	-7.26%	13097	11232	-14.24%	290374	299377	3.10%
Mid Devon	11810	5.16%	5.10%	4950	4739	-4.26%	9459	9858	4.21%	889	855	-3.87%	151335	131061	-13.40%
North Devon	4788	1.71%	2.07%	1460	1497	2.52%	7265	7180	-1.17%	72	169	132.97%	9276	9164	-1.20%
Teignbridge	33487	19.82%	14.45%	6980	6879	-1.44%	19232	19193	-0.20%	850	1369	60.99%	32814	27561	-16.01%
West Devon	3041	1.05%	1.31%	912	880	-3.51%	2809	2908	3.50%	57	76	32.82%	982	988	0.67%
Tauton Deane	2927	6.32%	1.26%	2101	2060	-1.96%	3318	3472	4.66%	870	961	10.50%	48498	68036	40.29%
West Somerset	30408	41.84%	13.12%	13413	13590	1.32%	99424	97547	-1.89%	4073	2067	-49.24%	73131	105914	44.83%
Total	**231749**		**100.00%**	**97971**	**97014**	**-0.98%**	**204713**	**198777**	**-2.90%**	**35938**	**30476**	**-15.20%**	**961795**	**1008505**	**4.86%**

3.4 Wildlife

The Exe estuary consists of several important estuarine habitats; mudflats, saltmarsh, eelgrasses, reedbeds and mussel beds. These habitats are home to significant populations of birds and other wildlife. All the same statutory and non-statutory designations that were present at the 2013 sanitary survey are still in effect; namely a Special Site of Scientific Interest (SSSI), Ramsar Site and Special Protection Area (SPA) designation to the whole estuary, a Local Nature Reserve (LNR), National Nature Reserve (NNR) and Special Area of Conservation (SAC) designation to Dawlish Warren, a spit at the western mouth of the Estuary.

The original sanitary survey reported a 5-Year average to 2010/2011 of 19,000 overwintering birds in the Exe estuary, citing the 2010/2011 Wetland Bird Survey (Holt et al., 2012). The 5-year average to 2018/2019 is 23,020 overwintering birds (Frost *et al.*, 2020), an increase of ~21%. Several avian species of both national and international importance are still supported by the Exe estuary. These include Avocet, Black-tailed Godwit, Brent Goose, Ringed Plover and Widgeon (Natural England, 2020). Geese and duck species within the estuary are more likely to forage grasslands and saltmarsh that ring the estuary, where their faeces will be carried into coastal waters through runoff or tidal inundation. RMPs placed near to saltmarsh drainage channels will best capture this contamination. The locations of wading birds are related to the distributions of their prey in the intertidal areas and as such will vary from year to year. Therefore, the spatial distribution of any faecal contamination will be variable, but it is likely to be temporally constrained to winter months when populations are highest.

Reports from around the time of the original sanitary survey (Environment Agency, 2010; Devon Mammal Group, 2012) indicate that otters are present in the estuary. No updated reports are available, though it is likely that their numbers remain low and given their wide distribution, will have no material bearing on the sampling plan.

No major grey seal colony is present in the Exe estuary, though sightings are common across the south coast (NBN, 2020). These animals show a wide foraging range and whilst they may well enter the estuary, do not represent a significant source of contamination to the shellfishery.

Whilst there has been a significant increase in the bird populations of the estuary since the original sanitary survey, their unpredictable spatial distribution makes it challenging to choose RMP locations that will consistently capture this source of pollution. No other wildlife species are likely to represent a significant source of contamination, and as such, the recommendations for RMP location made in the original sanitary survey are still valid.

3.5 Boats and Marinas

The discharge of sewage from boats is a potentially significant source of bacterial contamination of shellfisheries within the Exe estuary. Boating activities in the area have been derived through analysis of satellite imagery and various internet sources and compared to that described in the original sanitary survey. Their geographical distributions are presented in Figure 3.4.

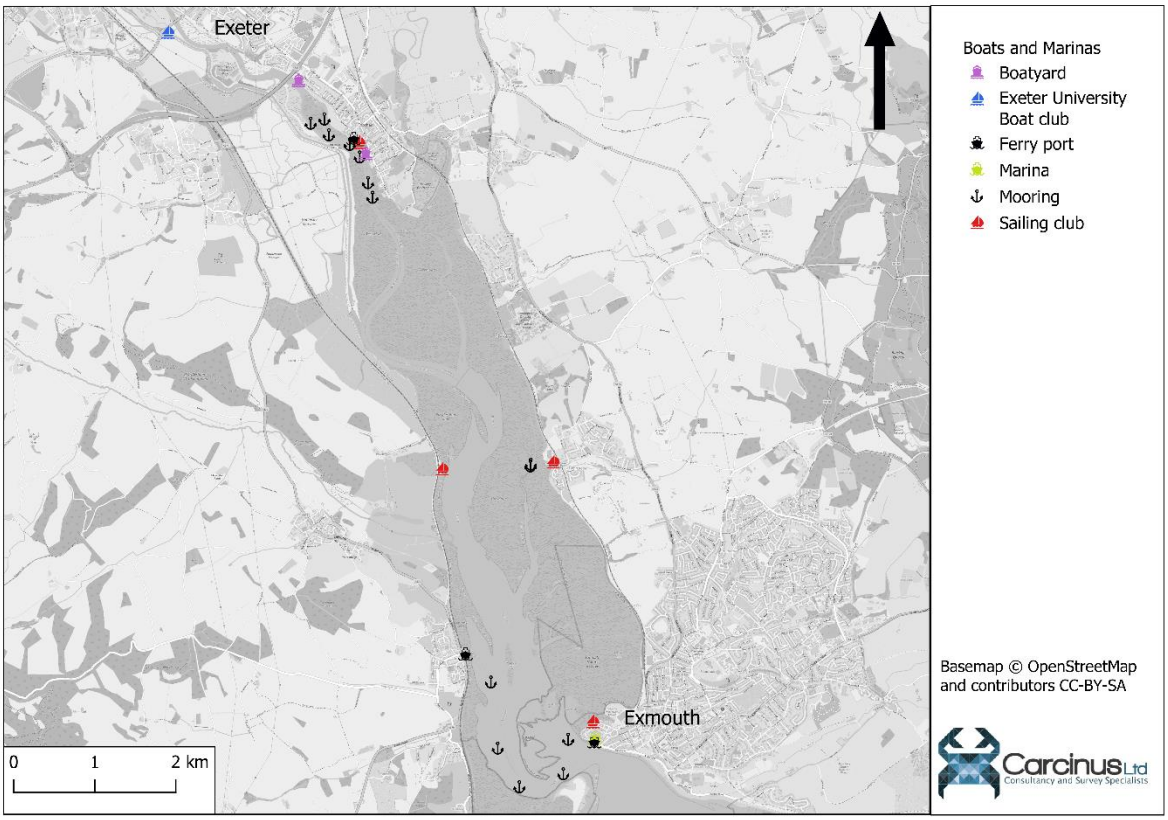

Figure 3.4. Locations of moorings, marinas, and other boating activities within the Exe estuary.

The 2013 sanitary survey reported the presence of 1800 moorings, most of which are located near the mouth of the estuary. The Lower Exe Mooring Authority state that they currently have ~750 moorings in the lower Exe (Exe Estuary Management Partnership, 2020). The exact number of moorings in the upper reaches of the estuary is unclear, though a significant number are visible from analysis of satellite imagery captured in 2020. Exmouth marina at the mouth of the estuary has 200 berths (Exmouth Marina, 2020) but no pump-out facilities are present (the closest pump-out facilities are present in Salcombe Harbour, approximately 50 km west of the estuary (The Green Blue, 2020)).

In addition to the marina berths and moorings, there are several sailing and water sports centres distributed throughout the estuary. The small recreational boats are not large enough to have onboard toilet facilities and are therefore unlikely to make overboard discharges. A report cited in the original sanitary survey (Liley *et al.*, 2011) states that there is a small (10 vessel) fishing fleet that operates out of the Exe estuary, though no updated report is available, and the current extent of this fleet is unclear. Additionally, there is a passenger ferry that runs between Exmouth and Starcross daily. No commercial ports are located within the Exe estuary. Consultation with the Local Authorities in charge of the region did not indicate any further changes to the boating activities within the estuary.

There have been no changes to the legislation governing overboard discharges from vessels, with restrictions placed on commercial vessels against overboard discharges within three nautical miles of land and guidance given to pleasure craft to follow the same advice (RYA, 2020). Private vessels of a

sufficient size may still make occasional overboard discharges, either when moored / anchored overnight or when navigating through the calm of the estuary.

Based on the information available to the authors of this review, no significant changes to the levels of boating activity within the Exe Estuary are expected to have taken place since the last sanitary survey was published. The areas of the BMPA most at risk of contamination from boat-borne pollution remain the dense areas of moorings near the mouth of the estuary and navigation routes through the estuary. Peak activity levels will continue to be during summer months and so associated impacts will occur seasonally as well. The original sanitary survey did not make specific recommendations for the sampling plan based on this source of contamination due to difficulties accurately monitoring the locations, timings, and volumes of such discharges. The same is true for any updated sampling plan.

3.6 Other Sources of Contamination

Urban fabric within the catchment remains concentrated around the banks of the Exe estuary. There are some minor towns and villages located throughout the catchment, such as Crediton, Cullompton and Tiverton. Settlements near to waterbodies represent a potential source of diffuse pollution via utility misconnections and dog fouling. The sizes of urban settlements within the catchment have not increased significantly, therefore the risk that these settlements pose remains broadly similar.

Some dog walking may well take place around the coastline, though railway lines follow the coast on both sides of the estuary; the 'Riviera Line' on the west and the 'Avocet Line' on the eastern side (Travel Devon, 2020). There are some footpaths that run near to the coast and dog fouling may represent a potential diffuse source of pollution to the near-shore coastal zone.

No evidence of significant changes to these sources of contamination exists. Therefore, it can be assumed that the RMP location recommendations made in the original sanitary survey will still capture the influence of these sources.

4 Hydrodynamics/Water Circulation

Significant storms in the winter of 2013/2014 scoured the existing mussel beds in the estuary to the point it affected the local hydrology. These storms also prompted the installation of coastal defences at Dawlish Warren, including the addition of 250,000 m^3 sand to the beach in 2017 (UK Government, 2017). Sedimentary transport in the area moves sand from Dawlish Warren toward the mouth of the estuary (Figure 4.1; SCOPAC 2013).

It is unlikely that any changes to the hydrodynamics of the Exe Estuary since the publication of the original sanitary survey will have significantly affected the circulation of contamination in the estuary; most contamination will still be carried from the main rivers into the main body of the estuary, particularly during ebbing tides. Therefore, no changes to RMPs are recommended.

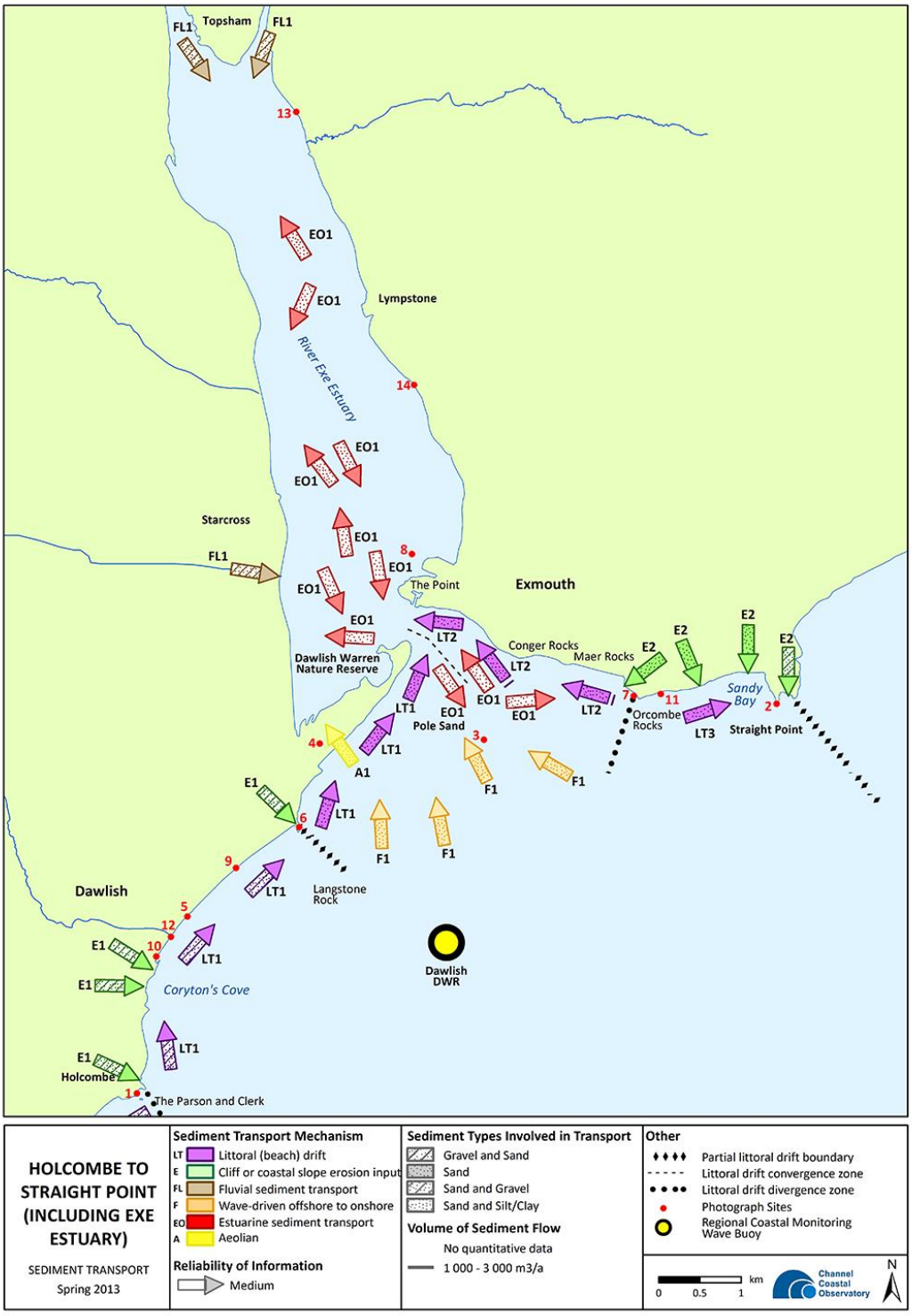

Figure 4.1. Sediment transport around the Exe estuary (SCOPAC, 2013).

5 Rainfall

Rainfall data from the Exe weather station (NGR: SX922918) from 2003 – 2012 (pre-sanitary survey) and 2013 – 2017 were used to determine whether any changes in rainfall patterns have occurred since the original Exe estuary sanitary survey. Figure 5.1 shows the average daily rainfall totals for

each month and Table 5.1 shows the annual summaries for the pre- and post-sanitary survey periods at the Exe monitoring station. Patterns of rainfall have remained very similar, and two sample t-tests revealed that there was no significant difference in mean daily rainfall per month (p = 0.9344) between the 2003 – 2012 and 2013 – 2017 periods.

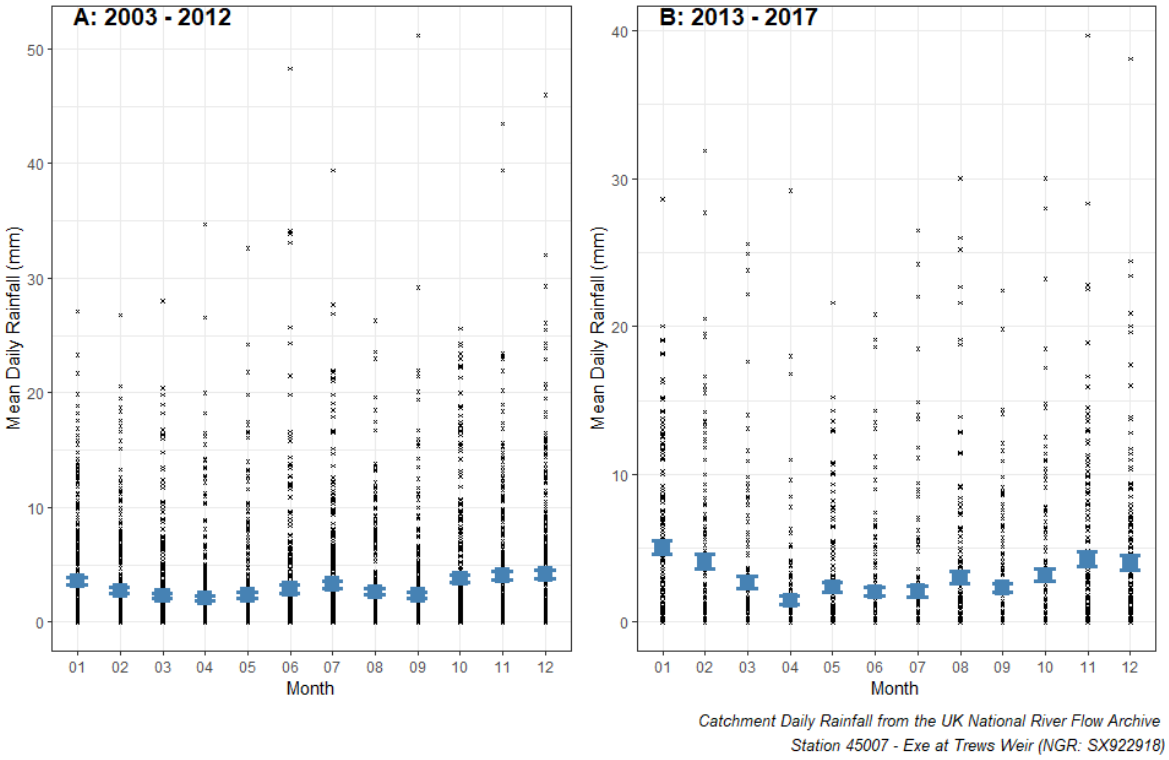

Figure 5.1 Comparison of mean daily rainfall for each calendar month prior to (2003-2012) and following (2013-2017) the original sanitary survey.

Table 5.1. Summary statistics for rainfall before and after the 2013 sanitary survey.

Period	Mean Annual Rainfall (mm)	% Dry Days	% Days Exceeding 10 mm	% Days Exceeding 20 mm
2002 - 2012	1102.81	31.83685	35.58719	21.54394
2013 - 2017	1111.74	28.80613	37.1851	23.11062

Rainfall leads to increased faecal loading through two factors; elevated levels of surface runoff and spill events from intermittent discharges. However, as the rainfall patterns have remained consistent across the two time periods, significantly increased bacterial loading due to these factors is unlikely and as such RMP recommendations made in the original sanitary survey to capture the influence of runoff and spill events remain valid.

6 Microbial Monitoring Results

6.1 Summary Statistics and geographical variation

There is a total of 5 Representative Monitoring Points (RMPs) that have been sampled within the Exe Estuary Production Area since the original sanitary survey report was published. Three of these RMPs are for mussels (*Mytilus sp.*) and two are for surf clams (*Spisula solida*). Only one of these RMPs was sampled prior to the original sanitary survey, with sampling at the two other mussel RMPs

commencing in 2014. Sampling at the two surf-clam RMPs commenced in 2018. The original sanitary survey made recommendations for the RMPs at Cockwood Harbour (B26BH) and River Kenn (B26BC), as well as several other RMPs for Pacific and Native oyster, cockles and palourdes (clams) that are not currently sampled and for which no monitoring data is available. The geometric mean results of shellfish flesh monitoring from all RMPs sampled since the original sanitary survey are presented in Figure 6.1. Table 6.1 shows the summary statistics for all RMPs sampled within the Exe estuary since 2003, using results from this point up until September 2020.

Only Cockwood Harbour (B26BH), Beacon Point (B26AT) and Exe West (B26BI) were sampled for the entire period between the original sanitary survey and this review; sampling at the River Kenn (B26BC) ceased in December 2015 following the area's prohibited classification, but was recommenced in August 2020. Sampling at Exe East (B26BI) was undertaken in combination with sampling at Exe West (B26BJ) for the purposes of classifying the Sandy Bay Classification Zone but was suspended as of June 2019. Monthly sampling at the remaining RMPs is ongoing.

Figure 6.1 Bivalve RMPs active since 2003.

E. coli levels exceeded 4,600 MPN/100g in more than 10% of samples at only one RMP, River Kenn (B26BC). This is also the only RMP that returned results greater than 46,000 MPN/100g, prior to the area being classified as prohibited. Mean *E. coli* levels were greater at all mussel RMPs than at surf clam RMPs. The surf clam RMPs are both located outside of the main estuary in the English Channel and so are further from the contamination carried by freshwater sources inside the main estuary that affect the mussel RMPs.

Table 6.1. Summary statistics of E. coli results (MPN / 100g) from RMPs sampled from 2003 onwards. Due to the large time gap between sampling periods at River Kenn (B26BC), the data have been separated.

RMP	NGR	No.	First Sample	Last Sample	Geometric Mean	Min. value	Max. value	% > 230	% > 4600	% > 46000
Beacon Point (M. sp) - B26AT	SX99698050	192	18/09/2003	16/06/2020	1476.9	<18	35000.0	62.4	7.2	0.0
Cockwood Harbour (M. sp) - B26BH	SX97948072	70	08/04/2014	24/06/2020	1688.3	<18	24000.0	65.3	6.9	0.0
Exe East (S. so) - B26BI	SY03687909	13	06/06/2018	19/06/2019	157.5	<18	330.0	23.1	0.0	0.0
Exe West (S. so) - B26BJ	SY02247907	23	06/06/2018	23/09/2020	836.0	<18	13000.0	40.0	4.3	0.0
River Kenn - B26BC (2014 – 2015)	SX97638313	22	08/04/2014	14/12/2015	14446.4	20.0	160000.0	72.7	18.2	9.1
River Kenn – B26BC (2020 – Present)	SX97638313	3	04/08/2020	01/09/2020	1866.7	1100	2300	100	0	0

Figure 6.2 and Figure 6.3 present box plots of *E. coli* monitoring results for RMPs sampled for mussels and surf clams, respectively. One-way analysis of variance (ANOVA) tests indicated that *E. coli* results recorded at River Kenn (B26BC) RMP between 2014 – 2015 were significantly higher than those at either Beacon Point (B26AT) ($p < 0.0001$), but no significant differences were found between the latter two RMPs. Additionally, no significant difference between the recently collected River Kenn samples and those collected between 2014 – 2015 were found ($p=0.243$). However, as only three samples have been collected from the River Kenn (B26BC) RMP since sampling restarted in September 2020, very limited conclusions can be drawn at this stage. No significant differences between the two surf-clam RMPs were found ($p = 0.353$).

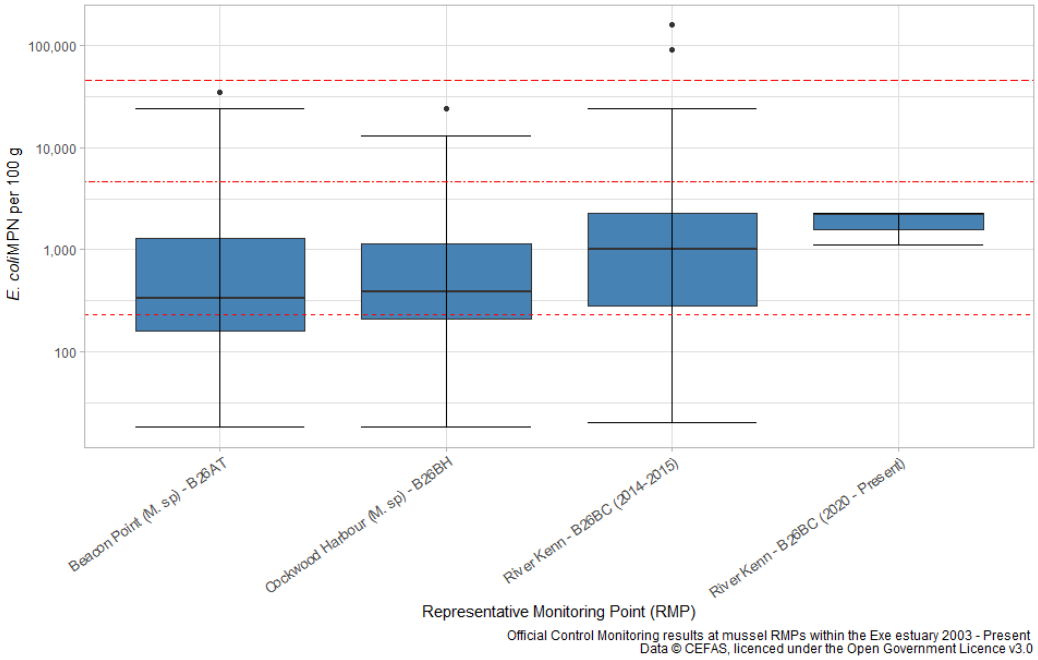

Figure 6.2. Boxplot of E. coli levels at Mussel RMPs sampled within the Exe Estuary 2003-Present. Central line indicates median value, box indicates lower – upper quartile range and whisker indicates minimum/maximum value excluding outliers (points >1.5 x interquartile range).

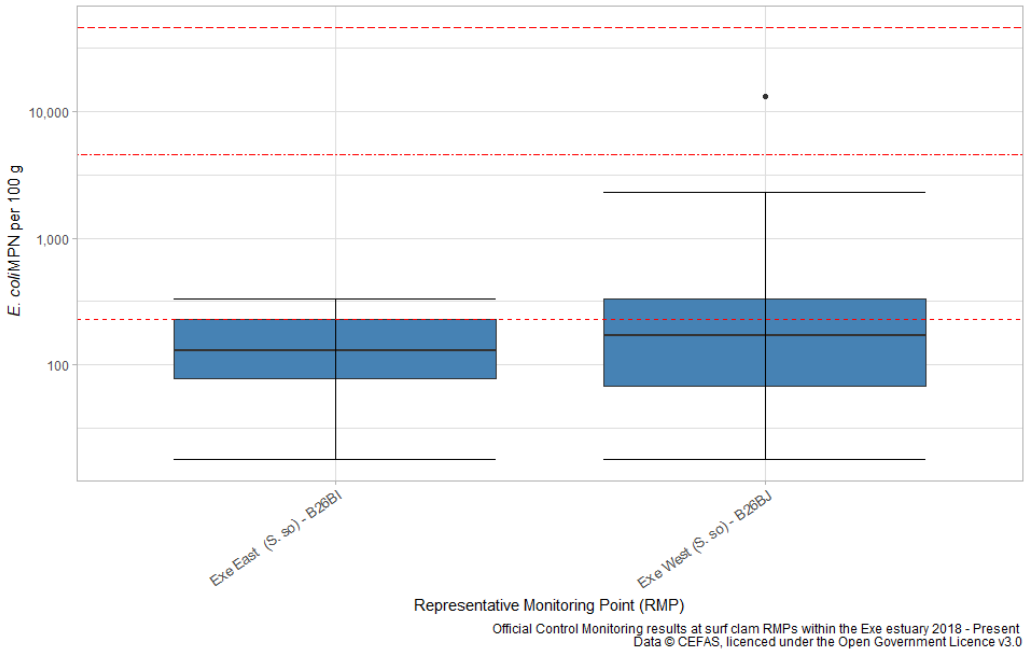

Figure 6.3. Boxplot of E. coli levels at Surf clam RMPs sampled within the Exe Estuary 2003 - present.

6.2 Overall temporal pattern in results

The overall temporal pattern in shellfish flesh monitoring results for mussel and surf-clam RMPs within the Exe estuary are presented in Figure 6.4 and Figure 6.5 respectively.

The single RMP sampled prior to the original sanitary survey returned generally consistent *E. coli* results, with the loess trend line falling above the threshold of 230 MPN/100g but below the higher threshold of 4,600 MPN/100g. Since the original sanitary survey, the results have indicated a general trend of decreasing *E. coli* levels, particularly in the last two years. When viewed temporally the rapid increase in *E. coli* levels at the River Kenn RMP is clear. Initial results fell below the other two RMPs but quickly rose to levels that necessitated the Starcross to Powderham Classification Zone being given a Prohibited classification. It was not clear what may have caused this pattern of results during LAG investigations. The high OC monitoring results (above prohibited levels) necessitated the prohibition of this area. Sampling recommenced at this RMP in August 2020, however as only three results had been collected at the time of this review, no temporal pattern is evident yet. The Cockwood Harbour RMP has remained consistent since monitoring began, with levels slightly higher than the Beacon Point RMP. The stability of *E. coli* levels at these two RMPs is reflected in their B-LT classification.

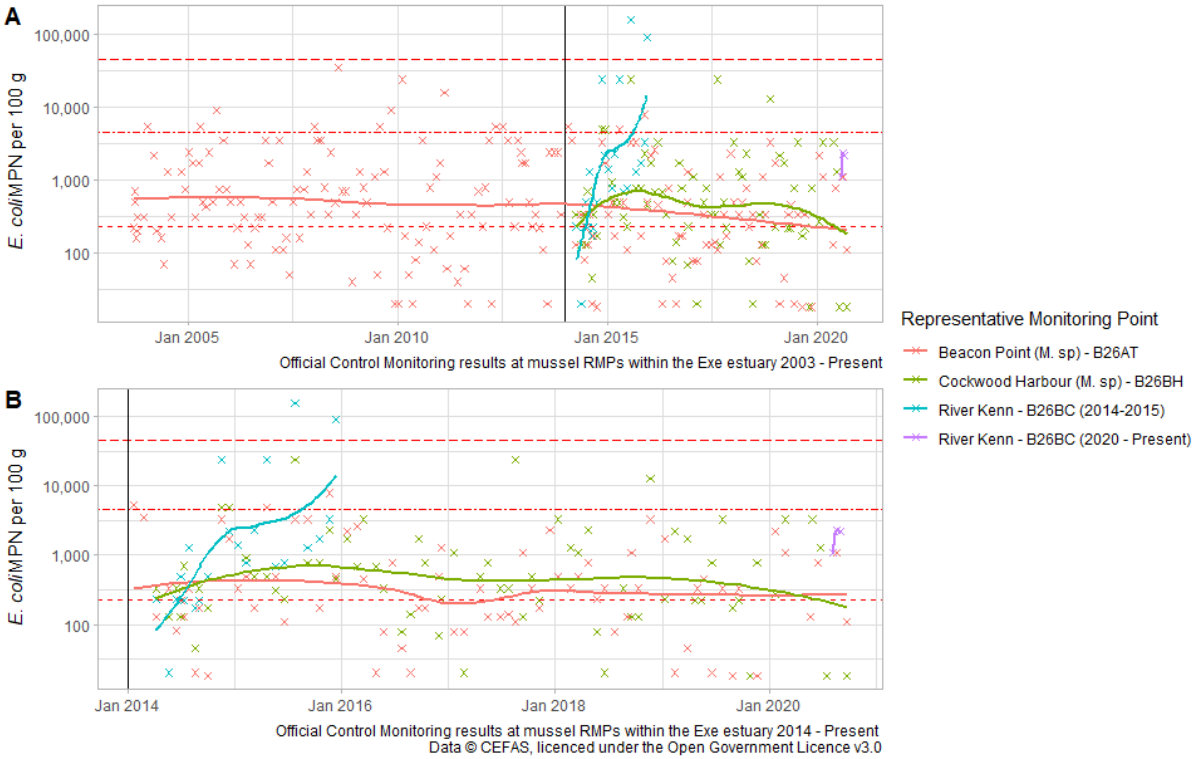

Figure 6.4. Timeseries of E. coli levels at mussel RMPs sampled within the Exe Estuary 2003 - present (A) and following the original sanitary survey in 2013 (B). Scatter plots are overlaid with loess model fitted to data.

Results for the two surf-clam RMPs sampled since 2018 have been variable, though generally lower than mussel RMPs with *E. coli* levels in more than 50% of samples falling below 230 MPN/100g. Whilst both Exe East and Exe West RMPs were sampled, *E. coli* levels were broadly similar. There has been a gradual increase in *E. coli* since mid-2019, though the RMPs have not been sampled for a long enough period to indicate whether this is a long-term trend or could be indicative of a seasonal pattern.

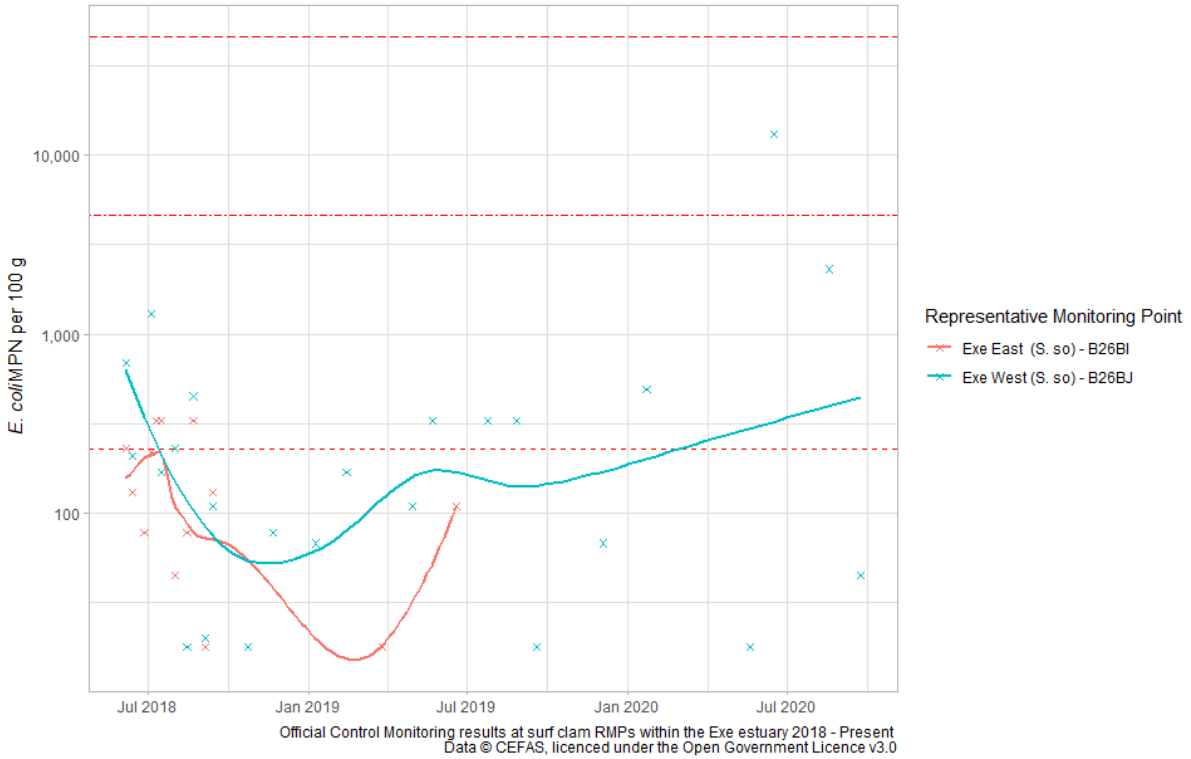

Figure 6.5. Timeseries of E. coli levels at surf clam RMPs sampled within the Exe estuary 2018 - present. Scatter plots are overlaid with loess trend lines.

6.3 Seasonal patterns of results

The seasonal patterns of *E. coli* results from 2003 to the present at each RMP were investigated. The data for mussel RMPs is presented in Figure 6.6 and for surf-clams in Figure 6.7. The data for each year was averaged into the four seasons, with Winter comprising data from January – March, Spring from April – June, Summer from July – September and Autumn from October – December.

Two-way ANOVA testing revealed no significant differences between results from any season at either the Beacon Point (B26AT) or Cockwood Harbour (B26BH) RMPs. Results in summer months at River Kenn (B26BC) were significantly greater than the results from winter ($p < 0.001$) or spring ($p < 0.0001$). However, limited inference can be taken from these initial River Kenn results as data was only collected for one year, during which time *E. coli* levels rose almost continually. No seasonal analysis on the re-started sampling was possible as only three results had been recorded at the time of this review. No significant differences were found in surf-clam RMPs by seasons, though as monitoring has only been taking place for 2 years, results should continue to be analysed for evidence of a seasonal pattern.

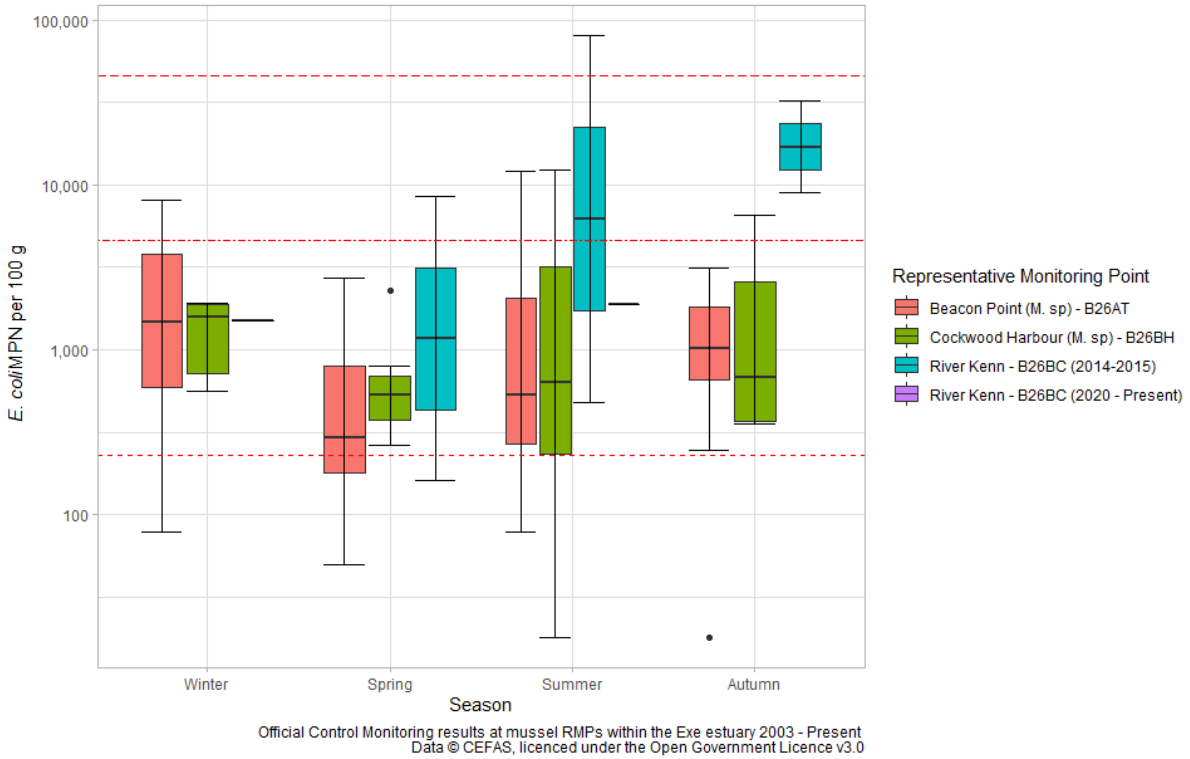

Figure 6.6. Boxplots of E. coli levels per season at mussel RMPs sampled within the Exe Estuary 2003 - present.

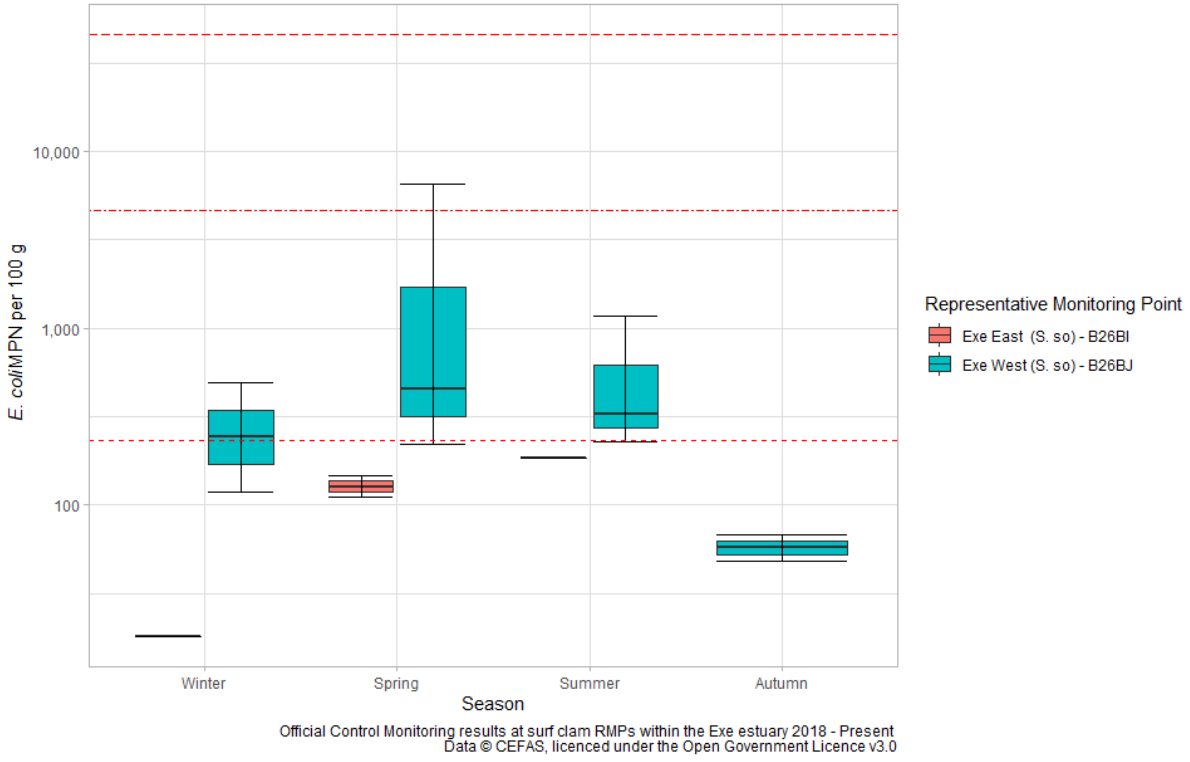

Figure 6.7. Boxplots of E. coli levels per season at surf clam RMPs sampled within the Exe Estuary 2003 - present.

7 Conclusion and overall assessment

Consultation with the Local Authorities in the area revealed that the current main industry focus in the area is on the *Exe Approaches* and *Dawlish to Starcross* beds for mussel harvesting and the *Sandy Bay* bed for surf clam harvesting. *Dawlish to Starcross* is also classified for Pacific oyster harvesting, though the current extent of this activity is unclear. Significant storms in the winter of 2013/2014 caused significant scour and disruption to the mussel beds that have since not been able to recover. Stocks at the 2019 survey were estimated to be < 1 tonne. The decline of mussel beds in the estuary has been followed by an increase of Pacific oyster beds, particularly on the western side of the estuary. The original sanitary survey suggested the presence of a naturally occurring cockle bed, and efforts to create culture sites for native oyster and palourdes (clams). Up to September 2020 no classifications are in place for these species but consultation with the Local Authorities and LAG indicated there is interest in obtaining classifications for oyster harvesting.

No updated population data was available at the time of this review, though the UK government predict that population will increase by 6.6% between 2011 & 2021 (when the next full census is scheduled to occur). Population density will continue to be centred around the urban areas that surround the estuary, Exeter, Exmouth and Dawlish Warren. Most of the catchment remains rural though population increases will almost certainly have led to increases in sewage discharges and associated urban runoff through misconnections and other urban factors.

There have been no significant changes to the sewerage network within the Exe Estuary catchment since the publication of the original sanitary survey. Five additional continuous discharges were identified and three discharges are no longer active, although none are likely to have a significant impact on the bacterial loading experienced by shellfish within the Production Area. Upgrades to a significant combined storm overflow have occurred, and additional upgrades are planned for the next 24 months. No updated spill event monitoring was available, but it is considered unlikely that the frequency of spills will have increased given that rainfall patterns have remained broadly similar. The most at-risk areas of this source of contamination remain the upper reaches of the estuary, and those at the mouth of the River Kenn.

The total livestock population of the catchment increased by 2.6% between 2013 and 2016, with 1.3 million animals residing within the catchment at the most recent count. Most of the pasture is in the northern sections of the catchment and so contamination from agricultural populations will continue to principally affect up-estuary areas.

The Exe estuary consists of several important habitats that continue to support a variety of important and protected species. The 5-year rolling average of overwintering birds has increased 21% on the 5-year average reported in the original sanitary survey, though the hotspots of potential contamination have mostly likely remained the same.

The estuary remains popular for recreational boaters, with hundreds of moorings and a large marina located at the mouth of the estuary. No legislative changes to permitted discharges from recreational vessels have occurred, and occasional overboard discharges in the main navigational and mooring / anchoring zones may still occur.

Five RMPs have been sampled within the Exe estuary since the publication of the original sanitary survey in 2013 (one was sampled prior). *E. coli* levels have remained stable since the sanitary survey at Cockwood Harbour and Beacon Point RMPs but the trend of results from the River Kenn RMP

show a rapid increase until sampling stopped in 2015. At the time of this review, samples have been taken from the River Kenn RMP, following the improvements to the sewerage network, but as only three additional samples have been collected it is not yet possible to draw strong conclusions as to the pattern at this stage. Results for this RMP have been below the class B threshold. Sampling at two surf clam RMPs began in June 2018, and *E. coli* levels were similar until sampling was stopped at the Exe East RMP in June 2019. *E. coli* levels have increased at Exe West in the last several months but remain low in the context of classification thresholds. In general, *E. coli* levels were higher at mussel RMPs, and there appeared to be a trend of higher results from sites inside and further up the estuary, closer to freshwater inputs that carry the contamination.

Only the historic monitoring results from the River Kenn RMP showed any significant differences in levels per season, though the data was only collected for one year, during which *E. coli* levels increased continually. No other RMPs for mussels or those for surf clams showed a seasonal difference in *E. coli* levels and as such it is unlikely that a seasonal classification would be appropriate for those beds.

Based on the information available, there does not appear to have been significant changes to the sources of contamination into this estuary since the publication of the original sanitary survey. The authors of this review have not identified any knowledge gaps that would justify a full shoreline survey. Sampling at the River Kenn RMP has recently recommenced. This will reveal the information likely to be produced by a full shoreline survey, as it will give data on any improvement in water quality caused by completion of upgrades to STWs draining to this Classification Zone, which has been identified to be the major change to probable sources of contamination to this Production Area.

Having reviewed the recommendations of the 2020 report and compared with the findings of the 2013 sanitary survey review for the Exe Estuary, the FSA are content that the level of risk posed by the findings is low and does not warrant a further review of the existing shoreline assessment.

8 Recommendations

8.1 Mussels (*Mytilus sp.*)

Consultation with the Local Authorities indicated that the current industry focus is on the Exe Approaches CZ on the eastern side of the estuary, as well as beds around Cockwood harbour on the western side of the estuary. It is also understood that there is industry interest in recommencing harvesting from areas within the estuary, including sections that are currently prohibited, should water quality improve. Recommendations for updates to the sampling plan for current mussel classification zones are described below and are summarised in Table 8.1. It should be noted that there is a temporary closure of the eastern side of the estuary by the Devon and Severn IFCA (Figure 2.1), however as the closure is likely to be short-term, no change to the CZ boundaries is considered appropriate at this stage but should be kept under review; If the closure becomes more long-term, adjusting the boundaries so that they no longer fall in the closed area may be necessary.

<u>Starcross to Powderham</u>

This classification zone is the farthest up-estuary of any currently classified zones. The original sanitary survey suggested that it should be classified using samples adjacent to the mouth of the River Kenn, as this was identified to be the major source of contamination. Sampling at the River Kenn RMP was suspended in December 2015, following a trend of rapidly increasing *E. coli* levels

with two results breaching the prohibited level (greater than 46,000 E coli/100g). It was not clear from investigations conducted at the time what led to these high results, and no further monitoring was conducted between December 2015 and August 2020. Harvesting of bivalve molluscs from this classification zone is currently prohibited. We understand there is industry interest in reclassifying part of this CZ, and at the time of this review, mussel samples have been taken to assess water quality. It is recommended that sampling continue at the RMP suggested in the original sanitary survey, as this will capture the most significant contamination that comes in the form of freshwater input from the River Kenn. Sampling in advance of the planned upgrades to the Kenn and Kennford STW (scheduled completion date of 30/06/2021) will allow analysis of any step change resulting from of these upgrades. Sampling would also show whether upgrades to Countess Wear CSO further upstream near Exeter have reduced bacterial loading to the estuary, as this is the most up-estuary RMP.

Dawlish to Starcross

The northern boundary of this classification meets the southern boundary of the Starcross to Powderham CZ and extends down to the spit at Dawlish Warren. It is currently sampled from an RMP where the Cockwood Harbour drainage channel cuts across the intertidal zone, due to the intermittent discharges in this location. The mussels harvested here are on-grown from relayed seed and harvested via dredge. The current RMP is still considered representative and to capture the most significant sources of contamination to this Classification Zone.

Exe Approaches

This classification zone is located on the eastern side of the estuary, where a naturally occurring mussel bed is harvested via dredge. It was proposed in the 2013 sanitary survey that the RMP for this zone be kept the same as an existing monitoring point, Beacon Point at the north-west edge of the CZ as background levels of contamination were higher at this end of the classification zone. This RMP is still considered appropriate, as the majority of contamination will still originate from up-estuary sources carried to the zone on the ebbing tide.

8.2 Pacific Oyster (*Crassostrea gigas*)

There is no current harvesting of this species, however Devon & Severn IFCA monitoring of bivalve molluscs in the Exe estuary indicated that populations of Pacific oyster are growing, particularly on the western side of the estuary. It is understood that the desired reclassifications/new classification being considered for the Dawlish to Starcross CZ is primarily for this species. Recommendations for updates to the sampling plan for current Pacific oyster classification zones are described below.

Starcross to Powderham

The boundaries of this CZ are the same as for mussels (see above), and harvesting from this zone is similarly currently prohibited. There is industry interest in obtaining a new classification for this species. Mussels are the species currently being sampled in order to provide Official Control Monitoring data for this CZ, as these showed higher *E. coli* levels under previous sampling regimens. It is recommended that samples continue to be taken from the current RMP, as this will capture the most significant contamination that comes in the form of freshwater input from the River Kenn and also capture any improvements due to upgrades to sewage works (see above). It has been suggested splitting the zone in two, with the northern section classified based on samples from the existing R. Kenn RMP and the southern zone classified using samples from the established trestle sites. However, it is our recommendation that (if monitoring results are acceptable) the entire zone be reclassified and sampled from the R. Kenn RMO, as there is insufficient evidence to suggest that

samples from the southern end would be markedly better than those from the existing RMP. Should additional monitoring results from the R. Kenn RMP not support reclassification of the entire zone, splitting of the zone may be appropriate, although this would require additional concurrent sampling from the two RMPs.

Dawlish to Starcross

The boundaries of this zone are the same as the mussel classification zone, though no RMP for this species is included in the current sampling plan. The classification for this area is based on mussel samples from the Cockwood Harbour (B26BH) RMP. The current RMP is still considered likely to capture the most significant sources of contamination to this Classification Zone and monitoring for this indicator species should continue as per current arrangements.

8.3 Soft-shell clams (*Spisula solida*)

No classification zones for this species were proposed in the original sanitary survey, though an application for harvesting a wild stock of this species in the waters off Sandy Bay was received in 2018. The area has been classified since 2018 and sampling has been carried out monthly. Recommendations for an updated sampling plan for this classification zone are described below and are summarised in Table 8.1.

Sandy Bay

This classification zone covers the waters between Orcombe Point and Straight Point, to the south east of the mouth of the Exe estuary. It was recommended in the pRMP assessment for this shellfishery that the zone be initially classified based on samples from two RMPs, one at each end of the CZ, but that *E. coli* levels should be evaluated after at least 8 samples had been collected and classification should be based on sampling from the RMP with higher levels moving forward. After one-year's samples were collected from each RMP, analysis indicated that the *E. coli* levels were greater at the western end of the CZ and the classification has been based on samples from this RMP. We recommend continuing monitoring from Exe West RMP, given that *E. coli* levels were significantly higher than from samples at the eastern end of the RMP, indicating that most contamination comes from the estuary on the ebbing tide.

8.4 General Information

8.4.1 Location Reference

Production Area	**Exe**
Cefas Main Site Reference	M026
Ordnance survey 1:25,000	Explorer 110
Admiralty Chart	2290

8.4.2 Shellfishery

Species	Culture Method	Seasonality of Harvest
Mussels (*Mytilus sp.*)	Wild/cultured	Year round
Pacific oyster (*Crassostrea gigas*)	Cultured	Year round
Soft Shell Clam (*Spisula solida*)	Wild	Year round

8.4.3 Local Enforcement Authority

Name	**Teignbridge District Council** Forde House, Brunel Road, Newton Abbot TQ12 4XX
Website	https://www.teignbridge.gov.uk/
Telephone number	01626 361101
E-mail address	envc@teignbridge.gov.uk

Name	**East Devon District Council** Blackdown House, Border Road Heathpark Industrial Estate Honiton EX14 1EJ
Website	https://eastdevon.gov.uk/environmental-health-and-wellbeing/
Telephone number	01237 428700
E-mail address	environmentalprotection@torridge.gov.uk

Table 8.1. Names and locations of Representative Monitoring Points (RMPs) and sampling frequencies and tolerances for classification zones within the Exe Estuary Production Area. Proposed changes are highlighted in red.

Classification Zone	RMP	RMP Name	NGR (OSGB 1936)	Latitude & Longitude (WGS 1984)	Species represented	Growing Method	Harvesting Technique	Sampling Method	Sampling Species	Tolerance	Frequency
Starcross to Powderham	B26BC	River Kenn	SX97638313	50.638841°, -3.4490335°	Mussels, P. Oyster	Wild	Dredge	Dredge	Mussels	100 m	Monthly
Dawlish to Starcross	B26BH	Cockwood Harbour	SX97948072	50.61723°, -3.4439871°	Mussels, P. oyster	Wild	Dredge	Dredge	Mussels	100 m	Monthly
Exe Approaches	B26AT	Beacon Point	SX99698050	50.615556°, -3.4191994°	Mussels	Wild	Dredge	Dredge/ hand	Mussels	100 m/ 10 m	Monthly
Sandy Bay	B26BJ	Exe West	SY02247907	50.603134°, -3.3827905°	*S. solida*	Wild	Dredge	Hand	*S. solida*	10 m	Monthly

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Appendices

Centre for Environment Fisheries & Aquaculture Science

www.cefas.defra.gov.uk

EC Regulation 854/2004

CLASSIFICATION OF BIVALVE MOLLUSC PRODUCTION AREAS IN ENGLAND AND WALES

SANITARY SURVEY REPORT

Exe Estuary

December 2013

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