Sanitary Survey- Review

Dart – 2023

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Carcinus Ltd, Wessex House, Upper Market Street, Eastleigh, Hampshire, SO50 9FD.
Tel. 023 8129 0095
https://www.carcinus.co.uk/

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Document QA and Approval

	Name	Role	Date
Author	Joshua Baker	Senior Consultant	03 April 2023
Checked	Matthew Crabb	Director	03 April 2023
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Consultation on draft report

Consultee	Date of consultation
Devon and Severn Inshore Fisheries and Conservation Authority	March 2023
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A sanitary survey relevant to the bivalve mollusc beds in Dart was most recently undertaken in 2011 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 and EU guidance the Food Standards Agency undertake 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 Ltd 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, South Hams District Council. The report is publicly available via the Carcinus Ltd. website.

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Carcinus Ltd., 2023. Review of the Dart 2011 Sanitary Survey. Carcinus report on behalf of the Food Standards Agency, to demonstrate compliance with the requirements for classification of bivalve mollusc production areas in England and Wales under retained EU Law Regulation (EU) 2019/627.

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1 Introduction

1.1 Background

The Food Standards Agency (FSA) is responsible for carrying out sanitary surveys in classified production and relay areas in accordance with Article 58 of retained (EU) Regulation 2019/627 and the EU Good Practice Guide (European Commission, 2021). In line with these requirements, sanitary surveys must be reviewed to ensure public health protection measures continue to be appropriate. Carcinus is contracted to undertake reviews on behalf of the FSA.

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 the outcome of the desktop report and identified risks. The desktop assessment is completed through analysis and interpretation of publicly available information, in addition to consultation with stakeholders.

1.2 Dart Review

This report reviews information and makes recommendations for a revised sampling plan for existing Pacific Oyster (*Crassostrea gigas*) classification zones in the Dart 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 and their impact on the classified shellfishery. Data for this review was gathered through a desk-based study and consultation with stakeholders.

An **initial consultation** with Local Authorities (LAs), Inshore Fisheries and Conservation Authorities (IFCAs) and the Environment Agency (EA) responsible for the production area was undertaken in November 2022. This supporting local intelligence 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 responsible Local Enforcement Authorities (LEAs), Industry and other Local Action Group (LAG) members was undertaken in March 2023. 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.

Sanitary Surveys of the Dart Estuary were undertaken by Cefas in 2009, 2010 and 2011 (Cefas, 2009, 2010, 2011). The review primarily considers changes since the 2011 survey, and unless specified this should be considered the 'original survey'. This review updates the assessment and sampling plan presented in that report as necessary. This report should be read in conjunction with all three previous surveys.

Specifically, this review considers:

(a) Changes to the shellfishery (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.

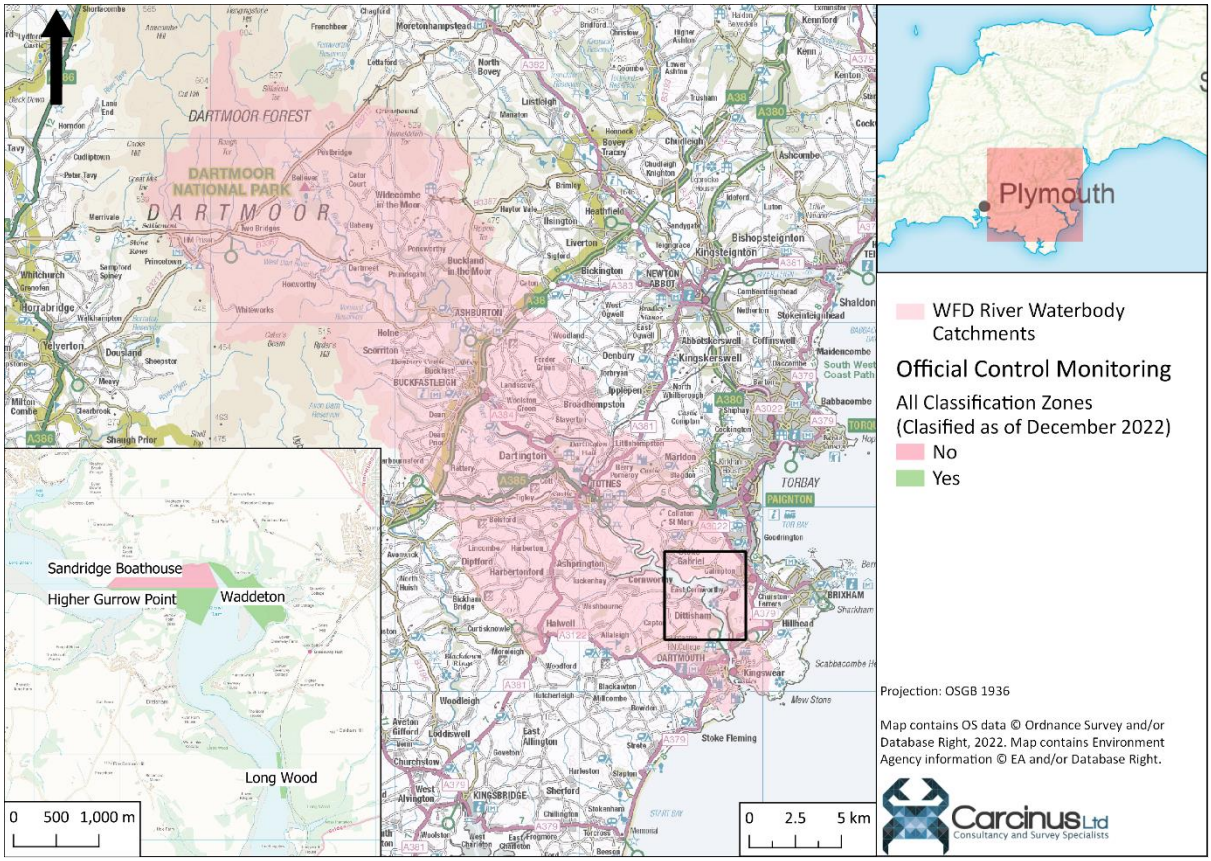

Figure 1.1 Location of the Dart Estuary (inset map shows positions of current Classification Zones, indicated by the black box on the catchment scale map).

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, Environment Agency and relevant Inshore Fisheries and Conservation Authority

- The findings of this report are based on information and data sources up to and including December 2022;
- Only information that may impact on the microbial contamination was considered for this review; and
- Official Control monitoring data have been obtained through a request to Cefas, with no additional verification undertaken. The data are also available directly from the Cefas data hub[1]. Results up to and including December 2022 have been used within this study. Any subsequent samples have not been included.

2 Shellfisheries

2.1 Description of Shellfishery

The Dart Estuary is a small, sheltered estuary situated in Devon, southwest England (Figure 1.1). Shellfish production in the area occurs in two locations, Long Wood, approximately 4.5 km upstream of the estuary mouth at Dartmouth, and an area around Gurrow Point, a further 2km upstream. The boundaries of the Bivalve Mollusc Production Area (BMPA) are defined as being the entirety of the estuary from its tidal limit at Totnes Weir, down to the estuary mouth.

The Local Enforcement Authority (LEA) responsible for this fishery in terms of food hygiene official control purposes (including sampling) is South Hams District Council.

A summary of the fishery for each species is summarised in the sections below.

2.1.1 Pacific oyster

During initial consultations, Devon and Severn Inshore Fisheries and Conservation Authority (D&S IFCA) indicated that the main fishery in operation is cultured Pacific oysters, and that the fishery is regulated under the Waddeton Fishery Order 2001[2] (Figure 2.1), which grants rights of regulating the fishery to D&S IFCA for a period of 25 years (therefore ending in 2026). This order only covers the area around Gurrow Point (Devon and Severn IFCA, 2022), and does not include the Long Wood area to the south. D&S IFCA stated that the areas are leased from the Duchy of Cornwall by D&SIFCA, with individual plots leased to mariculture operators via licences. D&S IFCA advised that there are currently three licence holders on a total of five plots within the Order Area, and that two of the five plots are considered 'half plots'.

[1] Cefas shellfish bacteriological monitoring data hub. Available at: https://www.cefas.co.uk/data-and-publications/shellfish-classification-and-microbiological-monitoring/england-and-wales/.
[2] The Waddeton Fishery Order 2001. Available at: https://www.legislation.gov.uk/uksi/2001/1380/contents.

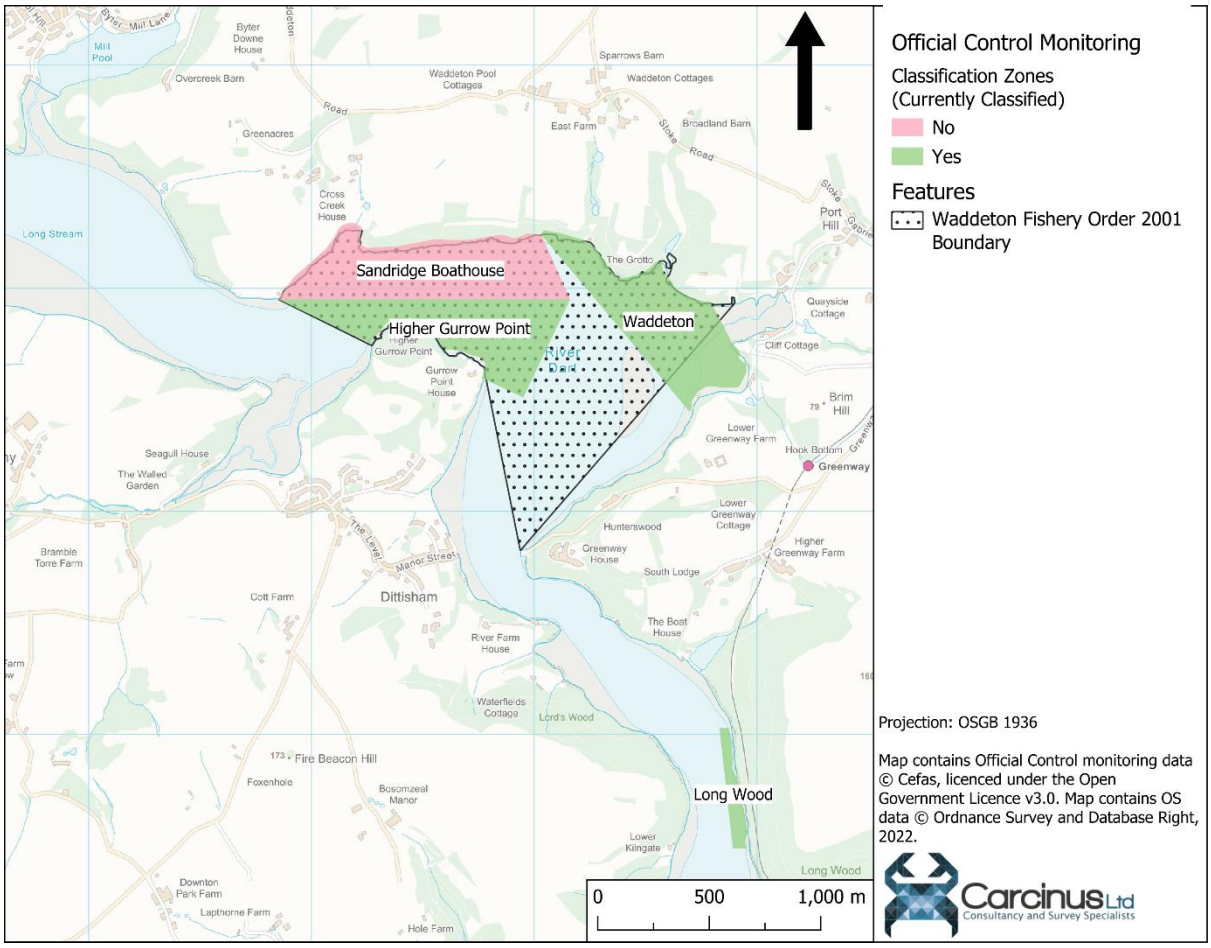

Figure 2.1 Boundary of the Waddeton Fishery Order 2001.

Mariculture operations in the Order area are managed in accordance with D&S IFCA's Biosecurity Measures Plan. No byelaws specific to the culture of Pacific oysters are in place.

No stock maps are available for the shellfish beds in this BMPA. The authors of this review understand, following information provided by both D&S IFCA and the LEA, that the current shellfish beds do not extend beyond the currently classified boundaries. We also understand that they have not done so at any point since the original sanitary surveys were published. During initial consultations, D&S IFCA advised that 660 kg of Pacific oyster were harvested from the Classified Zones in 2021.

2.1.2 Other Species

The original sanitary surveys describe that the estuary contained natural spatfalls of mussels (*Mytilus* spp.) but that the production of this species is based on the natural stock availability. During initial consultations, the LEA advised that sampling of this species stopped approximately 8 years ago following a series of poor classification results, but that commercial harvesting had ceased several years before this.

D&S IFCA stated that the limited use of one mussel dredge by a vessel below seven metres overall length is currently authorised in the Dart Estuary (under the existing Category Two

Permit Conditions to the Mobile Fishing Permit Byelaw). The Permit Conditions include the following:

- No fishing is authorised on bank holidays;
- No fishing is authorised on weekends;
- Fishing is only authorised between 0800 hrs and 1800 hrs local time; and
- Fishing is authorised between 1st October and 31st March inclusive.

However, they advised that since 2014, no fishers have taken advantage of a Category Two Permit to dredge for mussel in the Dart. In 2019 D&S IFCA's Byelaw and Permitting Sub-Committee concluded that conditions relating to mussel dredging in the Dart Estuary should be removed from any re-made Permit Byelaws. The Mobile Fishing Permit Byelaw is in the process of being re-made, with proposals in place to prohibit mobile fishing activity in the Dart Estuary (including mussel dredging).

During initial consultations, D&S IFCA confirmed there are no other unclassified species of bivalves in the BMPA.

2.2 Classification History

The 2010 Sanitary Survey recommended the creation of five Classification Zones (CZs) for Pacific oysters, four within the Waddeton Fishery Order Area, and one at the far south of the estuary near Kingswear. The Zones recommended in the 2009 Survey are the same as those recommended within the Fishery Order Areas in the 2010 Survey. The same five areas were recommended for Mussel classification. In the 2011 sanitary survey, a further two Classification Zones for Pacific oysters were recommended. The *Kingswear* CZ was Declassified in 2012 for both species, and the three mussel classification zones in the Waddeton Fishery Order area were declassified in 2015. The *Flat Owers*, *Sandridge Boathouse* and *Higher Gurrow Point* zones were declassified in 2021, although at the time of writing the following zones have active classifications within the Dart Estuary BMPA:

- *Waddeton* – Class B-LT
- *Higher Gurrow Point* – Class B-LT
- *Long Wood* – Class B-LT

Furthermore, the FSA received an application to reclassify the *Sandridge Boathouse* CZ in November 2022, and as such it has been included for consideration throughout this report. The location of all active CZs (including *Sandridge Boathouse*), along with all RMPs sampled within the BMPA since 2010, are presented in Figure 2.2.

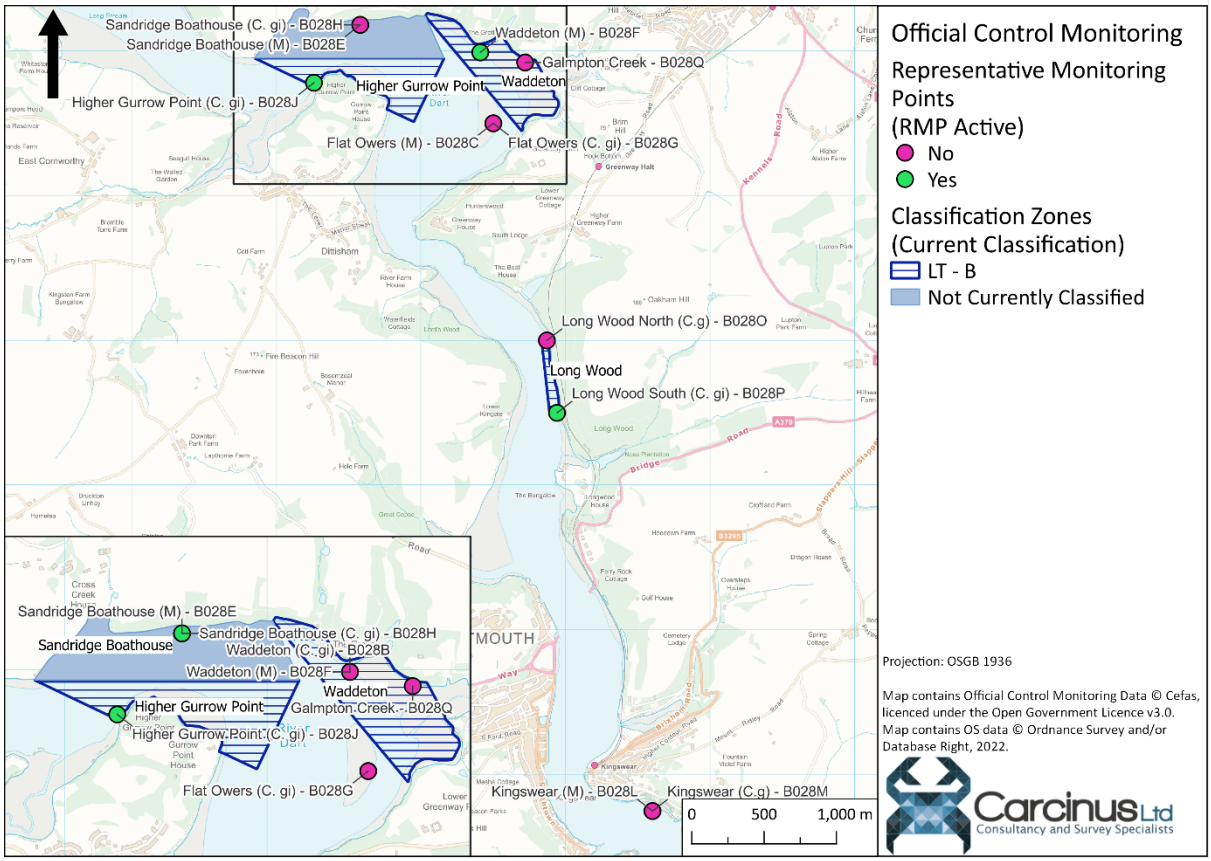

Figure 2.2 Current Pacific oyster Classification Zones and Associated Representative Monitoring Points in the Dart Estuary BMPA. See Figure 1.1 for the position of these zones within the wider catchment.

3 Pollution sources

3.1 Human Population

The 2011 Sanitary Survey does not provide an overall estimated human population of the catchment to facilitate comparison. It does provide some statistics, based on 2008 population estimates produced and provided by Devon County Council. In March of 2011 a full census of the United Kingdom was conducted, and data from this survey has been used to give an indication of human population around the time of the original sanitary surveys. Preliminary results from the March 2021 Census have been made available, and a comparison of these two surveys is used to give an indication of population trends across the catchment in the last 10 years. Changes in human population density within Census Super Output Areas (lower layer) wholly or partially contained within the Dart catchment at the 2011 and 2021 Censuses are presented in Figure 3.1.

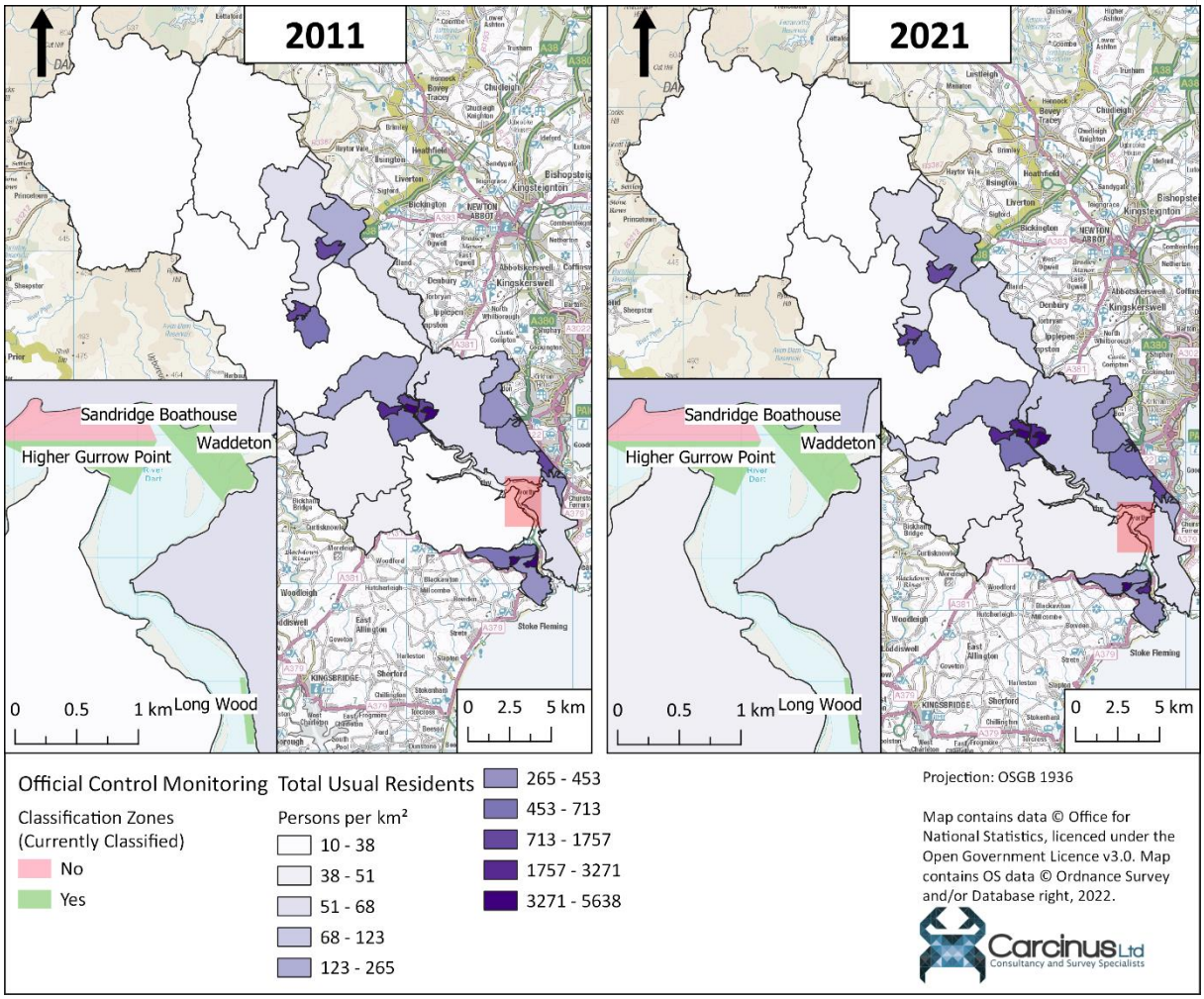

Figure 3.1 Human population density in census Super Output Areas (lower layer) wholly or partially contained in the Dart estuary catchment at the 2011 and 2021 Censuses.

The maps presented in Figure 3.1 indicate that much of the catchment remains very rural, with large areas having population densities of less than 50 people per km. The main urban centres of the catchment are unchanged from that described in the original sanitary survey and remain the towns of Totnes at the head of the estuary, Dartmouth at the estuary mouth, and Buckfastleigh and Ashburton farther up the catchment. The inland sections of Brixham and Paignton are also within this catchment and are areas of high population density, although much of the contamination from these areas will drain into Torbay and so do not require consideration within this assessment. At the 2011 Census, the population residing within the Dart catchment was estimated to be 62,176 people. By the 2021 Census, this had increased to 67,473, an increase of 8.5%. The land immediately surrounding the Classification Zones of this production area continue to have low population densities, and so the greatest potential for urban runoff remains Totnes at the head of the estuary and Dartmouth at the mouth.

During initial consultations, the LEA provided details of the number of 'dwelling completions' (new houses) that occurred in parishes within the South Hams district adjoining or feeding into the River Dart. A total of 1,083 dwelling completions occurred

between 2012 and 2022, with the majority of these occurring in Totnes (492 dwellings), Dartington (180) and Stoke Gabriel (140). The developments in Stoke Gabriel are likely to be of greatest significance given the proximity (approximately 2 km) of this village to the Classification Zones in the Fishery Order area. Any increase in population would place additional loading on the Wastewater Treatment Network, changes to which are discussed in the next section. During secondary consultation, the EA stated that all developers must receive written confirmation from the Water Company that additional flows as a result of their development can be accommodated.

The 2011 Sanitary Survey mentions that human population in the area increases significantly during the summer holiday period, but does not provide any tourism statistics. In the summer of 2021, South Devon received a 'record' number of visitors, estimated to be 10% higher than 2019 (Henderson, 2021). As concluded in the original sanitary surveys, the highest numbers of visitors will come during summer months, and the associated loading to the wastewater treatment network will therefore also occur during these periods. No information has been received during consultations to indicate that the existing capacity is not sufficient to handle the increase.

Analysis of the 2021 Census suggests that there are approximately 67,000 people residing in the Dart Catchment, an increase of 8.5% on the 2011 Census. The main population centres throughout the catchment have not changed, although the planning department of South Hams District Council advised during initial consultations that more than 1,000 dwellings were completed in the district between 2012 and 2022. It is also likely that the volume of tourists the area receives has increased since the publications of the original sanitary surveys, although there is no evidence that the existing wastewater treatment network does not have sufficient capacity to accommodate this increase. Overall, the recommendations made in the original sanitary survey to account for the impact of human populations remain valid.

3.2 Sewage

Details of all consented discharges in the vicinity of the Dart Estuary BMPA catchment were taken from the most recent update to the Environment Agency's national permit database at the time of writing (October 2022). The Locations of these discharges within the BMPA and near the Classification Zones are shown in Figure 3.2.

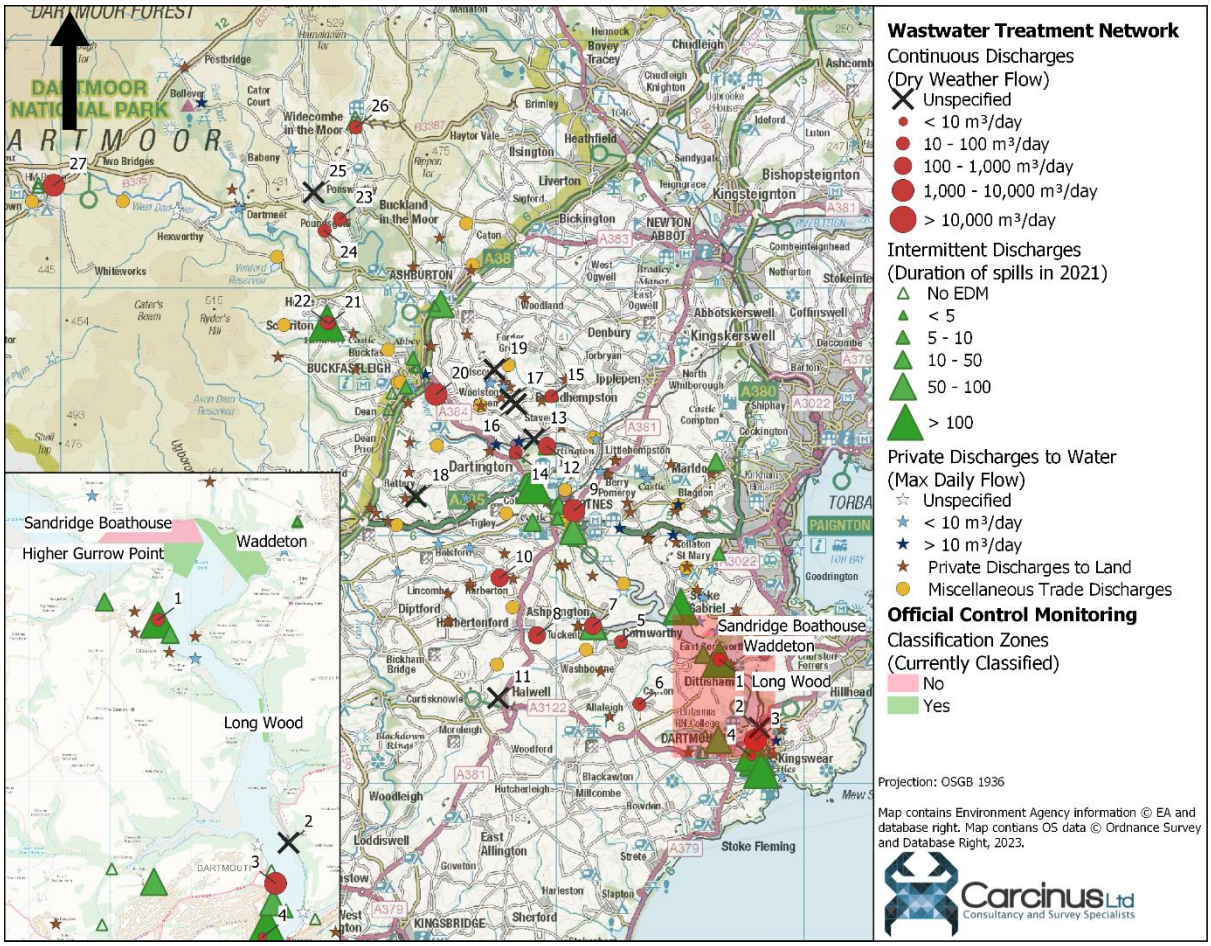

Figure 3.2 Locations of consented discharges in the vicinity of the Dart BMPA. Labels refer to continuous discharges, details of which can be found in Table 3.1.

Table 3.1 Details of continuous discharges in the vicinity of the Dart BMPA. Discharges are ordered by proximity to a Classification Zone. Discharges that have had an increase in consented discharge volume compared to that described in the 2011 Sanitary Survey are highlighted in red.

ID	Discharge Name	Permit Number	Receiving Environment	NGR	Treatment	Dry Weather Flow (m³/day)	Distance to nearest CZ (km)
1	DITTISHAM WWTW	202711	RIVER DART ESTUARY	SX8659055000	UV DISINFECTION	66	0.61
2	KINGSWEAR (HIGHER FERRY) STW	SWWA395	RIVER DART	SX8820052250	UNSPECIFIED	Unspecified	1.26

ID	Discharge Name	Permit Number	Receiving Environment	NGR	Treatment	Dry Weather Flow (m^3/day)	Distance to nearest CZ (km)
3	DARTMOUTH STW	202394	DART ESTUARY(E)	SX88040 51750	UV DISINFECTION	4644	1.74
4	BAYARDS COVE OUTFALL	203625	RIVER DART ESTUARY(E)	SX87880 51090	SCREENING	1	2.4
5	CORNWORTHY WWTW	200926	TRIB OF THE DART ESTUARY	SX82610 55720	BIOLOGICAL FILTRATION	56	3.25
6	CAPTON STW	004527/FD/01	TRIB OF DITTISHAM MILL CREEK	SX83350 53200	UNSPECIFIED	15	3.72
7	ASHPRINGTON WWTW	NRA-SW-3983	RIVER HARBOURNE (ESTUARINE)	SX81480 56360	BIOLOGICAL FILTRATION	181	4.39
8	HARBERTONFORD WWTW	203562	HARBOURNE RIVER	SX79220 55980	BIOLOGICAL FILTRATION	242	6.63
9	TOTNES STW	203080	DART ESTUARY(E)	SX80710 61010	UV DISINFECTION	3967	7.19
10	HARBERTON WWTW	NRA-SW-5295	HARBETON STREAM	SX77710 58290	BIOLOGICAL FILTRATION	150	8.47
11	HALWELL STW	SWWA 447	HALWELL STREAM	SX77650 53450	SEPTIC TANK	Unspecified	8.57
12	STAVERTON WWTW	NRA-SW-0257	RIVER DART	SX79620 63620	BIOLOGICAL FILTRATION	115	9.81
13	SOUTHFORD (STAVERTON) STW	SWWA 2104	NOT DESCRIBED IN CONSENT	SX79100 63890	BIOLOGICAL FILTRATION	Unspecified	10.36
14	HUXHAMS CROSS WWTW	204040	GROUNDWATER VIA INFILT SYSTEM	SX78350 63350	SEPTIC TANK	19	10.52

ID	Discharge Name	Permit Number	Receiving Environment	NGR	Treatment	Dry Weather Flow (m^3/day)	Distance to nearest CZ (km)
15	BROADHEMPSTON WWTW CSO	200357/FN/01	(S) RIVER HEIMS	SX7980065630	UNSPECIFIED	75	11.29
16	LANDSCOVE STW	NRA-SW-0086	LANDSCOVE STREAM	SX7837065310	SEPTIC TANK	Unspecified	11.91
17	LANDSCOVE STW	SWWA 375	LANSCOVE STREAM	SX7815065500	SEPTIC TANK	Unspecified	12.2
18	RATTERY WWTW CSO	SWWA 382	BIDWELL BROOK	SX7433061580	SEPTIC TANK & FILTER	Unspecified	12.82
19	LANDSCOVE (GULLAFORD FARM) STW	SWWA 438	TRIB. OF RIVER HEMS	SX7750066700	BIOLOGICAL FILTRATION	Unspecified	13.53
20	BUCKFASTLEIGH STW	NRA-SW-5002	RIVER DART (S)	SX7514065700	BIOLOGICAL FILTRATION	3165	14.47
21	HOLNE WWTW	SWWA 2251	HOLY BROOK	SX7082068560	BIOLOGICAL FILTRATION	36.4	19.61
22	SCORRITON STW	203887	HOLY BROOK(S)	SX7074068600	BIOLOGICAL FILTRATION	25	19.7
23	LEUSDON STW	SWWA 422	TRIBUTARY OF RIVER WEBBURN	SX7125872787	BIOLOGICAL FILTRATION	14.85	22.22
24	POUNDSGATE STW	201052	(S) POUNDSGATE STREAM	SX7064072310	BIOLOGICAL FILTRATION	13	22.3
25	PONSWORTHY STW	SWWA 575	(S) RIVER WEBBURN	SX7020073850	SEPTIC TANK	Unspecified	23.72
26	WIDECOMBE STW	203911	EAST WEBBURN RIVER(S)	SX7190076480	BIOLOGICAL FILTRATION	16	24.71
27	PRINCETOWN SEWAGE TREATMENT WORKS	201064	BLACKBROOK RIVER(S)	SX5971074140	BIOLOGICAL FILTRATION	1023	31.85

The original sanitary survey identified that five continuous sewage discharges lay within the estuary or within 10 km of the tidal limit at Totnes Weir (IDs 1, 3, 7, 8 & 9 in Table 3.1). That report identified that the two largest discharges (in terms of consented discharge volume) were at Totnes (ID 9) and Dartmouth (ID 3), but that both received UV disinfection. Neither of these discharges have seen changes to their consented discharge volume or treatment. There were some other smaller discharges that only employed secondary treatment. However, given the consented discharge volume (<250 m^3/day), they were adjudged to have a relatively small impact on the bacteriological health of the BMPA. None of the treatment methodologies at these five discharges have changed since 2011, although the consented discharge volume from Ashprington STW has increased from 98 m^3/day to 181 m^3/day. As of October 2022, all other continuous discharges within 10 km of a Classification Zone have a consented discharge volume of less than 250 m^3/day. The Shellfish Water Action Plan for the Dart Shellfish Water published by the Environment Agency provides details of upgrades to continuous water company outfalls. It states that UV disinfection was installed at Dartmouth and Totnes STWs during Asset Management Plan (AMP) 3 (2000 - 2005), and discharges from Galmpton STW were transferred from the Dart estuary and into into Torbay (via the Brokenbury STW). The Action Plan states that there are no active improvements measures in place for this shellfish water. There was a recorded failure at Dartmouth WWTW relating to the Chemical Oxygen Demand (COD) 2015, but the EA considered that this was unlikely to have contributed to any bacterial contamination. The risk associated with contamination from continuous water company discharges is considered to have remained broadly similar since the original sanitary survey was published.

In addition to the continuous discharges, the original sanitary survey identified a series of intermittent outfalls associated with the continuous discharges. Intermittent discharges comprise Combined Storm Overflows (CSOs), Storm Tank Overflows (STOs) and Pumping Station Emergency Overflows (PSs). During AMP6 and AMP7, Event Duration Monitoring (EDM) was installed at several of the discharges within the catchment. Summary data for 2020 and 2021 was published by the Environment Agency in March 2021 and in March 2022, respectively (Environment Agency, 2022). Details of the EDM data from 2021 for those discharges in the Dart catchment are presented in Appendix I.

No detailed EDM data is provided by the original sanitary survey, but some has been provided in the 2010 report. The closest intermittent discharges to the Classification Zones of this BMPA are the Mill Creek PS (600 m from the *Higher Gurrow Point* CZ), Dittisham WWTW (600 m from *Higher Gurrow Point*) and Ferry Boat Inn PS (1 km from *Higher Gurrow Point* and *Waddeton*). Comparison of the EDM data suggests that in general, these discharges are spilling less frequently than at the time of the 2010 sanitary survey (although spills have occurred from every outfall), meaning that they likely have less of an impact on the bacteriological health of the BMPA. The EA's Shellfish Water Action Plan for the Dart states that during AMP6 (2015 – 2020), a scheme to limit the number of spills to <10 spills

per annum of >50 m³ was designed and constructed. Assets in this scheme include Tor Park Road PSCSO EO, Scout Hut CSO, Stoke Gabriel PSCSO EO, Galmpton (Dart) PSCSO EO, Dittisham PSCSO/EO and Ferry Boat Inn Transfer PSCSO EO. In the current AMP (2020 – 2025) EDM was installed at five further intermitted discharges (including the Mill Creek PS, which spilled 18 times for a total of 25 hrs in 2021).

In AMP6, an investigation of the Totnes STW catchment was undertaken, and the sewerage system feeding into this works at the head of the estuary was analysed. The Action Plan does not comment on the findings of this review, although it does state that the Dart Shellfish Water has been identified as a priority for AMP8 (2025 – 2030), and a comprehensive impact study will be undertaken.

In addition to water company owned discharges, privately owned discharges require consideration in any assessment of contamination sources affecting a fishery. The only private discharge noted in the previous sanitary surveys is the new development at Noss Marina, with a privately owned discharge near the Long Wood shellfishery. During initial consultations, there was a concern raised over the number of private discharges in the area. A permit for secondary treated wastewater at a rate of 136 m³/day was issued on 30 June 2011, but was revoked on 27 October 2016 when the company it was issued to dissolved. There continue to be several private discharges in the estuary, however those around the CZs are all small (<10 m³/day) and so are unlikely to be a significant source of pollution. Limited information can be provided in this report due to data protection requirements. During secondary consultation, the EA stated that no failures at private discharges had occurred since 2011.

No upgrades to continuous discharges in the Dart catchment have occurred since the 2011 Sanitary Survey was published, although works to reduce the number of spills from interment discharges have occurred during previous AMPs. Comparison of EDM data suggests these efforts have been broadly successful, with spills occurring less frequently now than around the time of the previous sanitary survey. However, spills do still occur and intermittent discharges spilling for more than 100 hrs are located within 600 m of CZs in the Waddeton area. These intermittent discharges should be taken into consideration in any updated sampling plan.

3.3 Agricultural Sources

The 2011 Sanitary Survey of the Dart provides some livestock statistics, based on the June 2008 Agricultural Census.. The 2010 Survey also provides statistics based on the 2008 Agricultural Census for sub-catchments of the Dart. Livestock data of the same spatial scale were not available to the authors of this review, and so a data request was made to the Farming Statistics Office of the Department for Environment, Food and Rural Affairs (DEFRA) for livestock populations within the catchment presented in Figure 1.1. This data was made available under the Open Government Licence v3.0. Figure 3.3 presents the changes in

livestock populations within the Dart catchment between 2010 and 2021, based on the June Survey of Agriculture and Horticulture[3].

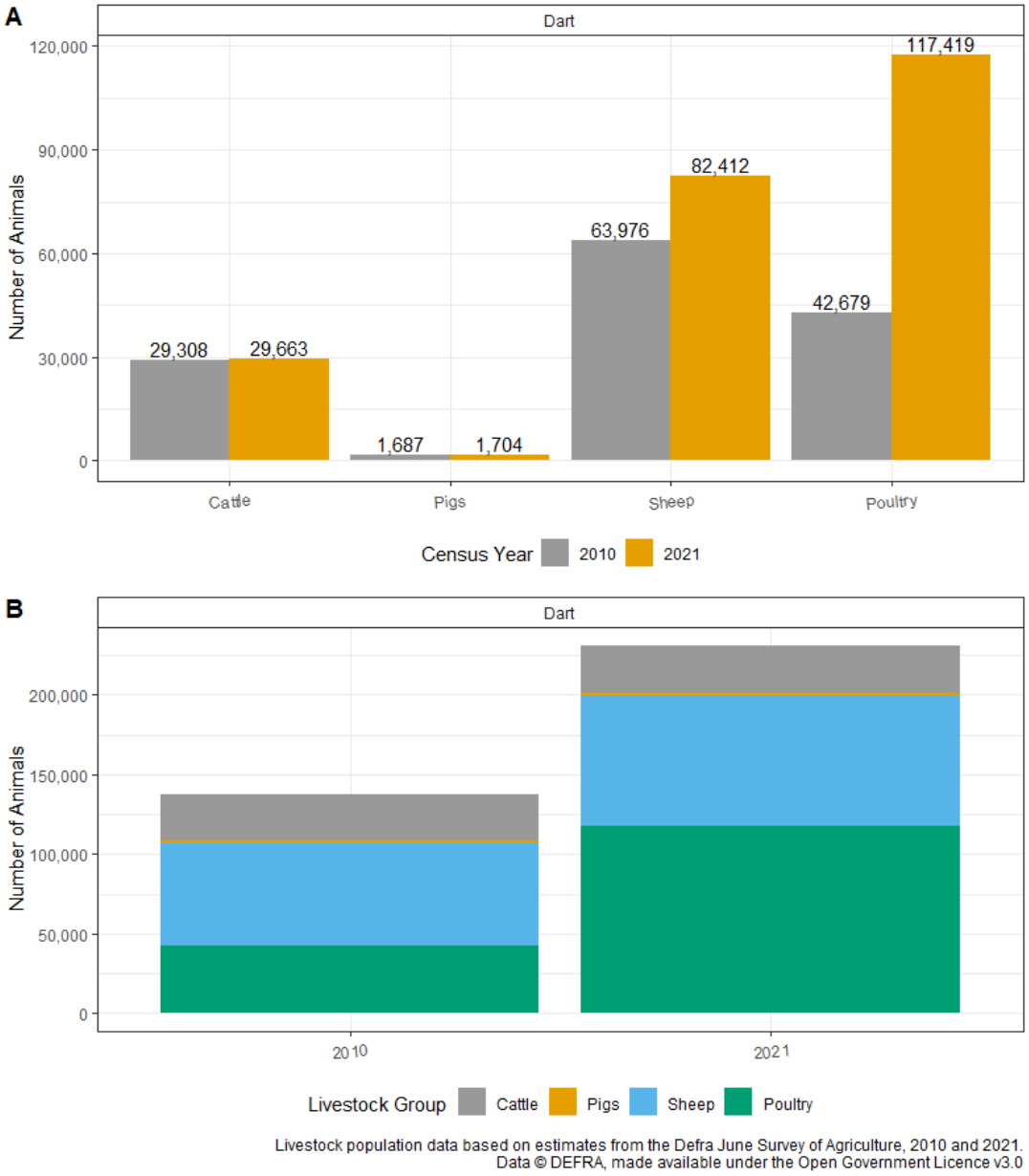

Figure 3.3 Changes in livestock populations within the Dart catchment. Panel A shows populations broken down by different livestock groups, and panel B shows the aggregated population.

The data presented in Figure 3.3 shows that the dominant livestock group in terms of population size for both years is poultry, followed by sheep. Livestock populations in the catchment increased by 67% between 2010 and 2021, although this was driven by an almost

[3] June Survey of Agriculture and Horticulture. Further information available at: https://www.gov.uk/guidance/structure-of-the-agricultural-industry-survey-notes-and-guidance#june-survey-of-agriculture-and-horticulture-in-england.

threefold increase in poultry populations and a 28% increase in sheep populations. It should be noted that the June Survey[4] represents a snapshot of livestock populations in a single day, but populations will vary throughout the year. Highest numbers of animals will occur in spring, following the birthing season, and the lowest in autumn and winter when animals are sent to market.

The principal route of contamination of coastal waters by livestock is surface runoff carrying faecal matter. The change in land cover in the Dart catchment between 2012 and 2018 is shown in Figure 3.4.

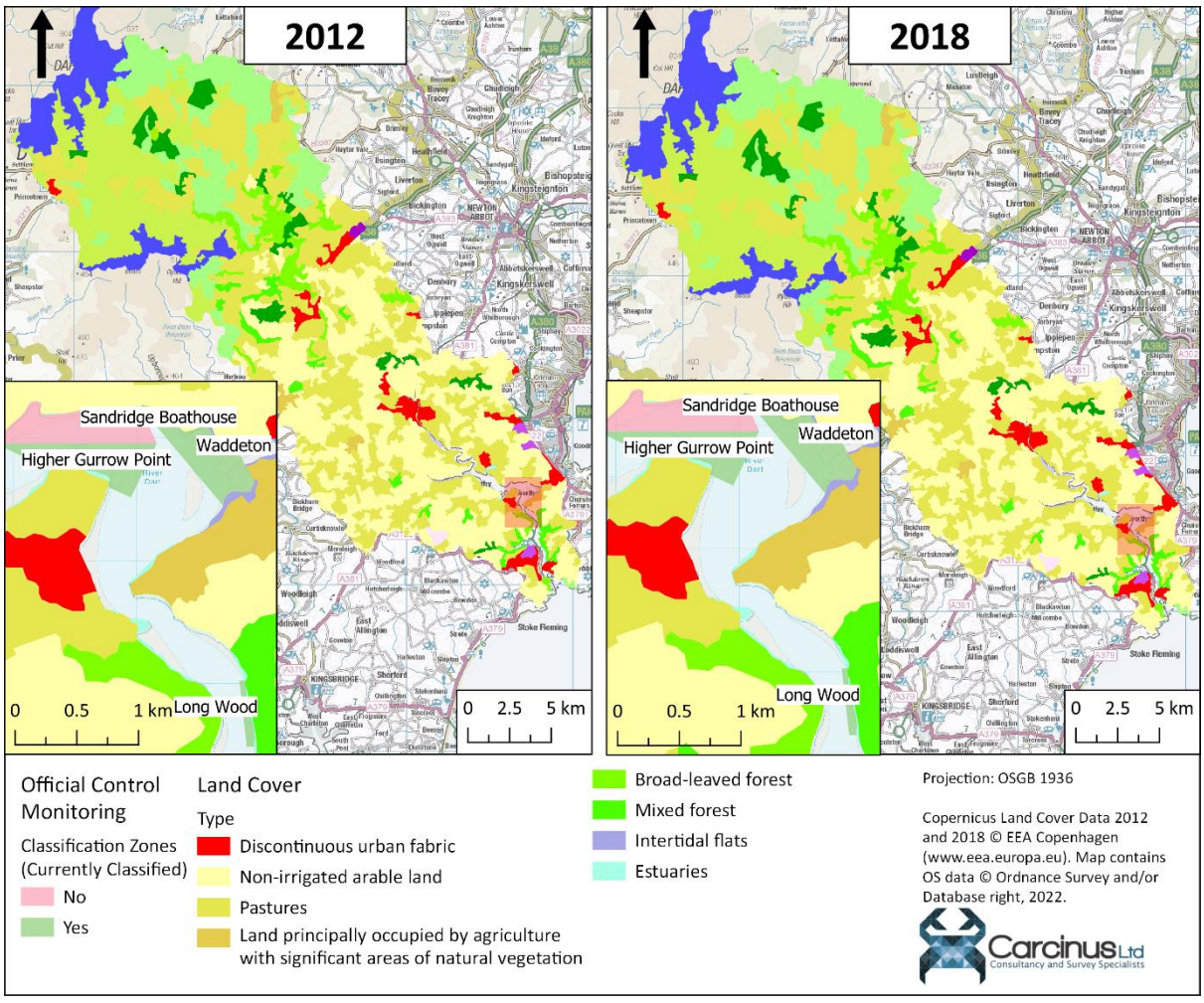

Figure 3.4 Land cover change between 2012 and 2018 within the Dart catchment. Note – items in the figure legend are those contained in the inset-maps.

Figure 3.4 suggests that a significant proportion (58%) of the catchment is rural, either reserved for pasture or other agricultural uses. Furthermore, the land immediately adjacent to the shellfish Classification Zones is almost exclusively farmland (except for the *Long Wood*

[4] June Survey of Agriculture and Horticulture. Further information available at: https://www.gov.uk/guidance/structure-of-the-agricultural-industry-survey-notes-and-guidance#june-survey-of-agriculture-and-horticulture-in-england.

zone, which is backed by forest). Pasture areas adjacent to CZ shorelines represent the greatest contamination risk to the classification zones. This is due to run-off from the land travelling less distance before reaching the CZs, resulting in less dilution and less *E. coli* die off. Run-off from rivers further up the catchment will have a lower risk of contamination to the CZs, because the increased distance will result in further dilution and die-off of the *E. coli* contained in the faecal matter. The Shellfish Action Plan for the Dart notes that the catchment is dominated by diffuse agricultural inputs of *E. coli*, and that there is the potential for a 40% reduction in this source of pollution through a combination of advice, regulation and incentive over the next 40 years. The Catchment Sensitive Farming (CSF) initiative is a project run by Natural England and the EA, that aims to reduce agricultural runoff. The Action Plan notes that of the 1,069 farms in the catchment, 15 are engaged with CSF, 149 with Countryside Stewardship and 159 farms have received CS or CSF advice, with 83 CSF measures put in place and 358 CS and CSF Faecal Indicator Organism (FIO) grants.

Another potential route of contamination from livestock-associated factors is slurry spreading. The spreading of slurry to fields is controlled under the Reduction and Prevention of Agricultural Diffuse Pollution (England) Regulations 2018, known as the Farming Rules for Water (FRfW), which came into force in April 2018. Furthermore, silage and slurry storage for agricultural purposes is subject to The Water Resources (Silage, Slurry and Agricultural Fuel Oil) (England) Regulations 2010 (SSAFO). All farmers must comply with the SSAFO regulations when building new slurry stores, or substantially altering (e.g. enlarging) existing ones. All stores must be built at least 10m from any watercourse, including field drains or ditches, and be built or altered to last for at least 20 years with proper maintenance. Since 2021, the EA now has ART (Agricultural Regulatory Taskforce) Officers that have all been assigned a catchment and will engage, inspect, advise and if necessary, enforce the Silage, Slurry and Agricultural Fuel Oil regulations and the new (2018) Farming Rules for Water. In theory, these legislative changes should have reduced the pollution that this activity causes to shellfish beds. The Shellfish Water Action Plan for this area did not indicate that there were any problems associated with slurry use in this catchment.

Livestock populations increased by ~67% between 2010 and 2021, although this was mostly driven by increases in poultry. Land cover maps suggest that the areas of pasture have remained broadly similar in size, and that all the CZs within the Fishery Order area are backed by agricultural land. The overall risk of this source of contamination is assessed to have reduced slightly due to the works undertaken by the EA and farmers in the area, although diffuse agricultural runoff is still a potentially significant source of pollution and should be taken into consideration in any updated sampling plan.

3.4 Wildlife

The 2011 Sanitary Survey of the Dart states that no major wildlife populations which may affect the sampling plan for the dart were identified, and the impact of diffuse faecal contamination from wildlife is not discussed in either the 2010 or 2009 survey reports. The Dart Estuary was designated as a Marine Conservation Zone (MCZ) in 2019 (DEFRA, 2019), and the background information for this site states that the area supports a diverse array of

habitats and species, including a number of rare species, and so the potential contamination from wildlife requires consideration within this review.

One of the key habitats within the Dart Estuary is the large areas of intertidal mud, which is important because it provides feeding and resting grounds for wading and migratory birds. Waterbirds are a potentially significant source of contamination for intertidal shellfish beds because the birds typically forage and defecate directly on the beds. In the five winters to 2019/20 (the most recent for which data are available) an average of 1,110 waterbirds were spotted within the estuary (Frost *et al.*, 2021), an increase of approximately 4% on the five winters to 2010/2011 (Holt *et al.*, 2012). There may be a small amount of contamination from wading birds, although it is not considered to be a significant source within this shellfishery. Furthermore, as the contamination from this source is spatially and temporally very variable, it is difficult to define RMP locations to capture this.

The 2021 Special Committee on Seals (SCOS) report (SCOS, 2022) identifies that there is a small breeding colony of grey seals near Salcombe, approximately 20 km southwest of the BMPA, and that within southwest England, the population is expanding. This expansion was also noted by the FBO during initial consultations. It is therefore reasonable to assume that grey seals will forage within the Dart estuary from time to time, although any contamination is likely minimal and does not require additional consideration in any updated sampling plan.

No other wildlife populations of significance are noted.

3.5 Boats and Marinas

The discharge of sewage from boats is a potentially significant source of pollution to the Dart BMPA. 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 surveys. Their geographical positions are presented in Figure 3.5.

The original sanitary survey describes that there is significant small boat traffic within the Dart Estuary, with marinas and moorings located throughout the estuary. During initial consultations, the FBO advised that the number of yachts within the estuary had increased in recent years. The highest concentrations continue to be in the lower estuary, near Dartmouth and Kingswear. The original sanitary survey also notes that the development of the marina at Noss on Dart was underway. This development has since been completed, and provides an additional 230 berths beyond the significant volume already present within the estuary (All At Sea, 2021). The original sanitary survey notes that there are no pump out facilities at any of the marinas in the estuary, although there is currently one sewage pump out facility at Darthaven Marina (dartharbour.org, 2022). Vessels of a sufficient size to contain on board toilets may still make overboard discharges from time to time, particularly when moving through the main navigational channels or anchored/moored outside of the main marinas. The greatest risk of this source of contamination will occur in summer months when vessel numbers are highest. It is difficult to define exactly when overboard

discharges will be made, although consideration should be given to the presence of moorings within or near to Classification Zones in any updated sampling plan.

There is a small fishing fleet that operates out of the estuary, with 20 vessels <10 m overall length listing Dartmouth as their home port (gov.uk, 2022). Limited contamination from these vessels is expected, as the majority of their operations will be outside the estuary.

No impacts from merchant shipping are expected as there is very little merchant shipping in the estuary, beyond a few small passenger ferries, and the regulations governing overboard discharges from vessels[5] have not changed since the original sanitary survey was published.

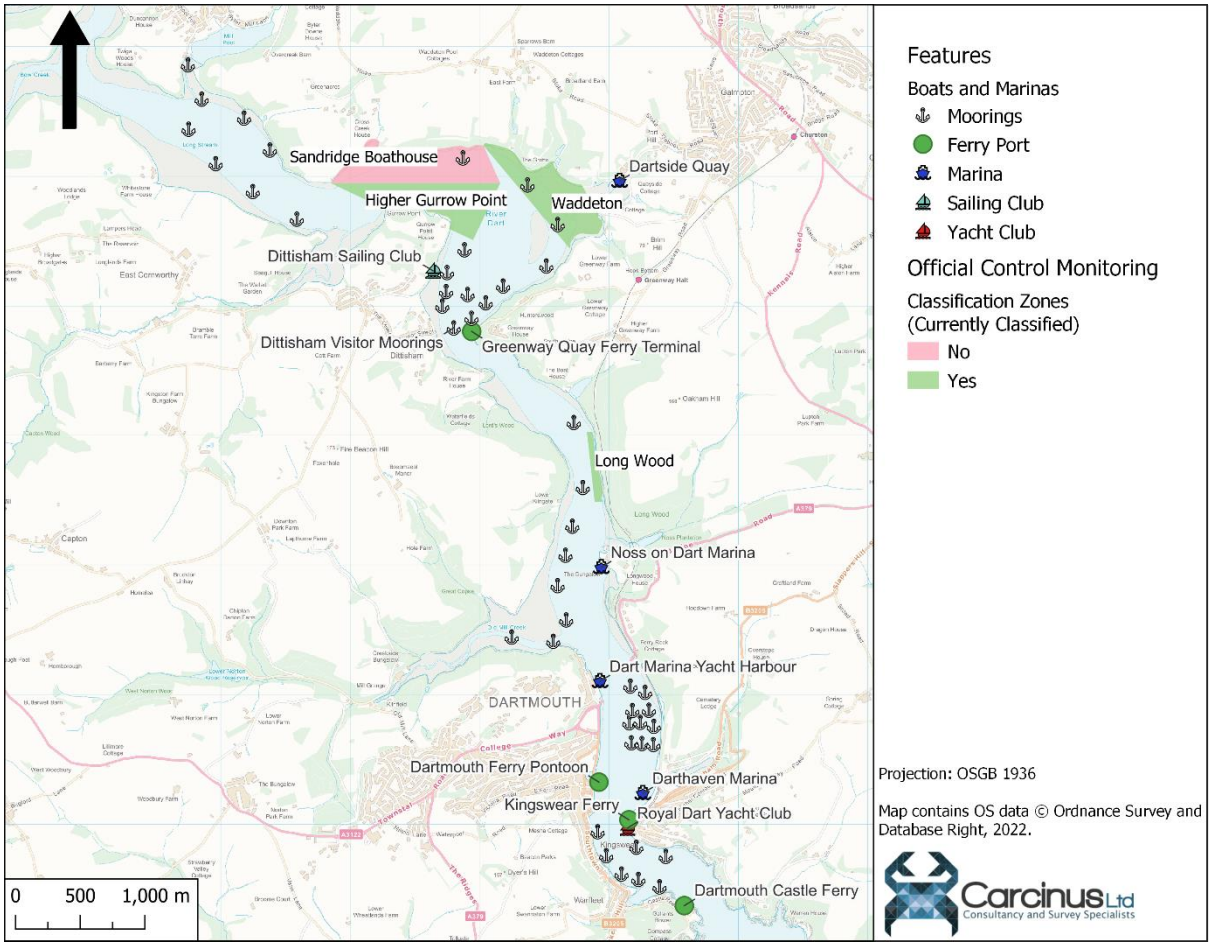

Figure 3.5 Locations of moorings, marinas and other boating related activities in the vicinity of the Dart Estuary BMPA.

There is likely to have been an increase in the volume of recreational boat activity within the Dart estuary, particularly due to the construction of a new marina south of the *Long Wood* CZ. Consideration should still be given to the presence of moorings in the vicinity of Classification Zones in the development of any new sampling plan.

[5] The Merchant Shipping (Prevention of Pollution by Sewage and Garbage from Ships) Regulations 2008.

3.6 Other Sources of Contamination

Utility misconnections are when foul water pipes are wrongly connected and enter surface waters without treatment, potentially putting raw sewage directly into watercourses via surface water drains. Areas at greatest risk of this source of contamination are areas of urban fabric, although the Shellfish Action Plan for the Dart notes that there is no evidence of utility misconnections within the Dart catchment.

Limited impact from dog fouling is expected as much of the shoreline is relatively inaccessible to pedestrians, with steep, wooded banks starting from the shoreline.

4 Hydrodynamics/Water Circulation

The dominant pattern of water movement is likely to be tidal circulation, with contamination carried downstream on an ebbing tide and upstream on a flooding tide. Interrogation of freely available nautical charts of the area[6] indicates that much of the Classified Area within the Dart Estuary dries at low tide. This means that bivalves growing in these areas will not be exposed to contamination carried down the main river channel at low water, but any contaminated land-runoff will not be dispersed and diluted if it occurs directly onto shellfish beds.

No significant changes to the hydrodynamics of the area have occurred since the publication of the original sanitary survey, and as such the recommendations made in that report to account for the hydrodynamics of the area remain valid.

5 Rainfall

Rainfall data for the Brixham Reservoir rain gauge (RG) (ID: 363148) and Habertonford RG (ID: 364799) were requested from the Environment Agency for the period 2000 – Present. These stations were chosen as they are the geographically closest monitoring stations to the BMPA situated ~ 6 km east and 7 km north-west of the BMPA respectively. Monitoring at the Brixham Reservoir RG only started in 2011, around the time of the original sanitary surveys, and so a comparison of rainfall patterns preceding and following the original sanitary survey is only possible with the data from Habertonford RG. The data from this monitoring station were subdivided into 2002 – 2011 (pre sanitary survey) and 2012 – 2022 (post sanitary survey) and processed in R (R Core Team, 2021). These data were used to determine whether any changes in rainfall patterns had occurred since the original sanitary surveys were published. Figure 5.1 shows the average daily rainfall totals per month at this monitoring station, and the results are summarised in Table 5.1.

[6] Navionics Chart Viewer. Available at: https://webapp.navionics.com/?lang=en#boating@6&key=_~jxHbdyC

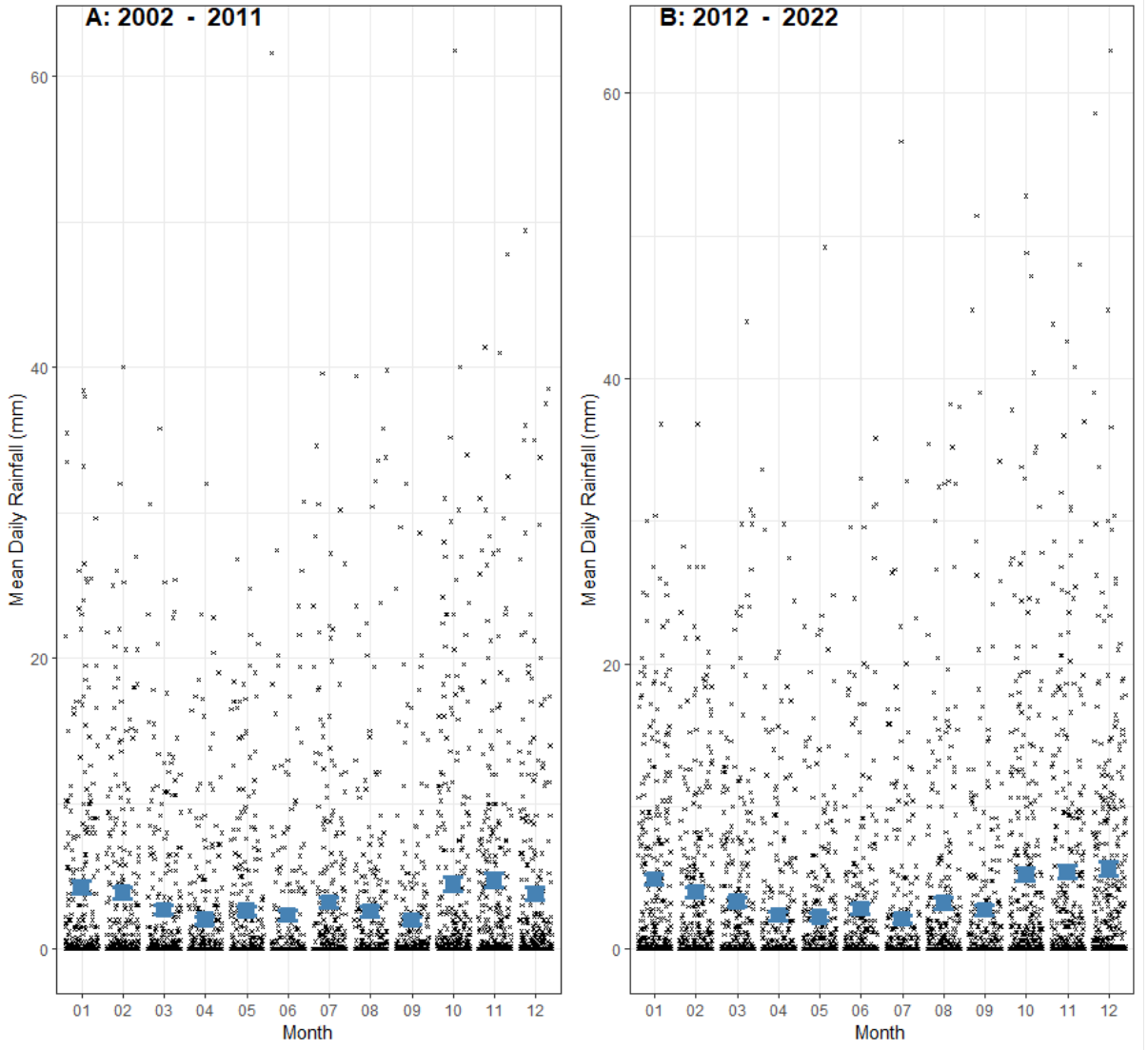

Figure 5.1 Mean daily rainfall per month for the Habertonford RG monitoring station (NGR: SX 79180 55990) for the periods (A) 2002 – 2011 and (B) 2012 – 2022.

Table 5.1 Summary statistics for rainfall for the period preceding and following the original sanitary survey, from the Habertonford RG monitoring station.

Period	Mean Annual Rainfall (mm)	Percentage Dry Days	Percentage Days Exceeding 10 mm	Percentage Days Exceeding 20 mm
2002 - 2011	1152.52	44.08	30.573	18.705
2012 - 2022	1331.218	41.667	33.807	20.235

Monitoring data from the Brixham RG monitoring station from 2011 – 2022 is summarised in Figure 5.2 and Table 5.2.

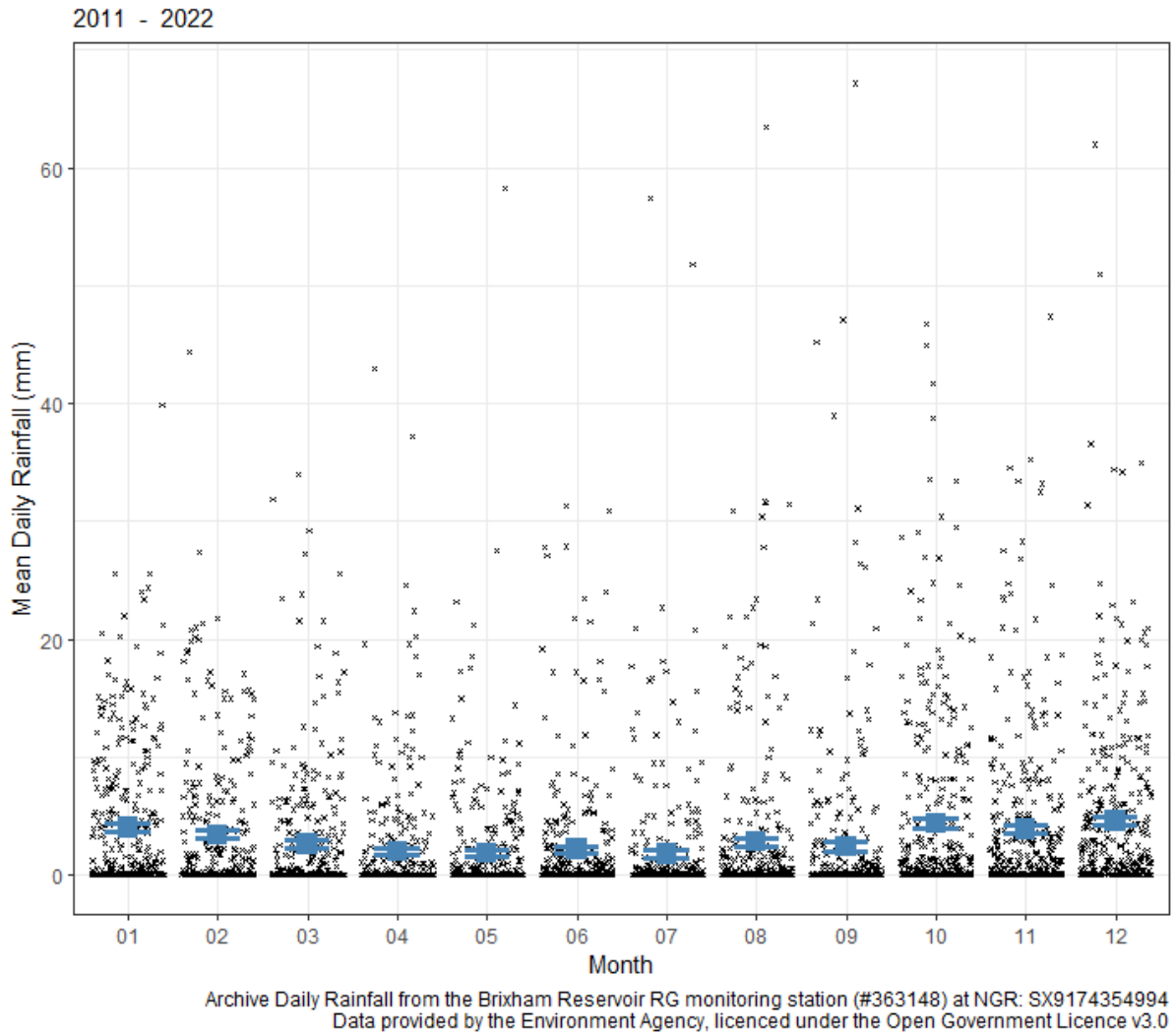

Figure 5.2 Mean daily rainfall per month for the Brixham Reservoir RG monitoring station (NGR: SX 9174354994).

Table 5.2 Summary statistics of rainfall data collected at the Brixham Reservoir RG monitoring station.

Period	Mean Annual Rainfall (mm)	Percentage Dry Days	Percentage Days Exceeding 10 mm	Percentage Days Exceeding 20 mm
2011 - 2022	1038.184	46.369	30.044	18.177

The data from the Habertonford RG show that annual rainfall levels in the catchment have increased slightly, as have the percentage of days with heavy rainfall (>10 mm / day).. Two sample t-tests indicated that there was no significant difference ($p > 0.05$) in the mean daily rainfall per month for the 2002 – 2011 and 2012 – 2022 periods. No statistical comparison of the data recorded at the two monitoring stations is possible, but the data do suggest that the Brixham Reservoir location receives less rainfall than the Habertonford location, this is

probably because the Brixham Reservoir point is closer to the coastline than the Habertonford point.

Rainfall leads to increased faecal loading through two factors, elevated levels of surface runoff and increased spill events from intermittent discharges, particularly during periods of heavy rain. Rainfall levels during both periods were greatest in winter months (November – February), and so levels of runoff etc. would be expected to be greatest during this time. However, as the rainfall patterns have remained (statistically) similar across the two time periods, significantly altered bacterial loading due to these factors is unlikely.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

The mean results of Official Control monitoring for *E. coli* concentrations at RMPs sampled in the Dart Estuary BMPA since 2010 are presented spatially in Figure 6.1 and summary statistics are provided in Table 6.1. This data was obtained through a request to Cefas, but is freely available on the datahub[1].

A total of twelve RMPs have been sampled within the Dart Estuary BMPA since 2010, eight involving the collection of Pacific oyster samples and four collection of mussel samples. In four locations, both species are/were sampled from the same position. Sampling at seven of the RMPs began in January 2010 (at Flat Owers, Higher Gurrow Point, Sandridge Boathouse and Waddeton, following the 2009 Sanitary Survey), a further two in May 2010 (at Kingswear, following the 2010 Sanitary Survey), a further two in February 2011 (at Long Wood, following the 2011 Sanitary Survey). Sampling at the final RMP (Galmpton Creek), started in June 2012. Of these RMPs, only four are sampled as of December 2022. These are at Waddeton (B028B), Higher Gurrow Point (B028J), Long Wood South (B028P) and Sandridge Boathouse (B028H). Sampling at all RMPs not currently active stopped because of either a lack of stock or,declassification of the .

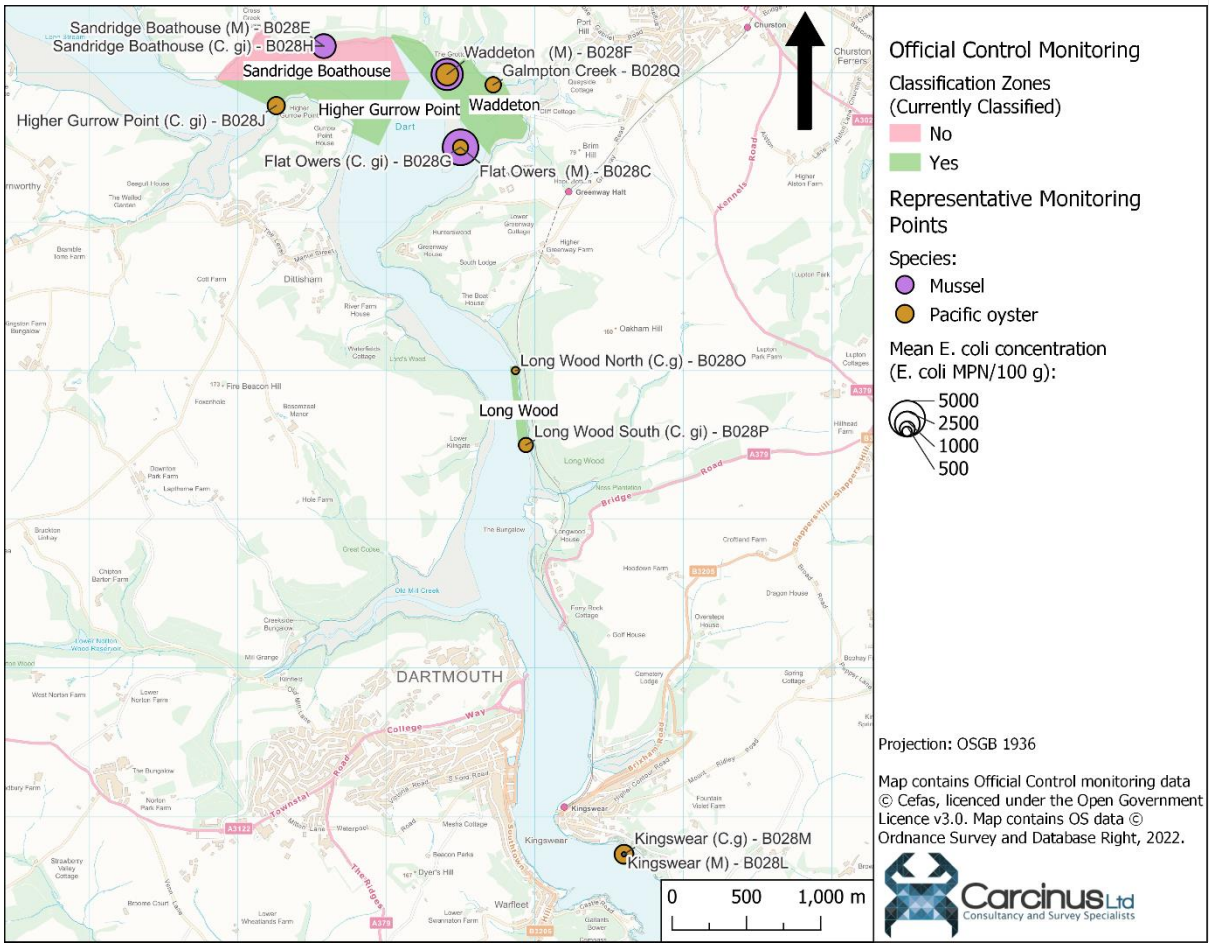

Figure 6.1 Mean E. coli *results from Official Control monitoring at bivalve RMPs in the Dart Estuary BMPA.*

Table 6.1 Summary statistics of Official Control monitoring conducted at RMPs in the Dart BMPA since 2010.

RMP (Species)	NGR	Species	No.	First Sample	Last Sample	Mean	Min Value	Max Value	% > 230	% > 4,600	% > 46,000
Flat Owers (M) - B028C	SX87505550	Mussel	54	18/01/2010	16/06/2014	4899.815	20	54000	77.77778	22.22222	1.851852
Flat Owers (C. gi) - B028G	SX87505550	Pacific oyster	120	18/01/2010	21/01/2020	1008.008	18	7000	67.5	5.833333	0
Galmpton Creek - B028Q	SX87725592	Pacific oyster	6	20/06/2012	29/11/2012	1050	220	3500	66.66667	0	0
Higher Gurrow Point (C. gi) - B028J	SX86265578	Pacific oyster	140	18/01/2010	08/12/2022	1274.029	20	35000	65	5	0
Kingswear (C.g) - B028M	SX88605075	Pacific oyster	19	05/05/2010	05/09/2011	1498.421	20	16000	26.31579	10.52632	0
Kingswear (M) - B028L	SX88605075	Mussel	19	05/05/2010	05/09/2011	296.8421	20	1700	21.05263	0	0
Long Wood North (C.g) - B028O	SX87875400	Pacific oyster	12	03/02/2011	14/12/2011	373.3333	20	1700	50	0	0
Long Wood South (C. gi) - B028P	SX87945350	Pacific oyster	140	03/02/2011	08/12/2022	915.4929	18	24000	57.14286	2.857143	0

RMP (Species)	NGR	Species	No.	First Sample	Last Sample	Mean	Min Value	Max Value	% > 230	% > 4,600	% > 46,000
Sandridge Boathouse (C. gi) - B028H	SX86585618	Pacific oyster	124	18/01/2010	08/12/2022	1306.847	20	17000	66.12903	8.064516	0
Sandridge Boathouse (M) - B028E	SX86585618	Mussel	54	18/01/2010	16/06/2014	2306.667	20	16000	77.77778	12.96296	0
Waddeton (M) - B028F	SX87415599	Mussel	54	18/01/2010	16/06/2014	3839.074	20	54000	79.62963	22.22222	1.851852
Waddeton (C. gi) - B028B	SX87415599	Pacific oyster	152	18/01/2010	05/12/2022	2002.145	18	92000	63.15789	7.236842	0.657895

More than 20% of all samples collected at each RMP exceeding the Class A threshold of 230 *E. coli* MPN/100 g. Furthermore, at all but three RMPs (Kingswear B028L, Long Wood North B028O and Galmpton Creek (B028Q) the 4,600 *E. coli* MPN/100 g threshold has been exceeded. It is likely that the only reason this threshold was not exceeded at these RMPs is because they were only sampled on 19, 12 and 6 occasions respectively. In three of the four instances when an RMP is co-located for more than one species, mussel RMPs have returned higher results. When considered spatially, there appears to be a general trend of RMPs situated farther upstream returning higher monitoring results.

Figure 6.2 and Figure 6.3 present boxplots of *E. coli* monitoring at mussel and Pacific oyster RMPs in the BMPA respectively. One-way analyses of variance (ANOVA) tests were performed on the data to investigate the statistical significance of any differences between the monitoring results from the two RMPs. Significance was taken at the 0.05 level. All statistical analysis described in this section was undertaken in R (R Core Team, 2021). It is not appropriate to compare between different species due to the differences in rates of *E. coli* uptake and clearance.

The results from Kingswear B028L are notably lower than at the other three RMPs, although ANOVA testing indicated that there is no significant difference in the monitoring data.

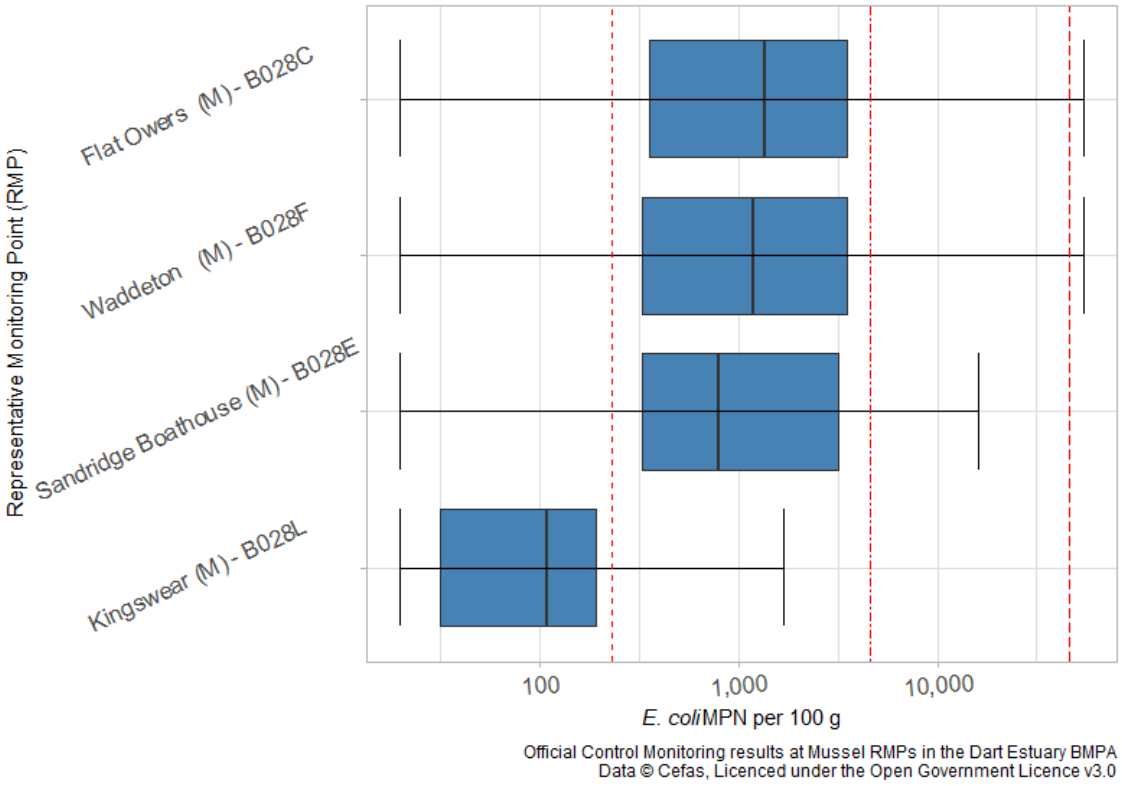

Figure 6.2 Boxplots of E. coli concentrations at mussel RMPs in the Dart Estuary BMPA since 2010. Central line indicates median value, box indicates lower-upper quartile range and whisker indicates minimum/maximum values, excluding outliers (points >1.5 x the

interquartile range). Horizontal dashed lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g respectively.

At Pacific oyster RMPs (Figure 6.3), Kingswear (B028M) also has notably lower median and maximum/minimum values than other RMPs, although again ANOVA testing indicates that there is no significant difference between any of the RMPs.

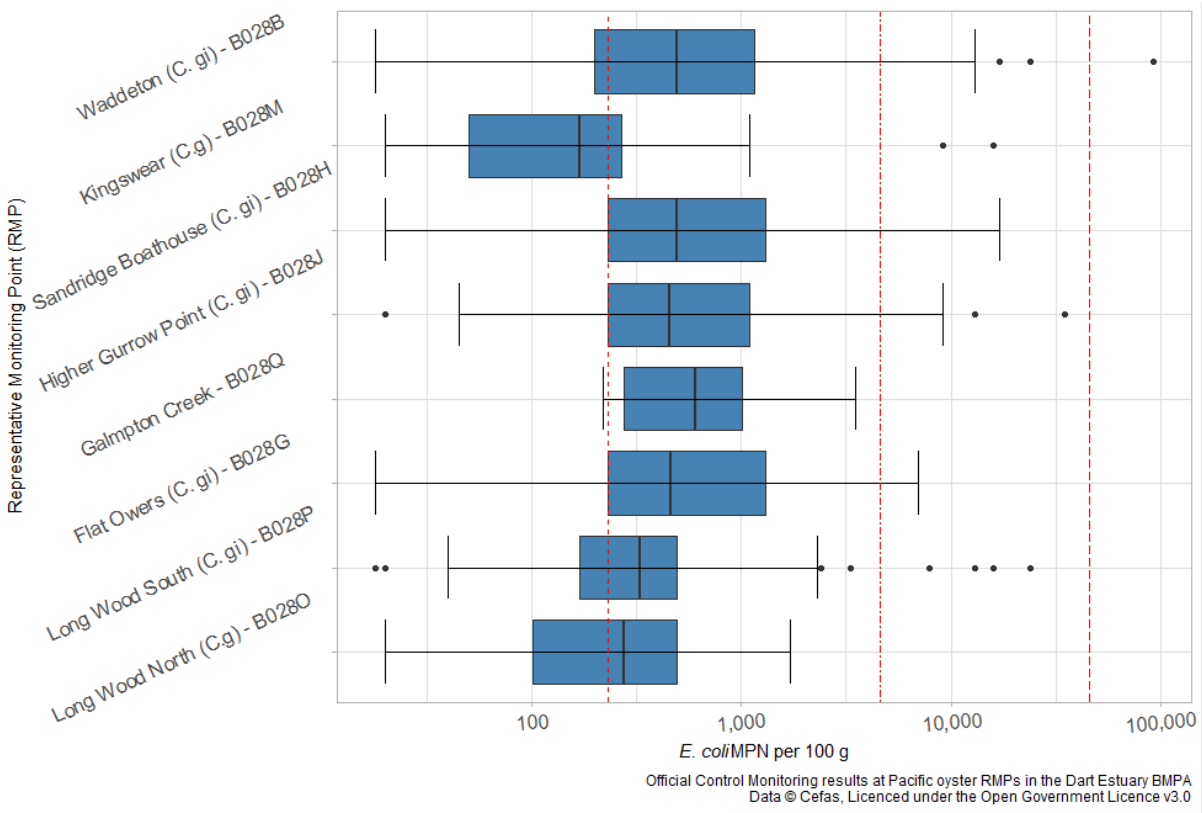

Figure 6.3 Boxplots of E. coli concentrations at Pacific oyster RMPs in the Dart Estuary BMPA since 2010. Central line indicates median value, box indicates lower-upper quartile range and whisker indicates minimum/maximum values, excluding outliers (points >1.5 x the interquartile range). Horizontal dashed lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g respectively.

6.2 Overall temporal pattern in results

The overall temporal pattern in shellfish flesh monitoring results for RMPs sampled in the Dart Estuary BMPA is shown in Figure 6.4 for mussel RMPs and Figure 6.5 for Pacific oysters.

The monitoring data from mussel RMPs indicate that the Kingswear B028L RMP returned lower monitoring results than other mussel RMPs. The trend lines from the other three RMPs are broadly similar to one another, with the loess model consistently falling between the 230 and 4,600 *E. coli* MPN/100 g thresholds, but that the level of contamination has been gradually increasing in the last 10 years. The similarity of monitoring results may be due to the three RMPs being located withing 1 km of one another.

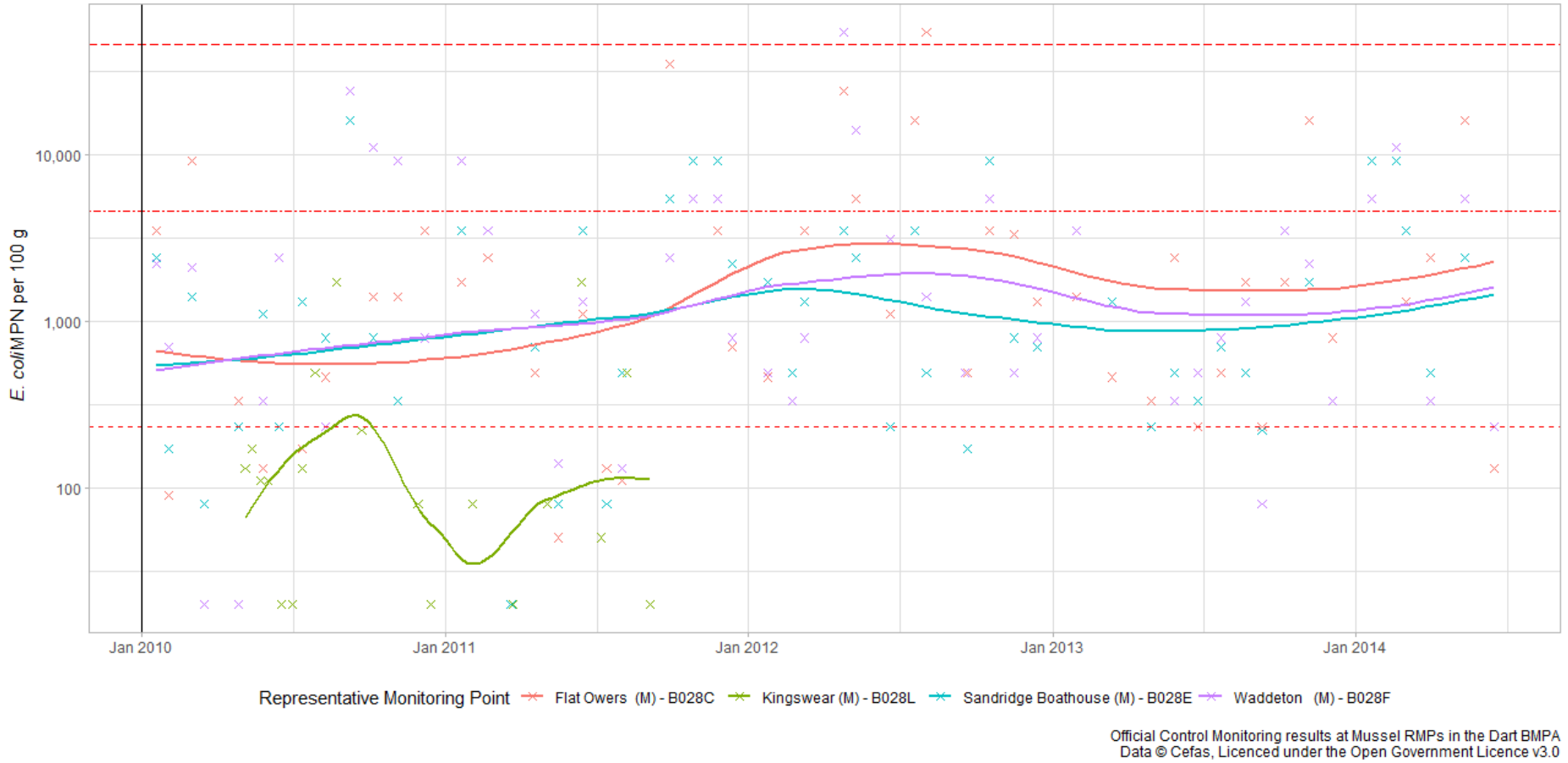

Figure 6.4 Timeseries of E. coli levels at mussel RMPs sampled in the Dart Estuary BMPA since 2010. Scatter plots are overlaid with a loess model fitted to the data. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g respectively.

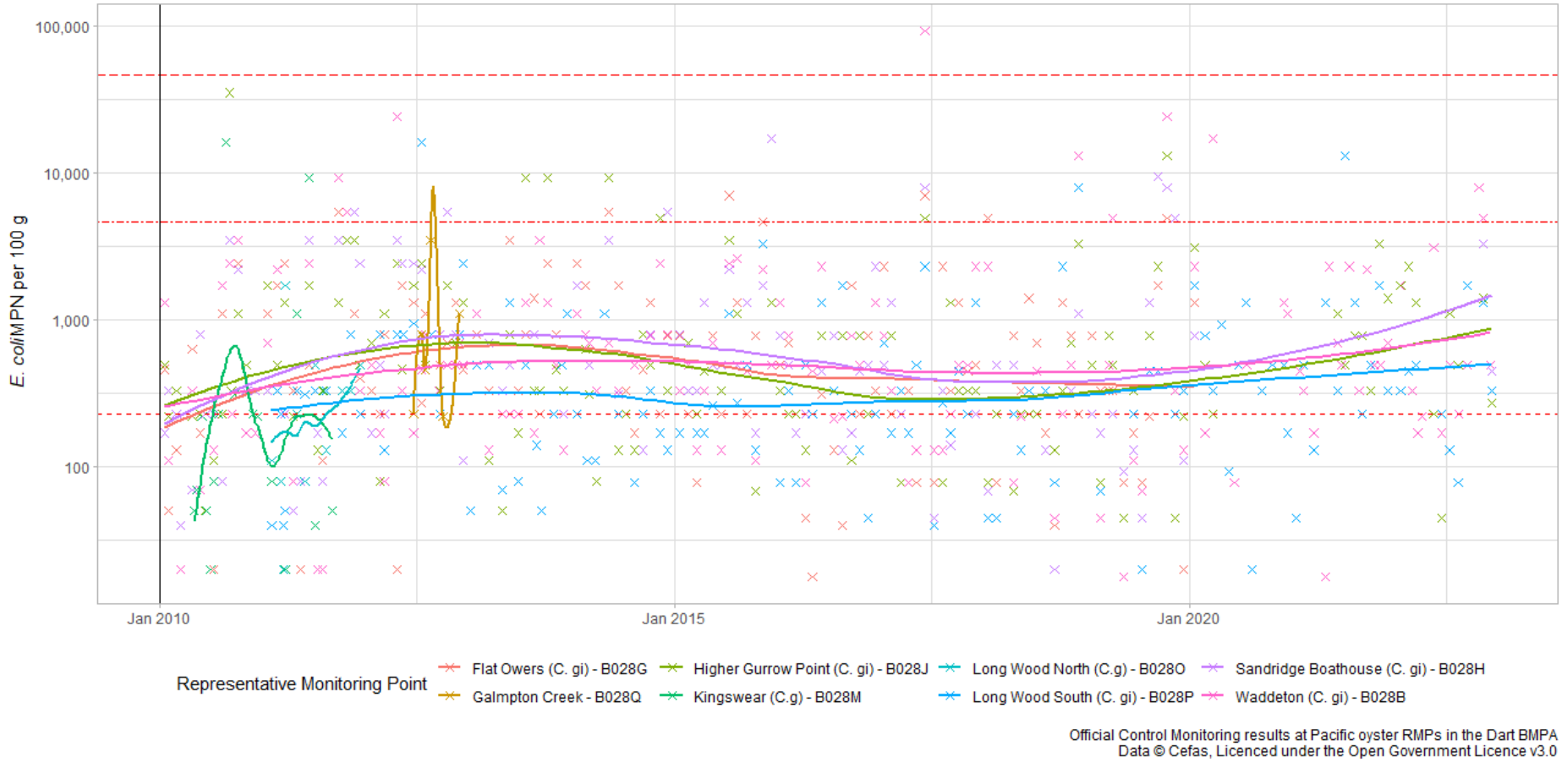

Figure 6.5 Timeseries of E. coli levels at Pacific oyster RMPs sampled in the Dart Estuary BMPA since 2010. Scatter plots are overlaid with a loess model fitted to the data. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g respectively.

Monitoring results fitted to the Pacific oyster data (Figure 6.5) again show that monitoring results have been very similar between all four RMPs currently sampled, with the loess models showing the same overall pattern. It also indicates that in general monitoring results at Pacific oyster RMPs are lower than at mussel RMPs. It does also suggest that shellfish flesh monitoring results have declined slightly since late 2019, although there is lots of variability in the raw data.

6.3 Seasonal patterns of results

The seasonal patterns of *E. coli* levels at the RMPs within the Dart estuary were investigated and are shown in Figure 6.6 and Figure 6.7. The data for each year were averaged into the four seasons, with, spring from March – May, summer from June – August, autumn from September – November and winter comprising data from December – February the following year. Two-way ANOVA testing was used to look for significant differences in the data, using both season and RMP (if there is more than one RMP for a given species) as independent factors (i.e., pooling the data across season and RMP respectively), as well as the interaction between them (i.e., exploring seasonal differences within the results for a given RMP). Significance was taken at the 0.05 level.

At mussel RMPs (Figure 6.6), results in summer months (at all RMPs except Kingswear B028L) tend to be lower than at other times of year. This is most likely due to the reduced level of rainfall and associated runoff. Similarly, results in autumn tended to be higher, possibly due to slurry spreading and increased rainfall. Where heavy rainfall follows an extended dry period (the 'first flush') levels of run off can be very high. Despite visual differences in the data, no significant differences were found, either when the data were pooled or considered independently.

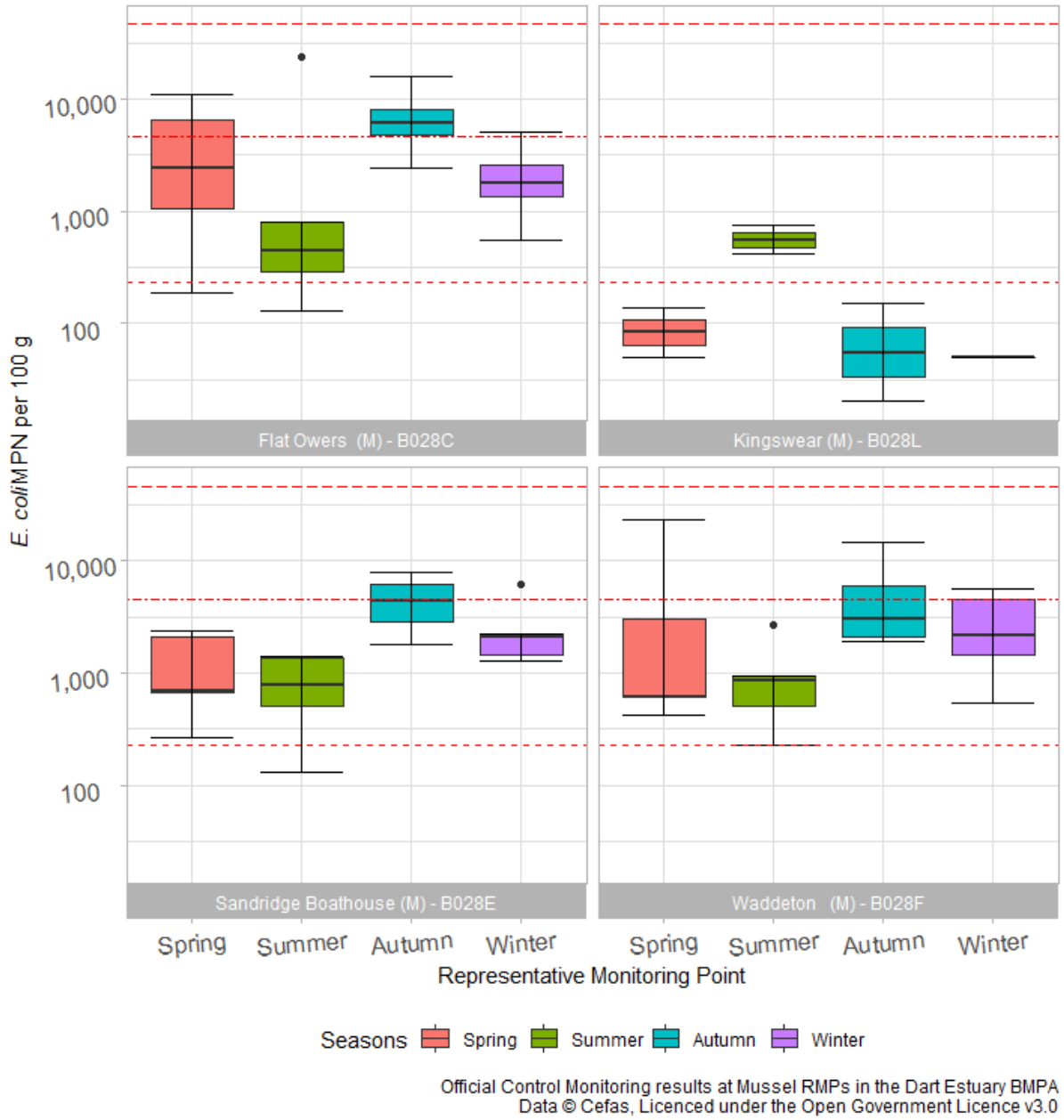

Figure 6.6 Boxplots of E. coli levels per season at mussel RMPs sampled within the Dart Estuary. Horizontal dashed lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g respectively.

At Pacific oyster RMPs (Figure 6.7), the seasonal pattern matches that at mussel RMPs, with results in spring and summer generally the lowest, and results in autumn and winter generally the highest. However, again no statistically significant differences in the data were observed.

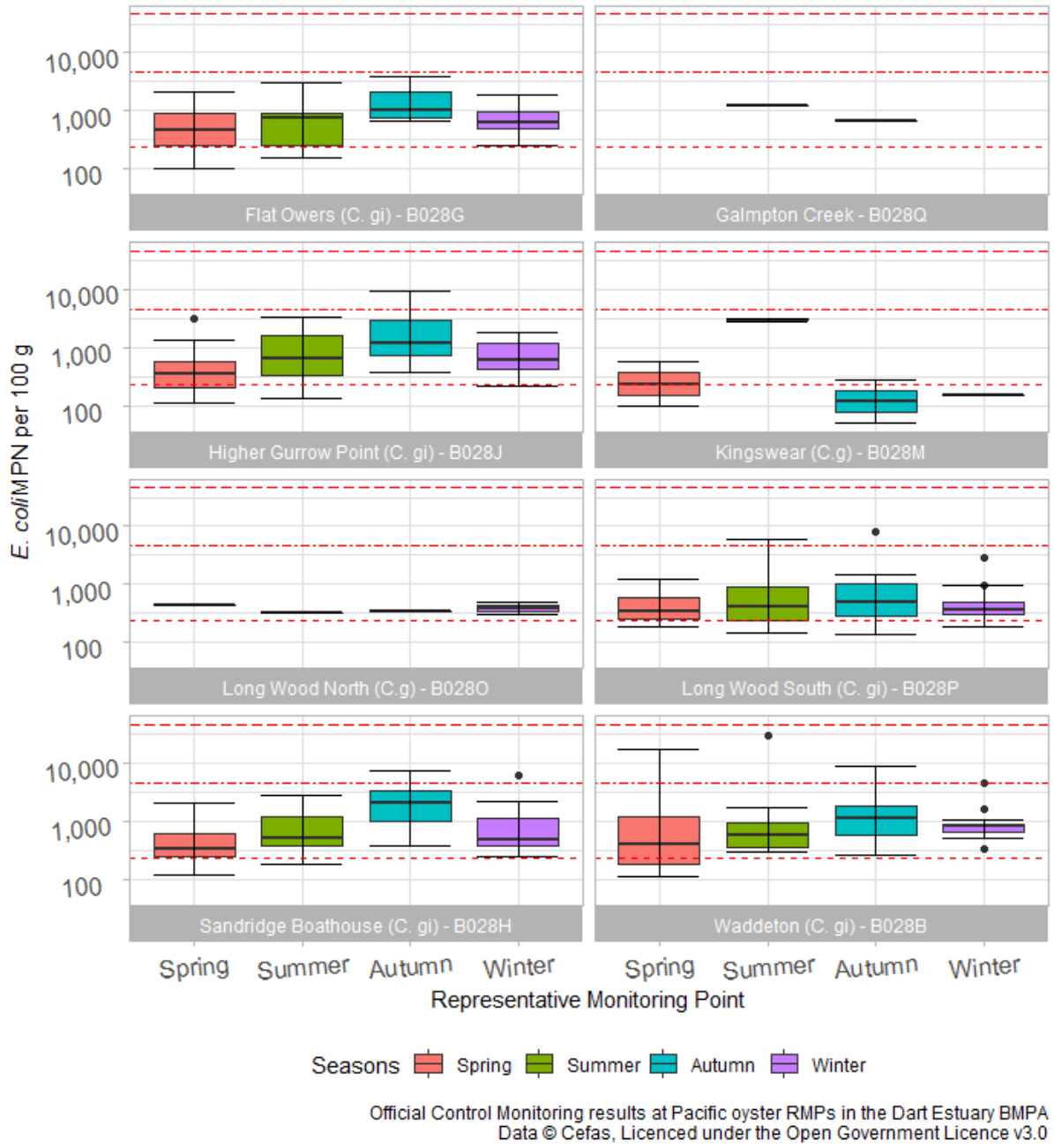

Figure 6.7 Boxplots of E. coli levels per season at Pacific oyster RMPs sampled within the Dart Estuary. Horizontal dashed lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g respectively.

6.4 Action States

Since the publication of the 2011 Sanitary Survey of the Dart, the following Action States have been triggered within the BMPA:

- On 28 September 2011, a result of 35,000 *E. coli* MPN/100 g at Flat Owers (B028C) was recorded. Other high results were recorded in the area (5,400 *E. coli* MPN/100 g at Sandridge Boathouse (B028E), 5,400 *E. coli* MPN/100 g at Flat Owers (B028G) and 9,200 *E. coli* MPN/100 g at Waddeton (B028B), although no Action States were

triggered from these results. No Action State sampling was undertaken. The LA reported at the time that the suspected source of pollution originated via the Galmpton Creek. The EA advised that there had been no significant rainfall or pollution events that would warrant waiving the result.

- On 24 April 2012, a result of 24,000 *E. coli* MPN/100 g was recorded in the Pacific oysters and 54,000 *E. coli* MPN/100 g in the mussels from the Waddeton RMPs (B028B and B028F respectively). A result of 24,000 *E. coli* MPN/100 g was also recorded at the Flat Owers (B028C) RMP. No Action State sampling was undertaken. Whilst there was not 'exceptional' rainfall in the days preceding the Action State result, rainfall levels were sufficiently high to trigger spills from various intermittent discharges, which was thought to have caused the high result.
- On 14 October 2019, a result of 24,000 *E. coli* MPN/100 g was recorded in both the Waddeton (B028B) and Longwood (B028P) Pacific oyster RMPs. Results of 13,000, 7,900 and 4,900 *E. coli* MPN/100 g were recorded at Higher Gurrow (B028J), Sandridge Boathouse (B028E) and Flat Owers (B028C). No Action State sampling was undertaken. There were no 'exceptional' rainfall or pollution incidents, although some heavy rainfall coincided with spills from several intermittent discharges, including the Fore Street CSO, Ashprington STW SSO, Cornworthy STW SSO, Dartington CSO, Dittisham STW SO, Ferryboat SP, Shinners Bridge CSO, St Katherines Way CSO, Steamer Quay CSO, Totnes STW SO and Totnes Town.

The investigations conducted following the Action State events described above suggest that there is often heavy rainfall and associated releases from intermittent discharges in the catchment that coincide with elevated Official Control monitoring results. As such, additional consideration should be given to the presence of intermittent discharges when determining RMP locations in any updated sampling plan.

7 Conclusion and overall assessment

Classification Zones within the Dart BMPA are situated within the main body of the estuary, situated around two areas: Long Wood, approximately 4.5 km upstream of the estuary mouth at Dartmouth, and an area around Gurrow Point, a further 2km upstream. The fishery currently involves the harvest of cultured Pacific oysters, but has previously supported mussel fisheries also. Approximately 660 kg of Pacific oyster were harvested in 2021 (no statistics are available for 2022).

There are currently three Classification Zones with active Classifications at the time of writing (January 2023). However, the FSA received an application to reclassify the *Sandridge Boathouse* CZ in November 2022, and as such it has been included for consideration throughout this report.

The results of the 2021 Census were compared to that of the 2011 Census to give an indication of population changes in the catchment since the original sanitary survey was published. These data suggest that the population has grown by ~8.5%, although the main conurbations remain the same. The land immediately surrounding the Classification Zones

of this production area continue to have low population densities, and so the greatest potential for urban runoff remains Totnes at the head of the estuary and Dartmouth at the mouth.

The area remains a popular tourist destination, and the number of seasonal visitors appears to be increasing, with 10% more visitors in 2021 than in 2019. No tourism statistics were presented in the original sanitary to allow comparison. It is likely that the main swelling in population size (and associated increase in loading to the WWTN) will occur during summer months, although no information has come forward during the desk assessment to suggest the existing capacity of the sewage network is insufficient to handle this increase.

No improvements to either the treatment methodologies or consented discharge volumes at the two major continuous discharges within 10 km of a Classification Zones have occurred since the 2011 Sanitary Survey was published. A scheme to limit the number of spills from a series of intermittent discharges in the catchment took place between 2015 and 2020. Comparison of EDM data suggests these efforts have been broadly successful, with spills occurring less frequently now than around the time of the previous sanitary survey. However spills do still occur so the presence of an intermittent discharge near to a CZ should be taken into consideration in any updated sampling plan.

Livestock populations in the catchment increased by 67% between 2010 and 2021, although this was driven by an almost threefold increase in poultry populations and a 28% increase in sheep populations. The land immediately adjacent to the shellfish Classification Zones is almost exclusively farmland (except for the *Long Wood* zone, which is backed by forest). Pasture areas adjacent to CZ shorelines represent the greatest risk of contamination to CZs because there is less distance for *E.coli* dilution and less *E. coli* die off. Runoff into up-catchment rivers will undergo a significant degree of dilution/die off before reaching any Classification Zones. The Shellfish Action Plan for the area notes that agricultural runoff is a significant source of pollution within this catchment, but that several improvements/upgrades to farming infrastructure in recent years should have reduced the impact that this causes to a degree. No issues with slurry usage were reported during initial consultations.

There are no significant wildlife populations within the Dart estuary likely to contribute significant levels of bacteriological contamination. There may be a small amount of contamination from wading birds or visiting marine mammals, although this is not considered to be a significant source within this shellfishery. Furthermore, as the contamination from this source is spatially and temporally very variable, it is difficult to define RMP locations to capture this.

There continues to be significant small boat traffic within the Dart estuary, and this is highly likely to have increased with the construction of the new marina at Noss on Dart. Pump-out facilities at the Darthaven marina have been added since the publication of the original sanitary survey, and so the number of vessels making overboard discharges may have reduced slightly. However, recreational craft of a sufficient size to contain onboard toilets

are liable to make occasional overboard discharges, either when moored overnight or when moving through the main navigational channels. The risk of this source of pollution is not assessed to have increased significantly, though considerations should be given to any mooring areas near to or within Classification Zones.

A total of twelve RMPs have been sampled within the Dart Estuary BMPA since 2010. Of these RMPs, only four are sampled as of December 2022. These are at Waddeton (B028B), Higher Gurrow Point (B028J), Long Wood South (B028P) and Sandridge Boathouse (B028H). Sampling at all RMPs not currently active stopped because of the lack of stock or declassification of the CZ.

No significant differences were found in the monitoring results from these RMPs, although in instances where RMPs were co-located for different species, generally mussel RMPs returned higher results.

Based on the information available, there do not appear to be any significant knowledge gaps that would justify a shoreline survey. There have been some changes to the sources of contamination in the area, although these have been reliably accounted for by the desk-based assessment.

Having reviewed and compared the desk-based study with the findings of the original sanitary surveys in 2009/10/11, the FSA are also content that an updated shoreline assessment is not required.

8 Recommendations

Recommendations for the various classification Zones within the Dart Estuary BMPA are described below and are summarised in Table 8.1.

8.1 Pacific oyster

Long Wood

This is the farthest south CZ in the BMPA, situated approximately 1.4 km from Dartmouth at the estuary mouth. It has been classified since the 2011 Sanitary Survey, and that report identified that the main sources of contamination would likely be from intermittent discharges near the southern end of the estuary, primarily from a new continuous discharge 350 m south of the site. There was an active discharge at this location between 2011 and 2016, but the permit was revoked when the company dissolved. As such, it cannot be reliably concluded that there would be higher contamination levels at the southern end of the bed any longer. We therefore recommend temporarily monitoring two RMPs within the zone, one at the up-estuary end (at the historic Long Wood North (B028O) location) and one at the down-estuary end (at the current RMP location). Both RMPs should be positioned at the shoreline side to capture contamination from land-run off. The RMPs should be concurrently sampled for a period of 8 – 10 samples, and whichever RMP returns higher results should be retained for Classification purposes moving forwards.

Waddeton

This zone covers an area of 2.63 km² and is situated near the village of Galmpton, with the Galmpton Creek draining into its eastern side. This Zone was recommended in the 2010 Sanitary Survey, and that report recommended placing the RMP near the eastern edge, so as to be representative of contamination from sewage discharges and diffuse pollution delivered to the estuary via Galmpton Creek. At the time of the 2010 Sanitary Survey, the boundary of the CZ was larger than the shellfish bed within it, and the RMP placed at the eastern extremity. The authors of this review understand that the shellfish bed continues to be smaller than the CZ boundary, but that the RMP is placed at the eastern extent of the bed. The current RMP can be retained as it will still be representative of the main sources of contamination affecting this zone.

Higher Gurrow Point

This zone covers an area of 2.42 km² and is situated off a spit of land around Gurrow Point House. Its current boundaries were recommended in the 2010 Sanitary Survey, and incorporated an existing oyster bed on the western side of the spit (higher gurrow point) with a new bed on the eastern side (lower gurrow point). The 2010 sanitary survey recommended placing the RMP on the western edge of the higher gurrow point bed to capture contamination draining down the estuary from up-catchment sources. It is recommended that this RMP be retained as it continues to be representative of the main contamination sources affecting this zone.

Sandridge Boathouse

An application to reclassify this zone with the historic boundaries was received by the FSA in November 2022. The zone was previously classified from 2011 to 2021, at which time it was declassified due to a lack of commercial interest. The 2010 Sanitary Survey that recommended its creation originally recommended placing an RMP at the centre of the bed to capture diffuse sources of contamination from up-estuary, but also contamination from the Galmpton Creek further downstream. It is recommended that the historic RMP be reinstated as it continues to be representative of the main sources of contamination affecting this zone.

8.2 General Information

8.2.1 Location Reference

Production Area	**Dart**
Cefas Main Site Reference	M028
Ordnance survey 1:25,000	Explorer OL20
Admiralty Chart	Admiralty 2253

8.2.2 Shellfishery

Species	Culture Method	Seasonality of Harvest
Pacific oyster (*Crassostrea gigas*)	*Cultured*	*Year Round*

8.2.3 Local Enforcement Authority(s)

Name	**South Hams District Council** Follaton House Plymouth Road Totnes Devon TQ9 5NE
Website	https://www.southams.gov.uk/
Telephone number	01803 861 234
E-mail address	Environmental.Health@swdevon.gov.uk

*Table 8.1 Proposed sampling plan for the Dart BMPA. Suggested changes are given in **bold red** type.*

Classification Zone	RMP	RMP Name	NGR (OSGB 1936)	Lat / Lon (WGS 1984)	Species Represented	Harvesting Technique	Sampling Method	Sampling Species	Tolerance	Frequency
Long Wood (Pacific oysters)	B028P	Long Wood South	SX 8794 5350	50°22.24'N 3°34.63'W	Pacific oysters	Hand	Hand picked	*C. gigas*	10 m	Monthly
	B028O	**Long Wood North**	**SX 8787 5400**	**50°22.52'N 3°34.70'W**						
Waddeton (Pacific oysters)	B028B	Waddeton	SX 8741 5599	50°23.57'N 3° 35.12'W	Pacific oysters	Hand	Hand picked	*C. gigas*	10 m	Monthly
Higher Gurrow Point (Pacific oysters)	B028J	Higher Gurrow Point	SX 8626 5578	50°23.75'N 03°36.15"W	Pacific oysters	Hand	Hand picked	*C. gigas*	10 m	Monthly
Sandridge Boathouse (Pacific oysters)	B028H	Sandridge Boathouse	SX 8658 5618	50° 23.67'N 3° 35.82'W	Pacific oysters	Hand	Hand picked	*C. gigas*	10 m	Monthly

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Appendices

Appendix I. Summary of Event Duration Monitoring at Intermittent Discharges within the Dart Catchment

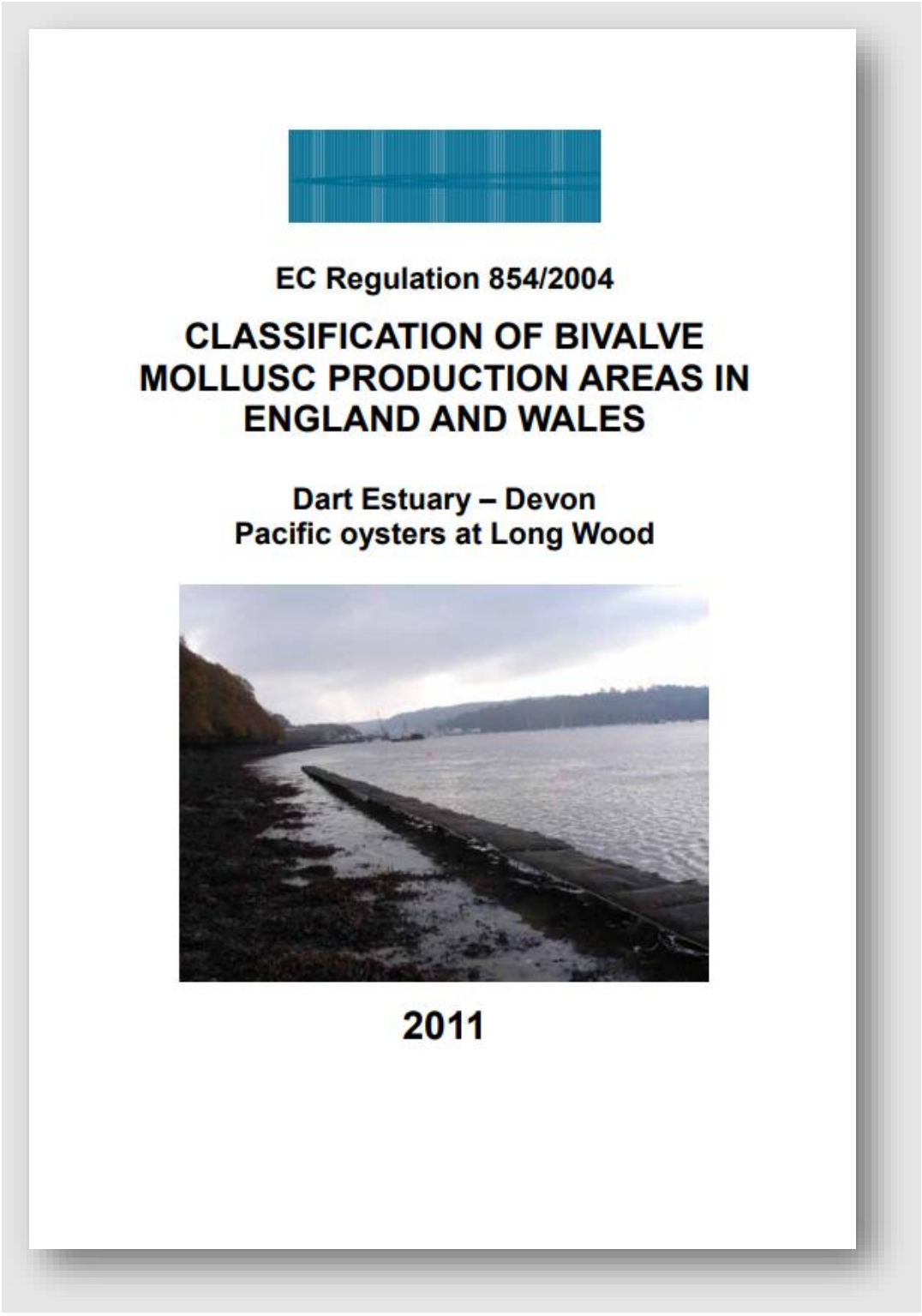
ID	Discharge Name	Permit No.	Asset Type	NGR	Count of spills in 2021	Duration of spills (hrs) in 2021	Distance to nearest CZ (km)
1	GALMPTON PUMPING STATION	202732	Storm discharge at pumping station	SX 8831 5621	7	2.34	0.59
2	DITTISHAM WWTW	202711	Inlet SO at WwTW	SX 8659 5500	44	164.15	0.61
3	MILL CREEK PUMPING STATION	202742	Storm discharge at pumping station	SX 8593 5522	18	25.57	0.62
4	FERRY BOAT INN PUMPING STATION	202713	Storm discharge at pumping station	SX 8674 5482	44	36.05	0.72
5	SCOUT HUT CSO	202853	SO on sewer network	SX 8502 5714	28	242.12	1.41
6	STOKE GABRIEL PSCSO/EO	202852	Storm discharge at pumping station	SX 8477 5691	13	45.57	1.44
7	MAYORS AVENUE PUMPING STATION	202401	Storm discharge at pumping station	SX 8801 5152	65	73.37	1.97
8	DARTHAVEN MARI PUMPING STATION	202398	SO on sewer network	SX 8817 5141	25	9.15	2.09
9	TOWNSTAL TANK CSO	202395	SO on sewer network	SX 8654 5177	15	69.76	2.19

ID	Discharge Name	Permit No.	Asset Type	NGR	Count of spills in 2021	Duration of spills (hrs) in 2021	Distance to nearest CZ (km)
10	SMITH STREET CSO	202400	SO on sewer network	SX 8793 5124	100	174.91	2.25
11	LOWER FERRY PUMPING STATION	200160 /PC/01	Storm discharge at pumping station	SX 8812 5103	71	126.27	2.47
12	PRIORY SLIP PUMPING STATION	200159 /PC/01	Storm discharge at pumping station	SX881 6550955	5	2.06	2.54
13	YARROW BANK PUMPING STATION	200472 /PC/01	Storm discharge at pumping station	SX884 3050800	Unspecified	Unspecified	2.73
14	WARFLEET CREEK PUMPING STATION	202402	Storm discharge at pumping station	SX 8828 5053	358	344	2.98
15	TOR PARK ROAD PUMPING STATION	201625	Storm discharge at pumping station	SX 8656 5928	9	8.72	3.01
16	CORNWORTHY STW	200926	Storm tank at WwTW	SX 8260 5569	119	1212.24	3.26
17	ASHPRINGTON WWTW	NRA-SW-3983	Inlet SO at WwTW	SX 8148 5636	69	88.93	4.39
18	ASHPRINGTON WWTW	NRA-SW-3983	Storm tank at WwTW	SX 8148 5636	97	1116.34	4.39
19	STEAMER QUAY BRIDGETOWN CSO	201695	SO on sewer network	SX 8068 6020	45	76.23	6.69
20	HARBERTONFORD WWTW	203562	Inlet SO at WwTW	SX 7915 5597	109	2229.52	6.7

ID	Discharge Name	Permit No.	Asset Type	NGR	Count of spills in 2021	Duration of spills (hrs) in 2021	Distance to nearest CZ (km)
21	FURZEGOOD PUMPING STATION	201665	Storm discharge at pumping station	SX 8645 6299	41	47.71	6.7
22	ST KATHERINE'S WAY CSO	EPRDB3893NP	SO on sewer network	SX 8057 6019	20	7.67	6.77
23	31 FORE STREET CSO	201955	SO on sewer network	SX 8057 6024	36	23.23	6.8
24	TOTNES TOWN PUMPING STATION	201662	Storm discharge at pumping station	SX 8066 6053	107	585.85	6.91
25	TOTNES STW	203080	Inlet SO at WwTW	SX 8071 6101	104	935.59	7.19
26	LOWER COLLAPARK CSO	EPRDB3993NS	SO on sewer network	SX 8005 6071	3	2.73	7.5
27	ST JOHNS TERRACE CSO	202242	SO on sewer network	SX 8005 6071	23	6.8	7.5
28	SWALLOWFIELDS CSO	202964	SO on sewer network	SX 8010 6123	18	30.1	7.79
29	QUARRY CLOSE CSO	202965	SO on sewer network	SX 7904 6054	19	40.72	8.21
30	HARBERTON WWTW	NRA-SW-5295	Inlet SO at WwTW	SX 7772 5830	158	2225.09	8.46
31	HARBERTON WWTW	NRA-SW-5295	Storm tank at WwTW	SX 7772 5830	166	2635.24	8.46
32	DARTINGTON C CSO	202968	SO on sewer network	SX 7919 6193	44	414.17	8.94
33	TEXTILE MILL	202967	SO on sewer network	SX 7908 6202	34	203.48	9.08

ID	Discharge Name	Permit No.	Asset Type	NGR	Count of spills in 2021	Duration of spills (hrs) in 2021	Distance to nearest CZ (km)
34	SHINNER'S BRIDGE CSO	202966	SO on sewer network	SX 7879 6215	31	36.42	9.38
35	DARTINGTON B CSO	202963	SO on sewer network	SX 7870 6219	64	636.91	9.48
36	STAVERTON WWTW	NRA-SW-0257	Storm tank at WwTW	SX 7963 6363	13	47.33	9.82
37	BROADHEMPSTON WWTW CSO	NRA-SWUnspecified 075	Inlet SO at WwTW	SX799 5065910	303	1503.28	11.45
38	RATTERY WWTW CSO	NRA-SWUnspecified 494	Inlet SO at WwTW	SX743 2061620	Unspecified	Unspecified	12.85
39	BUCKFASTLEIGH STW	NRA-SW-5004	Inlet SO at WwTW	SX 7513 6581	112	773.8	14.55
40	BUCKFASTLEIGH STW	NRA-SW-5003	Storm tank at WwTW	SX 7513 6581	107	1340.15	14.55
41	ST LUKES CHURCH CSO	201802	SO on sewer network	SX 7393 6600	13	6.5	15.58
42	OLD WOOLLEN MILL CSO	201803	SO on sewer network	SX 7421 6715	10	6.77	16.14
43	STONEPARK CRESCENT	202969	SO on sewer network	SX 7534 6935	44	97.46	16.95
44	PEAR TREE CROSS CSO	201952	SO on sewer network	SX 7508 6928	Unspecified	Unspecified	17.07
45	HOLNE WWTW	SWWA 2251	Inlet SO at WwTW	SX 7082 6856	130	1275.53	19.61
46	SCORRITON STW	203887	Inlet SO at WwTW	SX707 4068590	35	196.94	19.69

ID	Discharge Name	Permit No.	Asset Type	NGR	Count of spills in 2021	Duration of spills (hrs) in 2021	Distance to nearest CZ (km)
47	LEUSDON STW	SWWA 422	Inlet SO at WwTW	SX 7126 7279	Unspecified	Unspecified	22.22
48	WIDECOMBE STW	203911	Inlet SO at WwTW	SX 7190 7659	Unspecified	Unspecified	24.8
49	NEW PARK (GARDEN) CSO	201693	SO on sewer network	SX 7175 7661	Unspecified	Unspecified	24.9
50	PRINCETOWN SEWAGE TREATMENT WORKS	201064	Inlet SO at WwTW	SX596 9774273	Unspecified	Unspecified	31.93
51	PRINCETOWN SEWAGE TREATMENT WORKS	201064	Storm tank at WwTW	SX596 9774273	Unspecified	Unspecified	31.93
52	BLACKBROOK-CSO-PRINCETOWN	201856	SO on sewer network	SX 5909 7423	Unspecified	Unspecified	32.41



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Contact Us

Carcinus Ltd

Wessex House

Upper Market Street

Eastleigh

Hampshire

SO50 9FD

Tel. 023 8129 0095

Email. enquiries@carcinus.co.uk

Web. https://www.carcinus.co.uk

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