Sanitary Survey- Review

Helford – 2024

Document No. – *J0591/24/01/08*

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Document QA and Approval

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Initial Consultation

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Consultation on draft report

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A sanitary survey review relevant to the bivalve mollusc beds in Helford was undertaken in 2014 in accordance with Regulation (EC) 854/2004 (which was replaced by assimilated EU Law Regulation (EU) 2017/625, with sanitary survey requirements now specified in assimilated 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, Cornwall Port Health Authority. The report is publicly available via the Carcinus Ltd. website.

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Carcinus Ltd., 2024. Review of the Helford 2014 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 assimilated 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 assimilated (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 desk-top assessment also determined the need for a shoreline survey, which was conducted in March 2024 The desktop assessment is completed through analysis and interpretation of publicly available information, in addition to consultation with stakeholders.

1.2 Helford Review

This report reviews information and makes recommendations for a revised sampling plan for existing native oyster (*Ostrea edulis*) and Pacific oyster (*Crassostrea gigas*) classification zones in Helford (Figure 1.1). This review explores any changes to the main microbiological contamination sources that have taken place since the 2014 Sanitary Survey Review was conducted. Data for this review was gathered through a desk-based study and consultation with stakeholders.

An **initial consultation** with the Local Enforcement Authorities (LEA), Inshore Fisheries and Conservation Authorities (IFCA) and the Environment Agency (EA) responsible for the production area was undertaken in December 2023 and January 2024. Responses were received from the Environment Agency and the Local Authority. A kick-off meeting was also held in January 2024, attended by representatives from the LEA, EA, FBO, FSA and Carcinus. 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 2024. 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 Sanitary Survey Review originally conducted in 2014 and sampling plan as necessary and the report should read in conjunction with the previous survey.

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.

Sections 2 - 8 detail the changes that have occurred to the shellfishery, environmental conditions and pollution sources within the catchment since the publication of the 2014 Sanitary Survey Review. A summary of these 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 Environment Agency;
- The findings of this report are based on information and data sources up to and including January 2024;
- Only information that may impact on the microbial contamination was considered for this review; and
- Official Control monitoring data have been taken directly from the Cefas data hub[1], with no additional verification of the data undertaken. Results up to and including December 2023 have been used within this study. Any subsequent samples have not been included.

[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/.

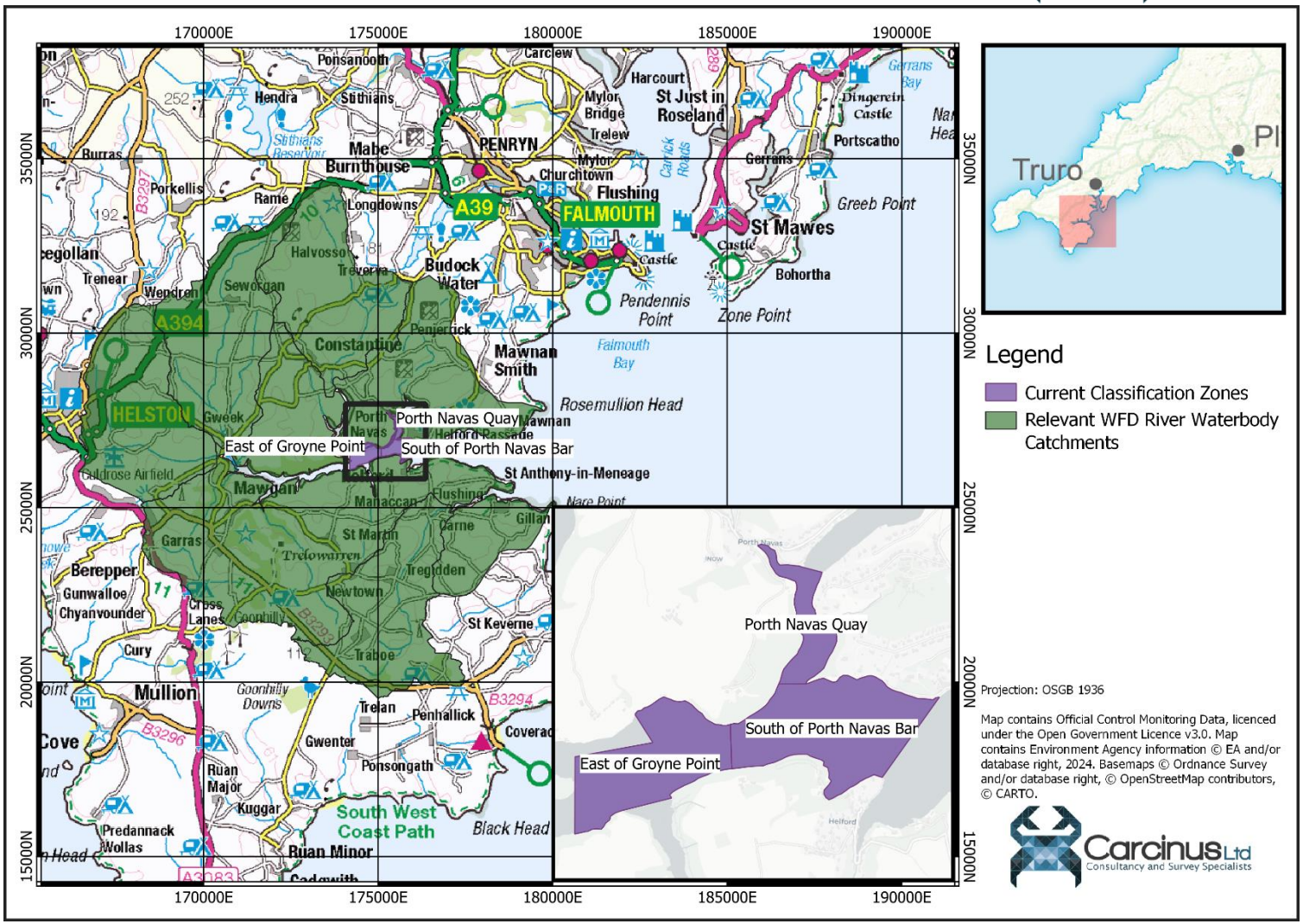

Figure 1.1 Location of the Helford BMPA in Cornwall. Inset map shows the locations of the Classification Zones within the BMPA.

2 Shellfisheries

2.1 Description of Shellfishery

The Helford BMPA is situated within the estuary of the same name, positioned on the south coast of Cornwall (Figure 1.1) near the villages of Helford and Porth Navas. The closest BMPA is that of Porthallow Cove (Cefas Reference M034), 5 km southeast. The Fal estuary (8 km northeast) also contains classified shellfish harvesting areas (Cefas Site Reference M033).

The Local Enforcement Authority (LEA) for this fishery in terms of food hygiene Official Control purposes (including sampling) is Cornwall Port Health authority. The 2014 Sanitary Survey Review states that the rights to harvest shellfish within the Helford estuary are leased from the Duchy of Cornwall. At the time of writing (January 2024), no consultation response has been received from Cornwall Inshore Fisheries and Conservation Authority (C-IFCA), and the authors of this review have no information to suggest that this situation has changed. No C-IFCA byelaws apply to the harvest of oysters within this shellfishery.

The 2014 Sanitary Survey review states that the active fishery at the time of publication of that report was for cultivated Pacific oysters, with sporadic harvesting of wild mussels. It also indicates that there were dense beds of cockles within the estuary. The 2014 review states that the leaseholder had plans at that time to stock the Helford estuary with native oysters from the nearby Fal. Currently, both native and Pacific oysters are classified for commercial harvesting. Mussels have not been harvested (or classified) since 2018.

A summary of the fishery for each species is provided in the subsequent paragraphs.

2.1.1 Pacific oyster

The 2014 Sanitary Survey Review stated that this was the main fishery species within the Helford BMPA and that there were 4 Classification Zones; Porth Navas Quay, East of Groyne Point, Bosahan (declassified 2017; see section 2.2), and South of Porth Navas Bar. Seed was implanted on a raft in the mouth of Porth Navas Creek (near Pedn Billy) before being moved to nursery cages at Bosahan Cove for approximately one year. From there stock was moved to the western end of the main estuary (East of Groyne Point) and grown in a combination of trestles, cages, nets and bags. The market sized oysters were then moved to a holding area in Porth Navas Creek.

The operators that held the lease at the time of the 2014 Sanitary Survey Review ceased operation in 2017 (PortNavas.com, 2024). The current harvester took on the lease in 2019, and during initial consultations, stated that in 2019/2020, approximately 40,000 Pacific oyster individuals were harvested from the Helford estuary, but that since then, various socioeconomic factors have meant that the current output is negligible. The harvester is hoping to resume the operation in 2024. The authors of this review understand that the current classified area is sufficient; no new areas of the Helford estuary require classification. The current/future operation of the shellfishery will involve growing-on the

oysters directly from the seabed rather than using aquaculture infrastructure such as cages and trestles.

2.1.2 Native oyster

The 2014 Sanitary Survey Review indicates that there was no commercial harvesting of native oysters from the Helford, although the Duchy Oyster Farm were hoping to stock the estuary with native oysters from the nearby Fal.

The current leaseholder indicated that in 2019/2020, 60,000 native oyster individuals were harvested from the Helford estuary, but that socioeconomic factors have limited the fishery with the current output being negligible. The planned recommencement in 2024 will continue to include native oysters.

2.1.3 Other species

The 2014 Sanitary Survey review states that there was sporadic harvest of wild mussels as well as some non-commercial gathering of cockles and mussels. During initial consultations, the LEA and harvester confirmed that some non-commercial hand gathering takes place currently, particularly related to the traditional Good Friday 'trigging'[2], but that there is no industry interest in formally classifying any other species.

2.2 Classification History

The 2014 Sanitary Survey Review gave recommendations for the creation of twelve Classification Zones (CZs), four each for mussels, native oysters and Pacific oysters. There are currently six active Classification Zones, three each for native and Pacific oysters. The mussel CZs were declassified in 2017 and the *Bosahan* oyster CZs were declassified in the same year. The location and classification status of all active CZs, along with RMPs sampled in the area since 2010, are presented in Table 2.1 and Figure 2.1.

Table 2.1 Summary of all active Classification Zones in the Helford Bay BMPA.

Classification Zone	Species	Current Classification (as of September 2023)	RMP
Porth Navas Quay	Native oyster Pacific oyster	B-LT	Porth Navas Quay (C. gi) – B034W
East of Groyne Point	Native oyster Pacific oyster	B	East of Groyne Point (O. ed) – B34AE
South of Porth Navas Bar	Native oyster Pacific oyster	B	Pedn Billy (O. ed) – B34AH

[2] 'Trigging': Digging for cockles and winkles at low tide. Ancient Law where this practice is permitted for one day a year – Good Friday https://www.falmouthpacket.co.uk/news/23443767.good-friday-trigging-cornwall-cockle-picking-helford/.

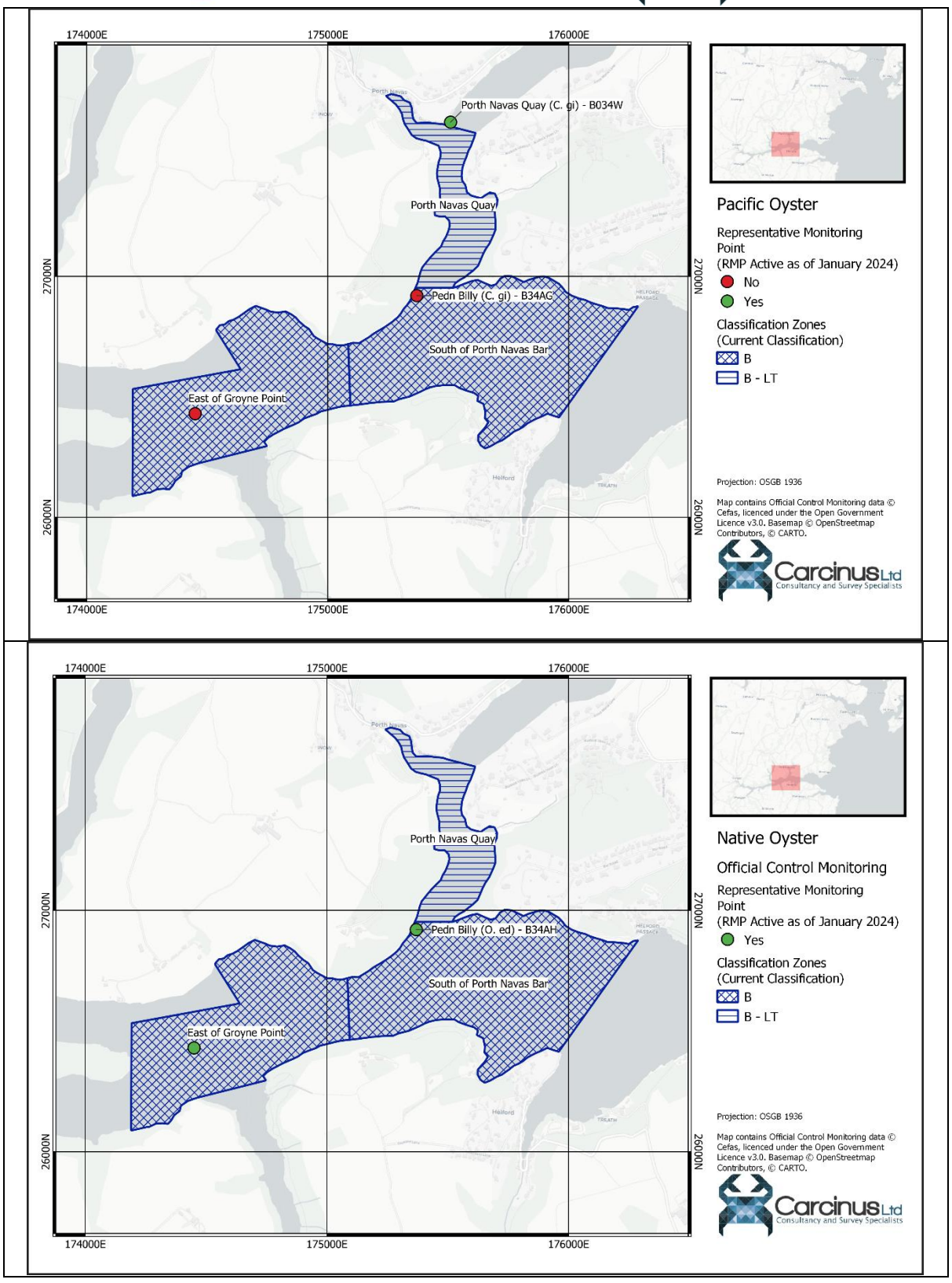

Figure 2.1 Current Classification Zones and associated Representative Monitoring Points in the Helford BMPA.

3 Pollution sources

3.1 Human Population

The 2014 Sanitary Survey review cites population data based on the 2011 Census of the United Kingdom. A subsequent census was conducted in March 2021 and so the results of the two censuses have been compared to give an indication in the changes in human population within the Helford Catchment.

Figure 3.1 shows the human population density (persons per square kilometre) in Census Output Areas wholly or partially contained within the Helford Catchment at the 2011 and 2021 Censuses. It shows that the population across the catchment has remained very rural, with the majority of the catchment having population densities of less than 100 people per square kilometre. The highest population densities are the town of Helston (the eastern part of which is within the Helford catchment), and the villages of Constantine, Porth Navas, Trebah and Mawnan Smith, all of which are on the northern side of the Helford estuary. The total population within the catchment was approximately 16,266 in 2011. By the 2021 Census this had increased to 19,900 (an increase of approximately 22%). The Shellfish Water Action Plan for the Helford River classifies the overall contribution of various sources of contamination to the shellfish water and assesses that the impact of urban associated runoff is 'low'[3]. The highest potential for urban associated runoff comes from the villages of Porth Navas and Trebah, because of their proximity to the CZs, particularly the *Porth Navas Quay* CZ. During initial consultations, both the LEA and the harvester indicated that there has been some small-scale housing development around Porth Navas since the 2014 Sanitary Survey Review was published, but that this was generally one or two houses at a time and often involved upgrading/renovating existing properties rather than the construction of homes on a large scale. As these settlements are very small, the overall level of urban runoff the shellfishery is likely to experience is also small in comparison to other sources of contamination, which are discussed later in this report. The March 2024 Shoreline Survey (Appendix II) confirmed that the risk from these settlements remains low given their size.

[3] 'Low contribution': considered to account for less than 10% of total contamination to a shellfish water.

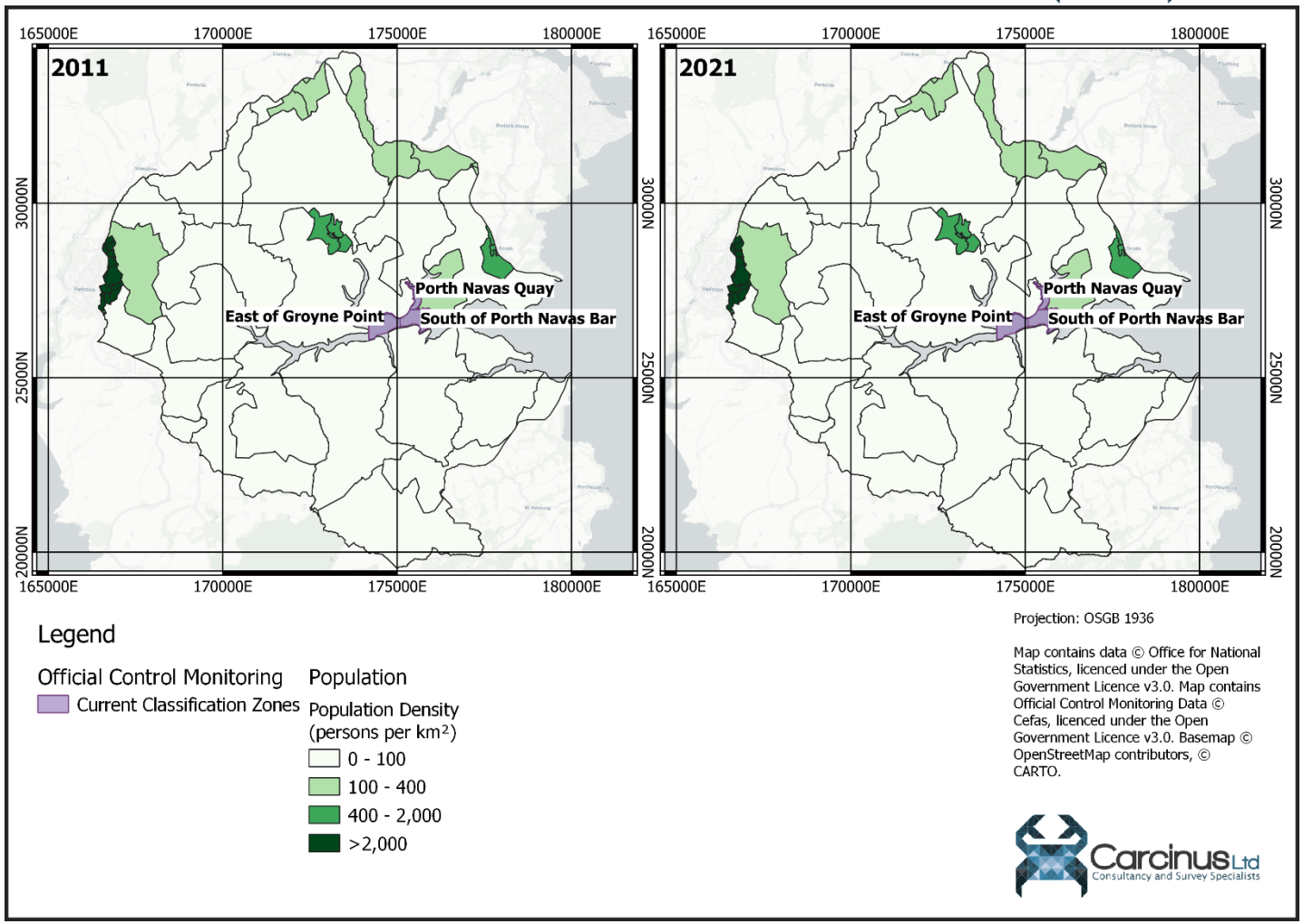

Figure 3.1 Human population density (persons per square kilometre) in Census Output Areas wholly or partially contained within the Helford catchment at the 2011 and 2021 Censuses.

The 2014 Sanitary Survey does not comment on any seasonal influx of tourists to the Helford area. However, it is likely that the area sees a notable increase in resident population during summer months, as approximately half of the annual visitors to Cornwall are motivated by activities in and around the Falmouth area (Falmouth.co.uk, 2024). The peak population within the catchment is likely to occur in the summer months of June – September and will result in increased loading to the wastewater treatment network. During initial consultations, the LEA stated that they had concerns over the adequacy of the network to handle the seasonal increase. During subsequent discussions, the EA indicated that in part due to the upgrades to the wastewater treatment network (discussed in the next section), they do not believe that the Helford area is at risk of additional contamination as a result of seasonal visitors.

Analysis of Census data shows that there has been a 22% increase in populations between 2011 and 2021, but that the majority of the catchment is rural with population densities of less than 100 people per square kilometre. The main urban centres have not changed significantly since the 2014 Sanitary Survey Review was published, and the area continues to be a popular tourist destination. Overall, the recommendations made in the 2014 Sanitary Survey Review to account for the impact of human populations remains valid.

3.2 Sewage

Details of all consented discharges in the vicinity of the Helford BMPA were taken from the most recent update to the Environment Agency's national permit database at the time of writing (November 2023 Update). The locations of these discharges within the catchment and near the Classification Zones are shown in Figure 3.2.

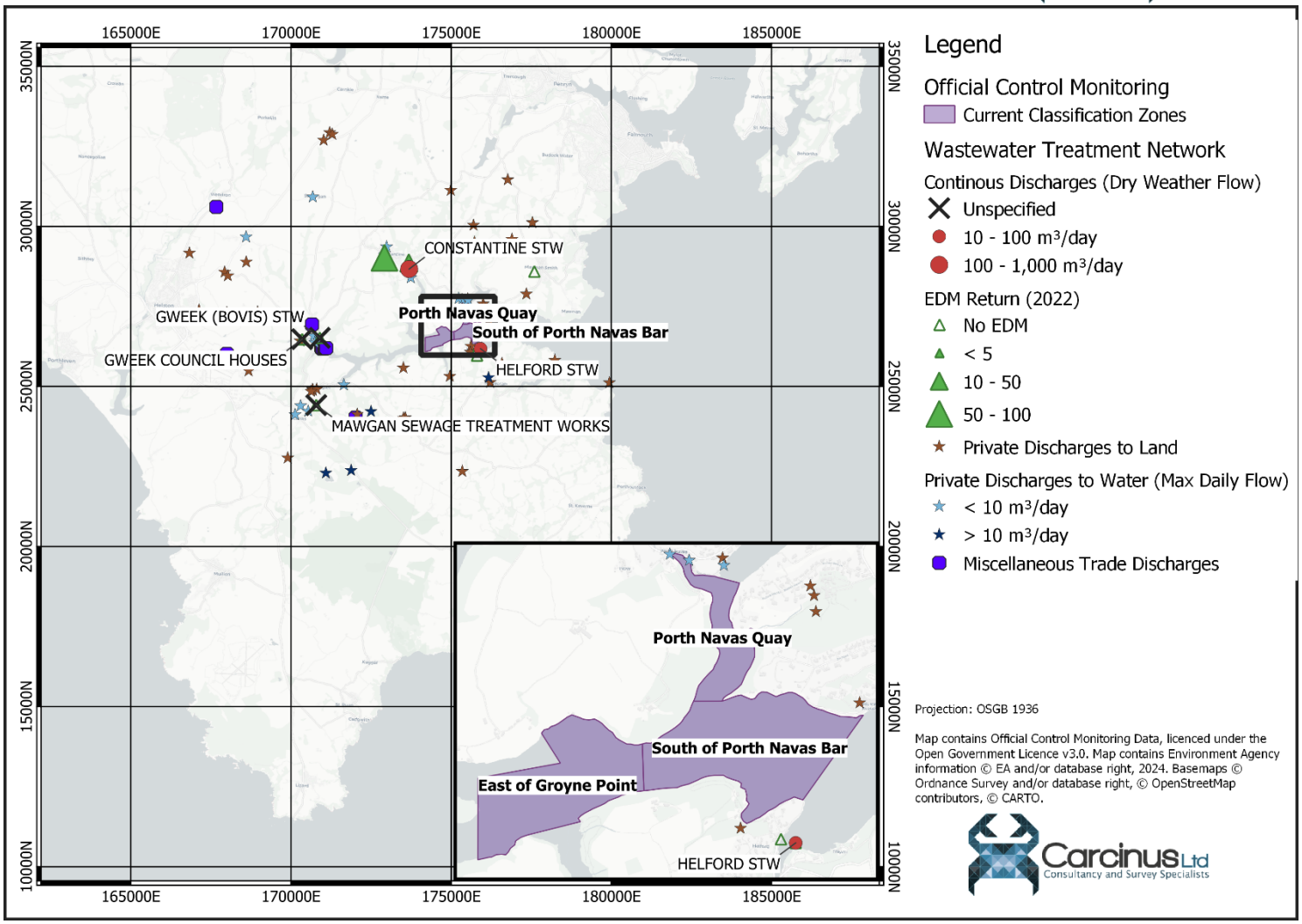

Figure 3.2 Location of all consented discharges in the Helford Catchment. Details of consented discharges are shown in Table 3.1.

Table 3.1 Details of continuous discharges within the vicinity of the Helford BMPA.

Discharge Name	Permit Number	Receiving Water	Outlet NGR	Treatment Methodology	DWF (m^3/day)	Distance (km) from centre of nearest CZ
HELFORD STW	303452	THE HELFORD CREEK(E)	SW7592026180	BIOLOGICAL FILTRATION	50	0.52
CONSTANTINE STW	302487	LESTRAINES RIVER(S)	SW7369028670	UV DISINFECTION	150	2.22
GWEEK (BOVIS) STW	SWWA 725	(E) HELFORD RIVER	SW7090026520	BIOLOGICAL FILTRATION	Unspecified	3.74
GWEEK COUNCIL HOUSES	301452	HELFORD RIVER	SW7035026480	PACKAGE TREATMENT PLANT	Unspecified	4.29
MAWGAN SEWAGE TREATMENT WORKS	301474/PW/01	TRIB OF HELFORD RIVER	SW7079024420	PACKAGE TREATMENT PLANT	Unspecified	4.37

The 2014 Sanitary Survey Review identified three continuous discharges in the vicinity of the Helford BMPA. All three discharges are still active and have seen no changes to their treatment methodologies or consented discharge volume. The largest consented discharge volume is at Constantine STW which employs UV disinfection on a consented discharge volume of 150 m^3/day. This modest consented continuous discharge volume is reflective of the small human population present in the Helford catchment. No upgrades to the continuous discharges in the catchment have taken place since the 2014 Sanitary Survey Review was published, and none are planned for the current (AMP7 2020 – 2025) or next (AMP8 2025 – 2030) Asset Management Periods (AMP).

In addition to the continuous discharges within the catchment, the 2014 Sanitary Survey Review identified a number of intermittent discharges with the potential to impact the bacteriological health of the BMPA. Intermittent discharges comprise Combined Storm Overflows (CSOs), Storm Tank Overflows (STOs), Pumping Station Emergency Overflows (PSs), and Sewer Pumping Stations (SPSs). During AMP6 and AMP7, Event Duration Monitoring (EDM) was installed at several of the discharges within the catchment. Summary data for 2020, 2021 and 2022 was published by the Environment Agency in March 2021, March 2022 and March 2023 respectively (Environment Agency, 2023). A summary of the EDM return for discharges in the vicinity of the Helford BMPA is presented in Appendix I.

The closest intermittent discharge to the shellfish beds, Shipwrights PS in Helford, has not spilled in 2020, 2021 or 2022. The most active intermittent discharges in the area are in the village of Constantine (approximately 3 km northwest of the CZs). Contamination from these sources will reach the shellfish beds via the Polwheveral Creek and will reach the western end of the *East of Groyne Point* CZ in the first instance. During initial consultations, the EA advised that during AMP6 (2015 – 2020), upgrades in the form of telemetry and EDM were installed at the Ford, Shipwrights and Mawnan Smith Pumping Stations. This form of upgrade means that water company officers can respond to spill events more quickly, hopefully reducing the volume of discharge. During AMP7 (2020 – 2025), Constantine Pumping Station was limited to a maximum consent of 10 spills per year with a 50 m^3 aggregated volume. This work was completed in 2022. During AMP8 (2025 – 2030), it is likely that the Helford Shellfish water will be subject to a comprehensive impact study to assess relative microbial sources within the river and surrounding catchments.

EA officers in the area have no concerns over the existing wastewater treatment network. Table 3.2 was provided during initial consultation and shows a significant reduction in the numbers and volume and spills into the estuary over the past five years, suggesting that the existing sewerage network capacity is sufficient. The data presented in this table have been taken at face value.

Table 3.2 Spill data into Helford Creek from 2018 - 2022. Source: Environment Agency.

Year	Total spills/hrs		
	STW SO	SPS	CSO
2018	74	4	2
2019	70	16	2
2021	75	70	2
2021	0	0	0
2022	0	0	0

In addition to the water company owned infrastructure, there continue to be many privately owned discharges throughout the catchment. During initial consultations the EA advised that many of the houses in the catchment are connected to septic tanks that discharge directly to groundwater or soakaway, rather than the main sewerage network. Limited details of these private discharges can be provided due to data protection requirements, and it is likely that there are some non-consented septic tanks present throughout the area. During initial consultations it was identified that many of the house/dwelling renovations that are taking place throughout the catchment involve the septic tanks of these buildings either being formally consented or decommissioned and the buildings' wastewater connected to the main sewerage network. The impact of non-consented septic tanks in this catchment, particularly along the waterfront, was considered to be potentially significant and identified for further investigation through a shoreline survey.

The Shellfish Water Action Plan for the Helford shellfish water identifies the contribution of water company owned sewerage infrastructure to overall contamination levels within the area to be 'high'[4]. This document was prepared in 2021 and it is likely that the upgrades/improvements within the area that have taken place in recent years (and are likely to continue into the future) would reduce this level to 'medium' should the Action Plan be re-assessed. The presence of intermittent discharges and privately owned discharges near to Classification Zones should still be taken into consideration in any updated sampling plan. During the shoreline survey (Appendix II), a number of outfalls/private discharges in small settlements/villages on the coast of the Helford Estuary were noted and water samples collected. The previous 2014 shoreline survey reported high *E. coli* from some private discharges (up to 5,300 CFU/100 ml). All water samples from the 2024 shoreline survey at private discharges returned lower *E. coli* results (<1,100 CFU/100 ml) suggesting improvements have been made reducing their contribution to overall contamination levels in the catchment, and that potential contamination from septic tanks is low.

3.3 Agricultural Sources

The 2014 Sanitary Survey Review cites livestock data for the Kerrier district in 2007 and 2010 based on the Livestock Censuses of the same years. To provide an indication of changes in the livestock population of the catchment, a data request was made to the

[4] 'High' contribution: accounting for more than 40% of overall contamination levels within a shellfish water.

Farming Statistics Office for the Department of Environment, Food and Rural Affairs (DEFRA) for livestock populations within the catchment presented in Figure 1.1 for 2016 and 2021 based on the June Survey of Agriculture and Horticulture[5]. The data could not be broken down into the various sub catchments to prevent disclosure of information about individual holdings. Figure 3.3 presents the changes in livestock populations within the Helford catchment.

[5] 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.

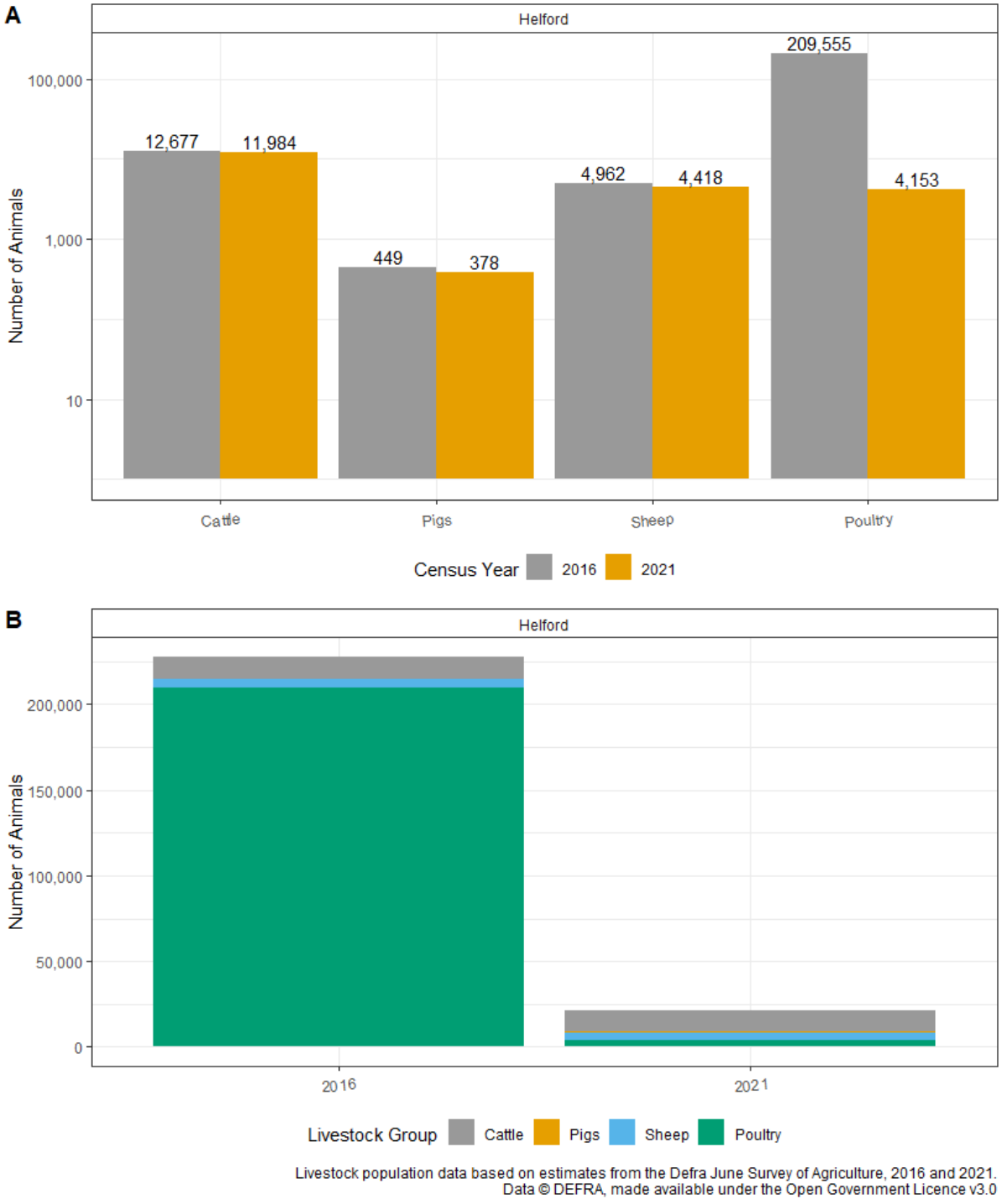

Figure 3.3 Changes in livestock populations in the Helford catchment between 2016 and 2021.

The data presented in Figure 3.3 show that in 2016, there were >200,000 poultry, making this a larger group in terms of population size than the other three groups combined. However, in 2021, the poultry population size had fallen to just over 4,000 birds. Following secondary consultation with the Environment Agency, the cause of this decline is unknown. All other groups showed smaller reduction in population size (5 – 10% reduction between

2016 and 2021). It should be noted that the June Survey of Agriculture and Horticulture presents a snapshot of population sizes at one point in a year, but the actual numbers 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 land cover of the Helford catchment in 2012 and 2018[6] is shown in Figure 3.4. The maps show that the majority of the catchment is rural, dominated by either arable or pastural farmland both adjacent to the estuary (and by extension the shellfish beds) and in the upper catchment. The maps do show that there has been some increase in the urban fabric around Helston, but this is unlikely to have a significant impact on any urban runoff levels. Pasture areas adjacent to 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 *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 *E. coli* die-off. These may, however, contribute to background levels of contamination in the CZs, particularly following significant rainfall events. A shoreline survey was recommended to further investigate the risk of run-off from agricultural land to the BMPA, and results from this are discussed at the end of this section.

[6] Most recent publicly available data.

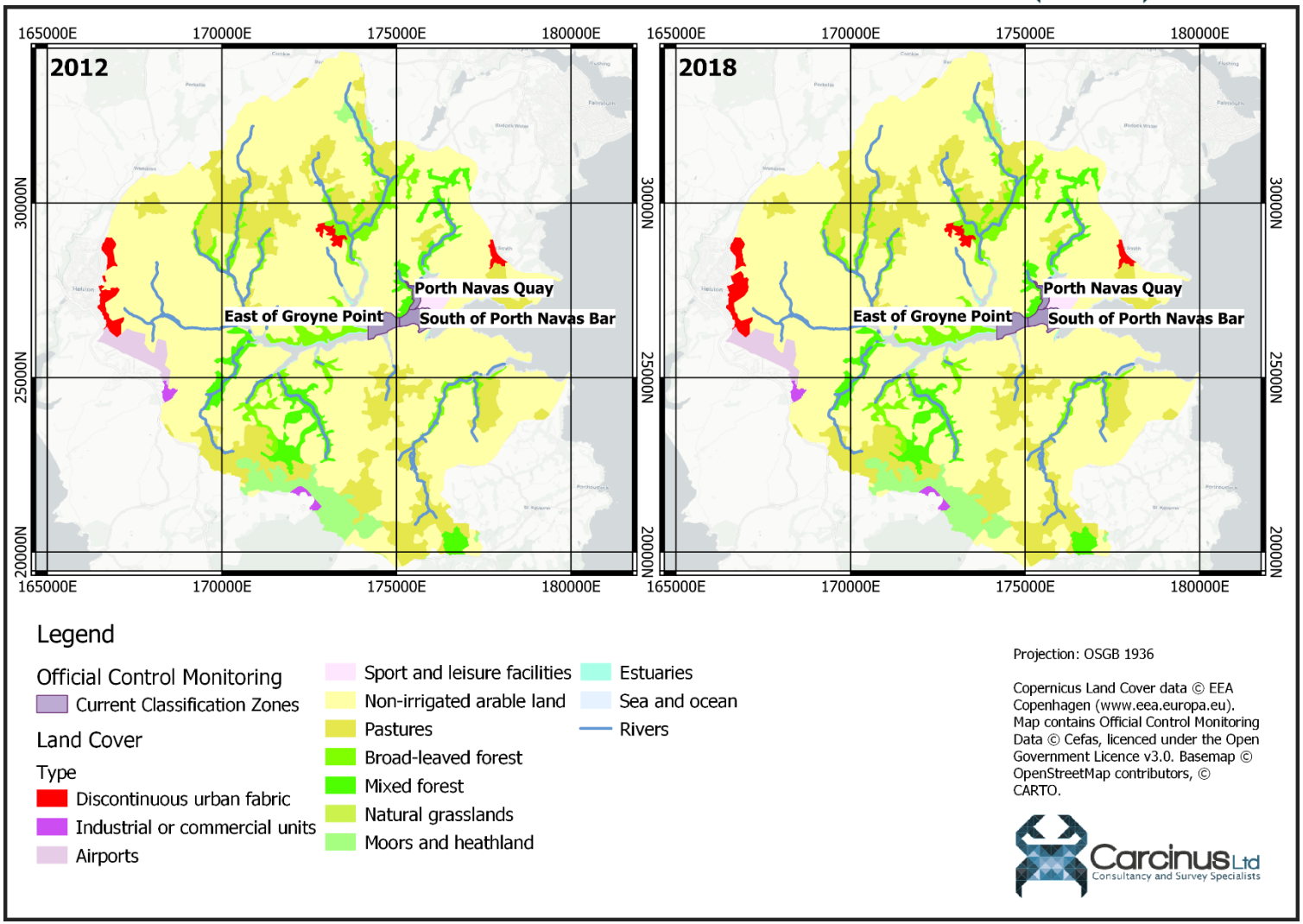

Figure 3.4 Land cover in the Helford catchment in 2012 and 2018.

Arable farmland can also represent a risk to the bacteriological health of a shellfishery, particularly where slurry is applied to fields. During initial consultation, the EA confirmed that there are no local management practices or byelaws in place relating to the usage of slurry. However, 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, which came into force in April 2018. This legislation lays out a set of rules that require good farming practice, so that farmers manage their land both to avoid water pollution and benefit their business. Rules include requiring farmers to judge when it is best to apply fertilisers, where to store manures and how to avoid pollution from soil erosion. 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 10 m 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 2021 Shellfish Action Plan for the Helford shellfish water states that there are 247 farms in the Helford Catchment. Three of these are engaged with Catchment Sensitive Farming (CSF), 39 are engaged with the Countryside Stewardship (CS) Scheme, and 13 CSF measures to reduce concentrations of Faecal Indicator Organisms (FIO) have been implemented. During initial consultations, the EA stated that they were not aware of any previous significant issues relating to the usage of slurry, but that the Helford catchment has been identified as a priority area for ART officers to engage with farmers. At secondary consultation, the EA explained that this involves undertaking farm inspections to assess compliance with relevant regulations in the catchment and a report identifying improvements issued to farmers eg replacing guttering etc., or more substantial improvements like building a new slurry store. Inspections are undertaken on a priority basis (mostly dairy and medium-large beef farms), and has been ongoing in the catchment since last summer (2023). Some larger scale improvements may take up to 2 years to complete, so impacts are likely to be seen in the longer term.

The Action Plan for the Helford Shellfish water assesses that agricultural contamination has a high contribution to contamination levels in the area. This desktop assessment supports that conclusion. A significant proportion of the catchment is farmland, and all rivers and watercourses are likely to be affected by agricultural runoff to varying degrees, particularly following significant rainfall events (see Section 5 for more detail on rainfall patterns in the area).

The shoreline survey (Appendix II) found very little livestock on or near the survey path. Approximately 40 cows were noted in a field on the South West Coast path, and some sheep at the Cornwall Seal Sanctuary. That being said, the survey was conducted in early Spring and it is possible livestock had not yet been put to pasture. There was no evidence of slurry/muck spreading on the shoreline path however given the rural land use, this is still likely to be a contamination risk to the BMPA and the recommendations in this review remain valid.

3.4 Wildlife

Overwintering and wading birds often represent a potentially significant source of microbiological contamination to shellfisheries because avian species frequently forage (and therefore defecate) on areas of shellfish beds. Helford Estuary lies within the Falmouth Bay to St Austell Bay Special Protection Area, designated for the presence of black-throated diver (*Gavia arctica*), great northern diver (*Gavia immer*) and slavonian grebe (*Podiceps auritus*).

Figure 3.5 shows the temporal trend in total overwintering waterbird counts from the winter of 2008/2009 to 2021/2022 (the most recent for which data are available). It shows that the dominant group in terms of population size are gulls, with small populations of other groups throughout.

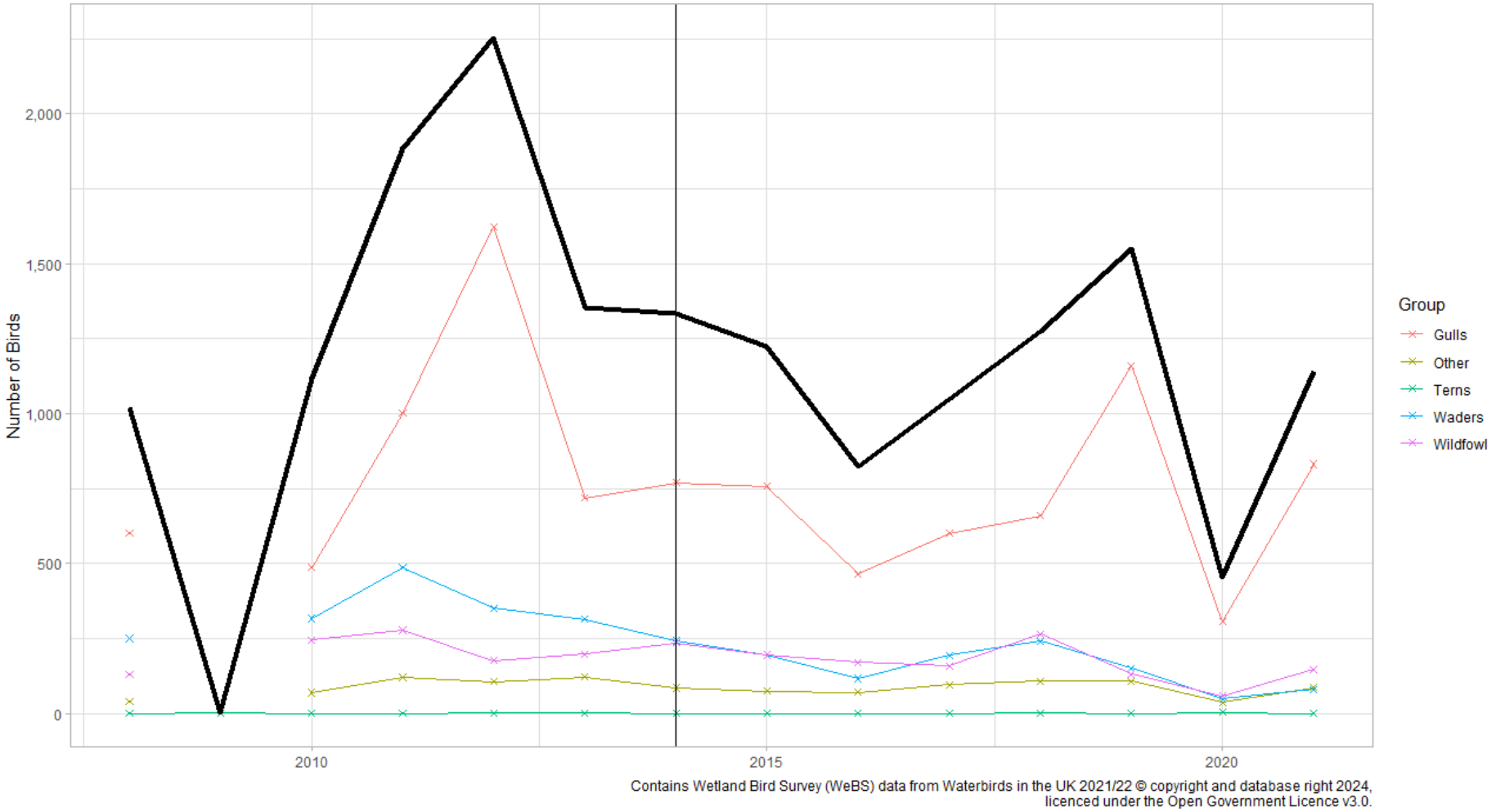

Figure 3.5 Temporal trend in waterbird counts from the Helford estuary. Data from the Wetland Bird Survey (Austin et al.*, 2023). Black line indicates total number of birds.*

In the five winters to 2021/2022 an average of 1,270 waterbirds were found (Austin *et al.*, 2023). This value is a decrease of 21% on the five winters to 2013/2014 (Holt *et al.*, 2015), but the area does still support nationally significant populations of both greenshank and mediterranean gull. The largest aggregations of waterbirds, and therefore the highest risk of contamination due to defecation, will occur in winter months. The distribution of waterbirds within the estuary will be driven by the aggregations of their foraging resource, which will shift from year to year. The precise timing and locations of the contamination will however be variable, and it is challenging to define RMPs which reliably capture this source of pollution. Currently, the situation has not changed since the original sanitary survey was published and waterbird counts do not need consideration in placement of the RMP.

The 2014 Sanitary Survey review does not comment on the presence of any other significant wildlife species within the Helford estuary. Marine mammals such as seals may also contribute some contamination, particularly when foraging in the area. However, the area is not considered to be a significant habitat for this group and so any contamination will be occasional and minimal and does not need to be taken into consideration in the placement of RMPs for this BMPA.

The 2024 Shoreline Survey (Appendix II) did not note a significant number of birds sighted during the survey. However, it was completed out of season (outside usual breeding bird survey season of mid-March – July) and so this is expected. One seal was spotted in the estuary during the boat survey but not sighted again. This habitat remains non-significant to seals, and any potential contamination from one-off sightings like this are likely to experience high spatial and temporal variation. The recommendations to take account of wildlife populations remain valid.

3.5 Boats and Marinas

The discharge of sewage from boats is a potentially significant source of contamination to the Helford 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 2014 Sanitary Survey Review. Their geographical positions are shown in Figure 3.6.

There is a small fishing fleet that operates from the Helford estuary; nine vessels under 10 m overall length list the Helford River as their home port (gov.uk, 2024) (seven of these are recorded as having a shell-fishing licence). No vessels over 10 m are present in the estuary, most probably due to the restricted bathymetry within the estuary. There is also not likely to be any merchant shipping traffic as there are no commercial ports in the area. Any merchant shipping transiting to and from the Port of Falmouth, 10 km north, will not pass close enough to the Helford Estuary to represent a contamination risk.

Recreational boating activity is however very popular within the Helford estuary, and was identified by the Environment Agency, harvester and LEA during initial consultations as being a potentially significant source of contamination. There are several areas of moorings present in the estuary, particularly within the *South of Porth Navas Bar* and *Porth Navas*

Quay CZs. The Porth Navas Yacht club does not have any pump out facilities (the closest pump-out facilities are in Falmouth[7]) and so recreational vessels of a sufficient size to contain onboard toilets are likely to make overboard discharges from time to time, particularly when moving through the main navigational channels or when moored overnight. The greatest impacts are likely to occur in summer months, when vessel numbers are at their highest, but it is impossible to accurately predict the timing or volumes of any contamination. In the absence of any other direct sources of contamination, the presence of a significant aggregation of moorings within a CZ should be taken into consideration in any updated sampling plan.

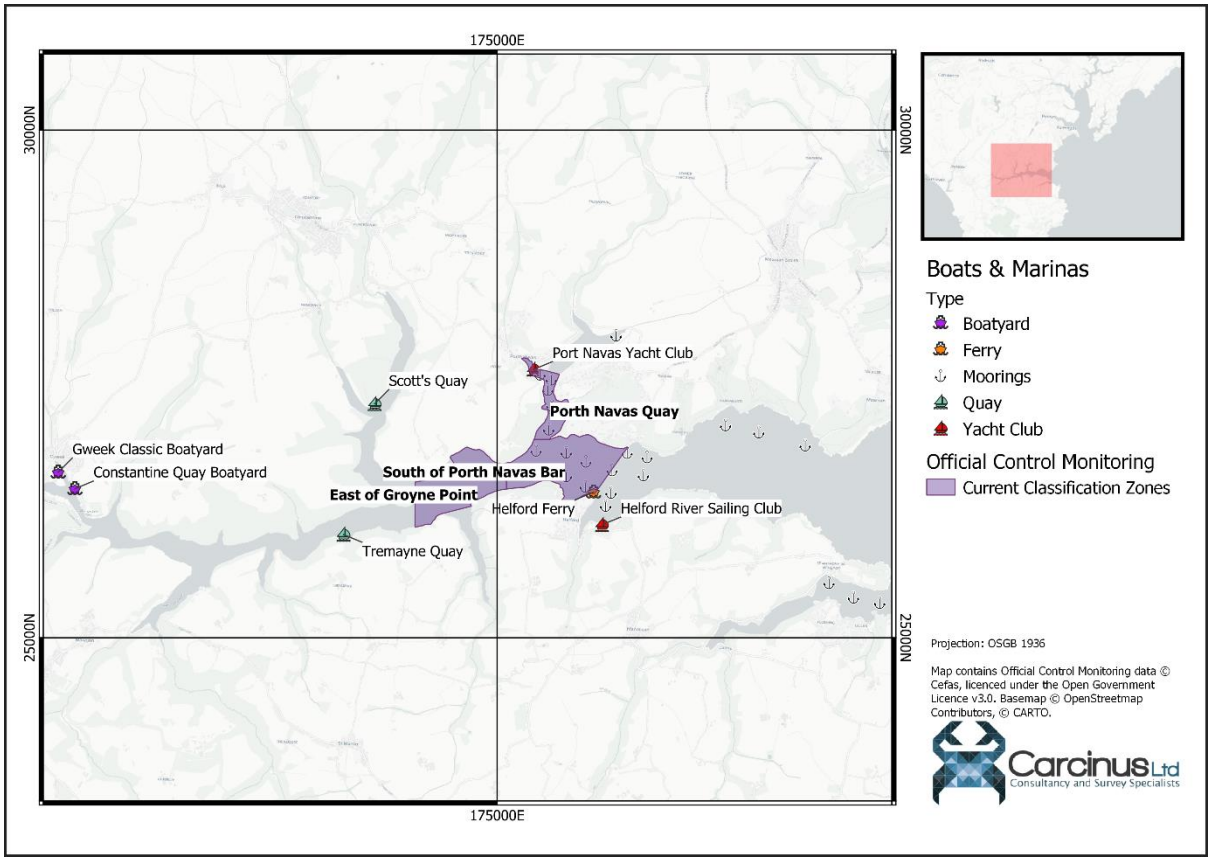

Figure 3.6 Locations of boats, marinas and other boating activities in the vicinity of the Helford BMPA.

No significant changes to the extent of boating activity within the Helford River have occurred since the 2014 Sanitary Survey Review was published, and no update to the sampling plan is necessary on this basis.

The shoreline survey (Appendix II) confirmed the use of the Helford as a popular boating destination. However, the boating activity was as expected from the desk-based assessment in this Sanitary Survey review, and so the recommendations in this report remain valid.

[7] https://thegreenblue.org.uk/environmental-facilities-map/

3.6 Other Sources of Contamination

Utility misconnections occur when foul water pipes are wrongly connected and their contents enter surface waters without treatment, potentially putting raw sewage directly into watercourses via surface water drains. During initial consultations, the EA stated that there have been some minor issues with misconnections related to waterfront properties in the estuary, but that these have not reoccurred in recent years.

There is likely to be a minor impact associated with dog fouling along coastal paths and beaches, but this is not expected to be a significant source of contamination. Some dog walking was noted in the Shoreline Survey, however many beaches are closed to dog walkers in the summer months which in turn further limits the risk of contamination from this source during summer months. The recommendations in this review remain valid.

4 Hydrodynamics/Water Circulation

The Helford BMPA is located within the Helford estuary, a relatively narrow estuary on the eastern coast of the Lizard peninsula in Cornwall. The Classification Zones are located in the middle part of the estuary, from Groyne Point to the Helford Creek, as well as in the Port Navas Creek. The estuary has a continually wetted subtidal channel, with intertidal areas on both the northern and southern sides of the estuary. The majority of the *East of Groyne Point* and *South of Porth Navas Bar* CZs are subtidal, but most of the *Porth Navas Quay* CZ is intertidal. Analysis of freely available nautical chart data suggests that the water depths and extents of intertidal areas are unchanged from the situation described in the 2014 Sanitary Survey Review.

The 2014 Sanitary Survey Review notes that there had been no changes to the depths/patterns of tidal circulation since the 2008 Survey (which the 2014 report was reviewing). Contamination from up-catchment sources will be carried in an easterly (from the main channel) or southerly (down Port Navas Creek) direction during ebbing tides, and in the opposite direction during flooding tides. The dilution potential will be greater in subtidal areas than intertidal areas, where contamination may sit in place for some time.

5 Rainfall

A complete record of the rainfall data from the Wendron rainfall monitoring station at NGR: SW 67789 30711 (ID: 379923) was downloaded from the Environment Agency's hydrology data explorer[8]. This station was chosen as it is the closest monitoring station to the BMPA with records spanning dates preceding the publication of the 2014 Sanitary Survey Review. This monitoring station is 8 km northwest of the nearest CZ (*East of Groyne Point*). The data were subdivided into 2009– 2014 (pre-sanitary survey) and 2014 – present (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

[8] Environment Agency's Hydrology Data Explorer. Available at: https://environment.data.gov.uk/hydrology/explore#/landing.

were published. The rainfall data are summarised in Table 5.1 and the rainfall levels per month are shown in Figure 5.1.

Table 5.1 Summary statistics for rainfall preceding and following the 2014 Sanitary Survey Review.

Period	Mean Annual Rainfall	Percentage Dry Days	Percentage Days Exceeding 10 mm	Percentage Days Exceeding 20 mm
2009 – 2014	1167.03	31.55	35.79	21.79
2015 – 2023	1213.98	34.18	35.91	22.09

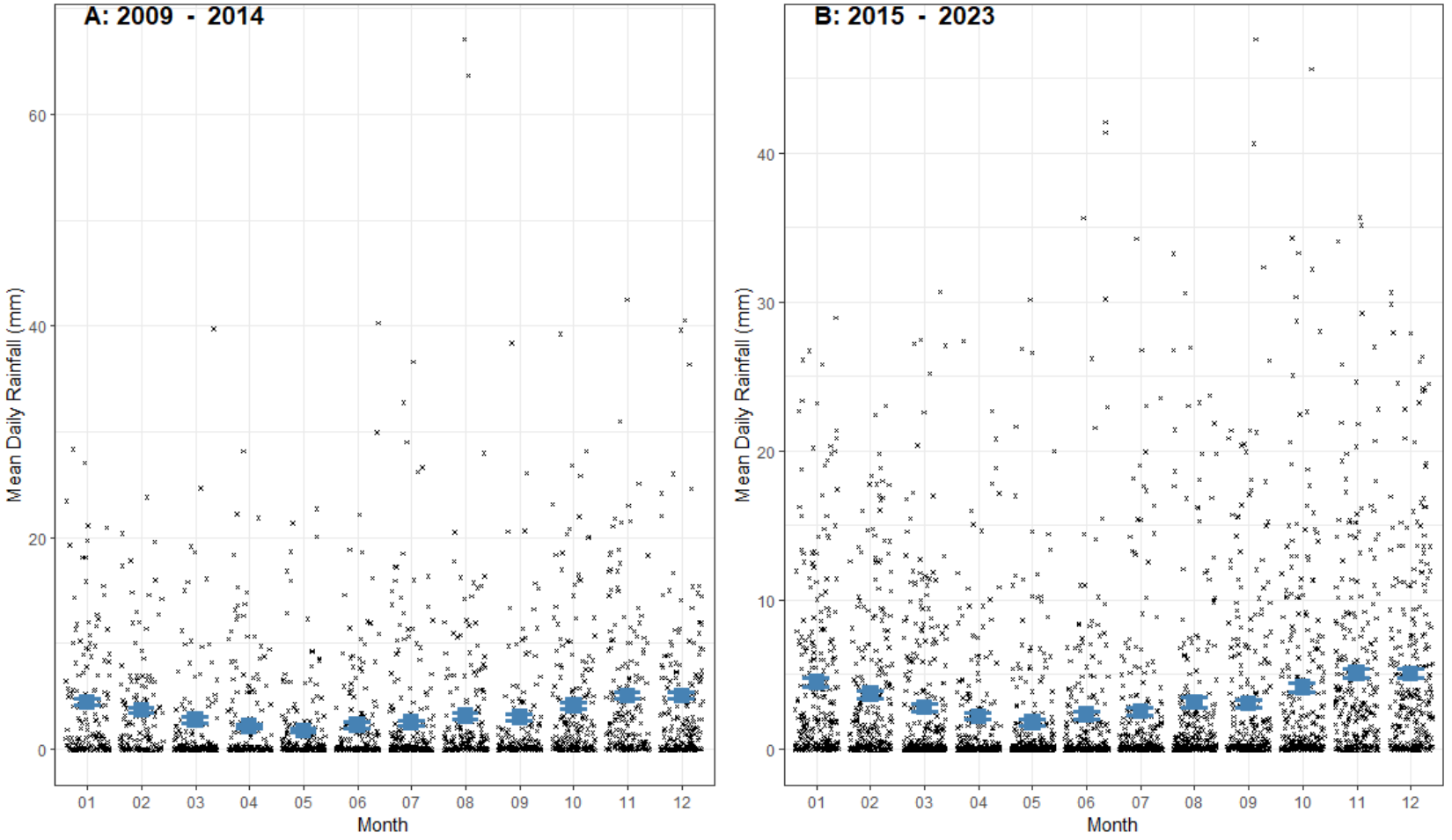

Figure 5.1 Mean daily rainfall per month at the Wendron monitoring station at NGR SW 67789 30711 for the period (A) 2009 – 2014 and (B) 2014 – 2023.

The data show that average annual rainfall has increased by approximately 50 mm per year, with the percentage of days in each year with heavy rainfall (>10 mm rain per day) also increasing. Average rainfall amounts of more than 1,000 mm per year also indicate that this area receives a significant volume of rainfall compared to other areas around the country. Two-sample t-tests indicated that there was no significant difference ($p > 0.05$[9]) in the mean daily rainfall per month between the 2009 - 2014 and 2015 – 2023 periods, meaning that rainfall levels across the catchment have remained statistically similar.

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 and number of spills would be expected to be greatest during this time. As the rainfall patterns have remained (statistically) similar across the two time periods, it is unlikely that bacterial loading due to these factors has changed significantly, 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 Official Control Monitoring

6.1.1 Summary Statistics and geographical variation

Mean Official Control monitoring results for *E. coli* concentrations at RMPs sampled in the Helford BMPA since 2010 are presented spatially in Figure 6.1 and summary statistics are presented in Table 6.1. Only monitoring data freely available for download from the Cefas datahub has been used in this section. No additional verification of the data has been undertaken.

[9] A p-value of <0.05 means that there is a greater than 95% probability that the observed differences between the groups didn't occur by chance.

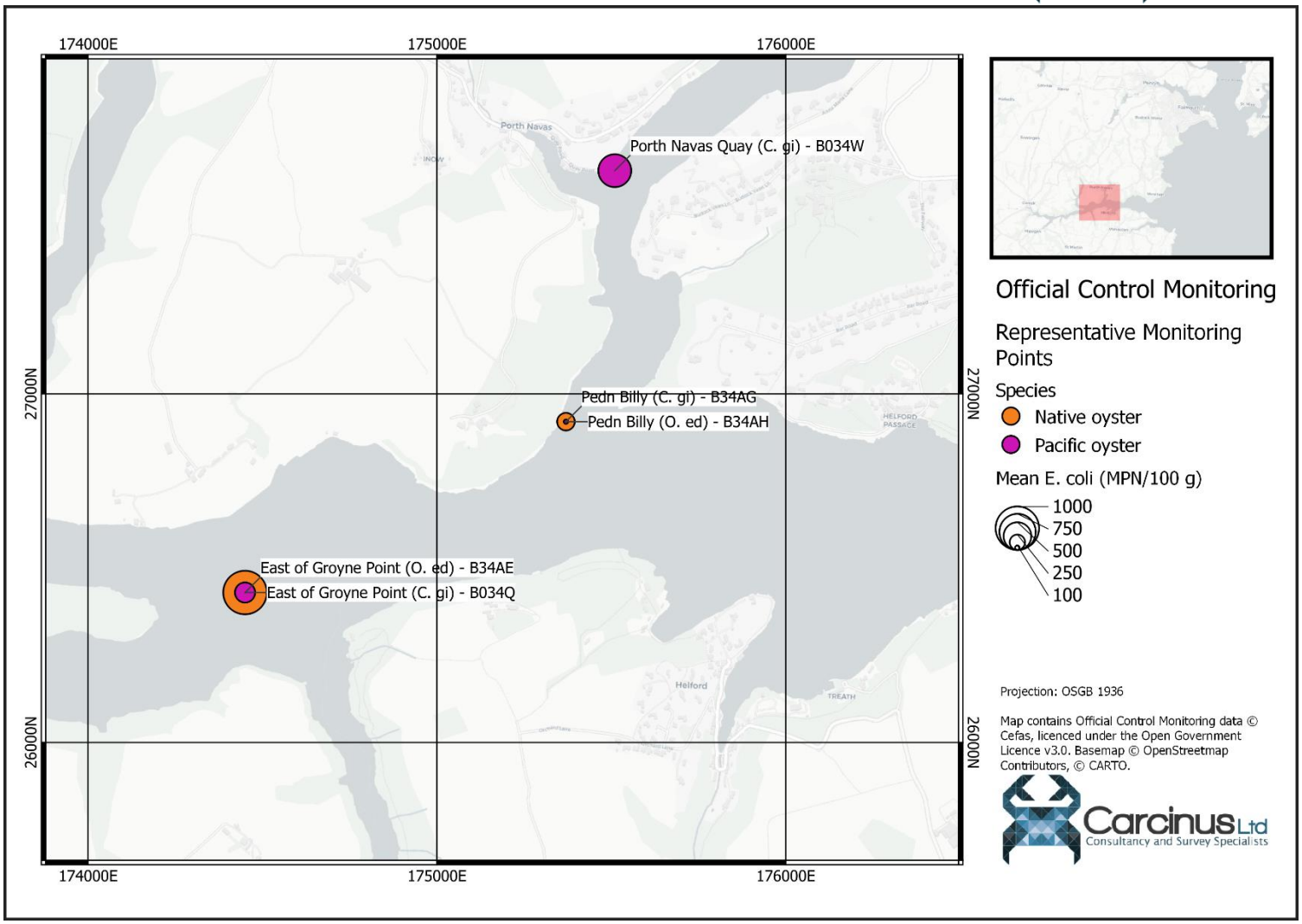

Figure 6.1 Mean E. coli results from Official Control monitoring at bivalve RMPs in the Helford BMPA.

Table 6.1 Summary statistics from Official Control monitoring at bivalve RMPs in the Helford BMPA.

RMP (Species)	NGR	Species	No.	First Sample	Last Sample	Mean	Min Value	Max Value	% > 230	% > 4,600	% > 46,000
East of Groyne Point (C. gi) - B034Q	SW74452643	Pacific oyster	62	09/09/2008	24/06/2020	331.27	18	2400	45.16	0	0
Porth Navas Quay (C. gi) - B034W	SW75512764	Pacific oyster	150	29/09/2008	07/12/2023	643.19	18	11000	40.00	2	0
East of Groyne Point (O. ed) - B34AE	SW74452643	Native oyster	75	09/09/2008	04/01/2024	1005.71	18	9200	50.67	8	0
Pedn Billy (C. gi) - B34AG	SW75372692	Pacific oyster	21	16/04/2019	24/11/2020	159.57	18	780	23.81	0	0
Pedn Billy (O. ed) - B34AH	SW75372692	Native oyster	36	09/12/2020	04/01/2024	286.06	18	1300	38.89	0	0

The datahub provides Official Control monitoring data for a total of five RMPs, three of which are for Pacific oyster and two for native oyster. Of these RMPs, three were sampled prior to the publication of the 2014 Sanitary Survey Review. Sampling at the East of Groyne Point (C. gi) B034Q RMP stopped in 2020, but the other two (Porth Navas Quay (C. gi) B034W and East of Groyne Point (O. ed) B34AE) are currently active. Sampling at the Pedn Billy (C. gi) B34AG RMP took place from April 2019 to November 2020, after which time it was replaced by the Pedn Billy (O. ed) B34AH RMP. There are currently three active RMPs within the Helford BMPA:

- Porth Navas Quay (C. gi) – B034W;
- East of Groyne Point (O. ed) – B34AE; and
- Pedn Billy (O. ed) – B34AH.

Only two of these RMPs (Porth Navas Quay B034W and East of Groyne Point B34AE) have returned a result above 4,600 *E. coli* MPN/100 g. In both situations where there is monitoring data available for two different species at the same RMP location (East of Groyne Point and Pedn Billy), the native oyster RMP has returned higher concentrations of *E. coli* than the Pacific oyster RMP. There is however only temporal overlap in the East of Groyne Point RMPs (B034Q & B34AE). Monitoring points nearer the head of the estuary or drainage channels have tended to return higher monitoring results, which is indicative of the main sources of contamination washing over the CZs on ebbing tides driven by fluvial currents from upstream sources.

Figure 6.2 and Figure 6.3 present box and violin plots of *E. coli* monitoring at RMPs within the Helford BMPA. 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[10]. All statistical analysis described in this section was undertaken in R (R Core Team, 2021).

Figure 6.2 includes monitoring data from the native oyster RMPs, demonstrating that results from the Pedn Billy (B34AH) RMP are lower than that of the East of Groyne Point (B34AE) RMP. The ANOVA test performed on this monitoring data suggested that the differences were statistically significant ($p = 0.035$).

[10] A p-value of <0.05 means that there is a greater than 95% probability that the observed differences between the groups didn't occur by chance.

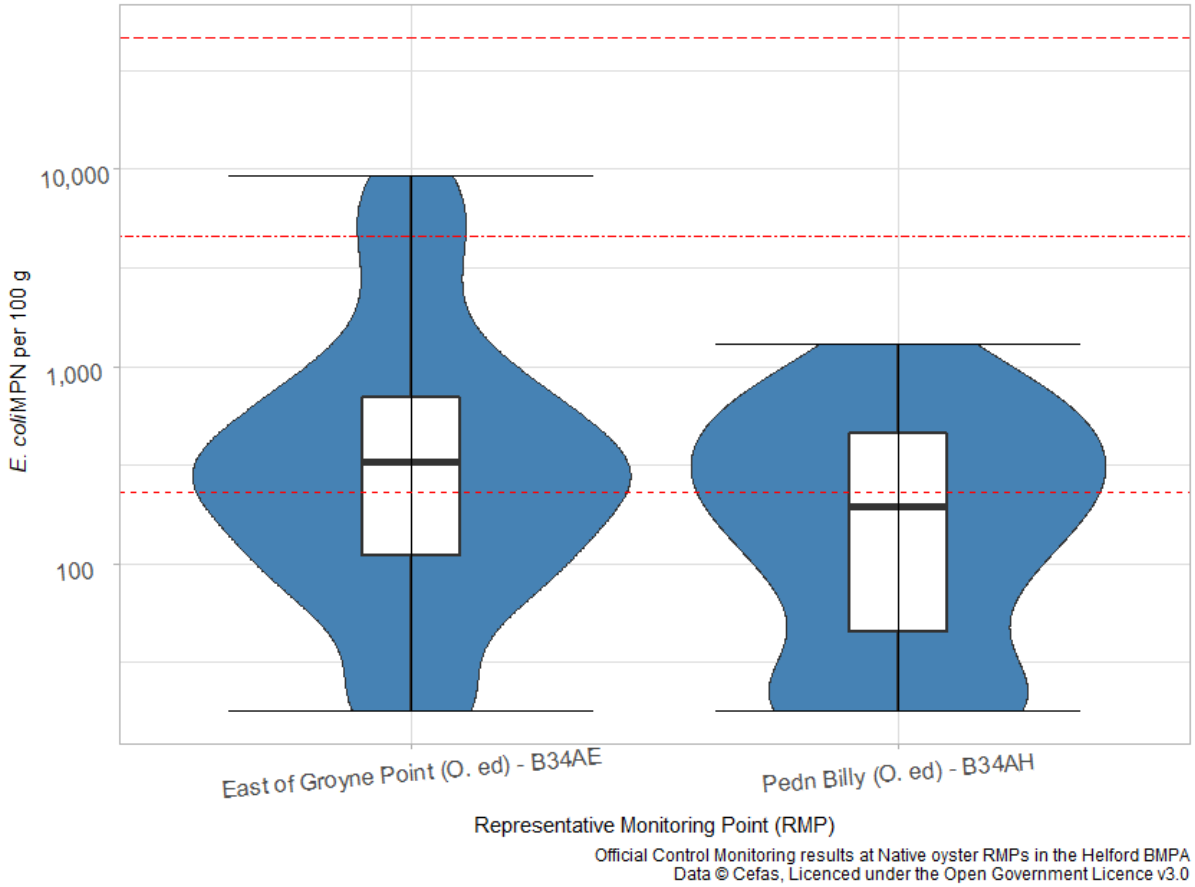

Figure 6.2 Box and violin plots of E. coli monitoring at native oyster RMPs in the Helford BMPA. Central line indicates median value, box indicates lower-upper quartile range and whisker indicates minimum/maximum values, excluding outliers. Boxplots are overlaid on the distribution of the monitoring data. Horizontal dashed lines indicate classification thresholds at 230, 4,600 and 46,000 E. coli MPN/100 g.

Figure 6.3 presents the monitoring data from the Pacific oyster RMPs. The highest median result was from the East of Groyne Point (B034Q) RMP and the lowest from Pedn Billy (B34AG). Occasionally high results (more than 1.5 times higher than the interquartile range) wererecorded at the Porth Navas Quay RMP. No significant differences ($p > 0.05$) were found in the Pacific oyster RMPs.

It is not appropriate to compare the results of RMPs for different species due to the variance in rates of *E. coli* uptake.

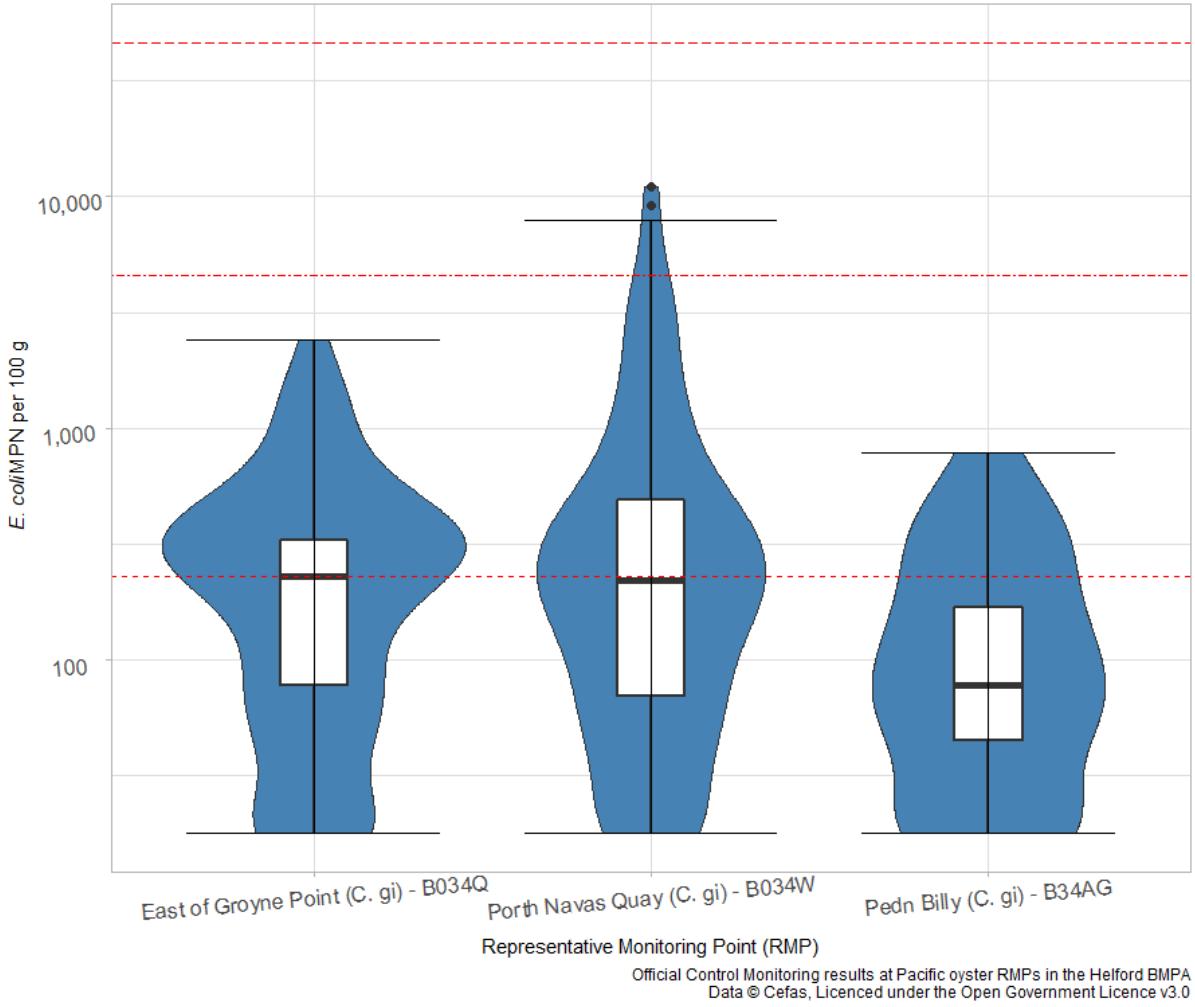

Figure 6.3 Box and violin plots of E. coli monitoring at Pacific oyster RMPs in the Helford BMPA. Central line indicates median value, box indicates lower-upper quartile range and whisker indicates minimum/maximum values, excluding outliers. Boxplots are overlaid on the distribution of the monitoring data. Horizontal dashed lines indicate classification thresholds at 230, 4,600 and 46,000 E. coli MPN/100 g.

6.1.2 Overall temporal pattern in results

The overall temporal pattern in shellfish flesh monitoring results within the Helford BMPA are shown for native oysters in Figure 6.4 and Pacific oysters in Figure 6.5.

The monitoring data from the native oyster RMPs suggests that the concentration of *E. coli* in shellfish flesh at the East of Groyne Point (B34AE) RMP is lower from 2020 – present than when the RMP was previously sampled (2008 - 2012). No inference can be drawn from the trend line during the period where no sampling occurred (2012 to 2020). It also suggests that the concentration of *E. coli* in shellfish flesh at the two currently sampled RMPs is quite similar. The statistical significance identified in Section 6.1.1 is likely due to the elevated results from the 2008 – 2010 data.

The monitoring data from the Pacific oyster RMPs shows that the concentration of *E. coli* in shellfish flesh at the Porth Navas Quay (B034W) RMP has remained very consistent, with the trend line continually falling around the 230 *E. coli* MPN/100 g threshold.

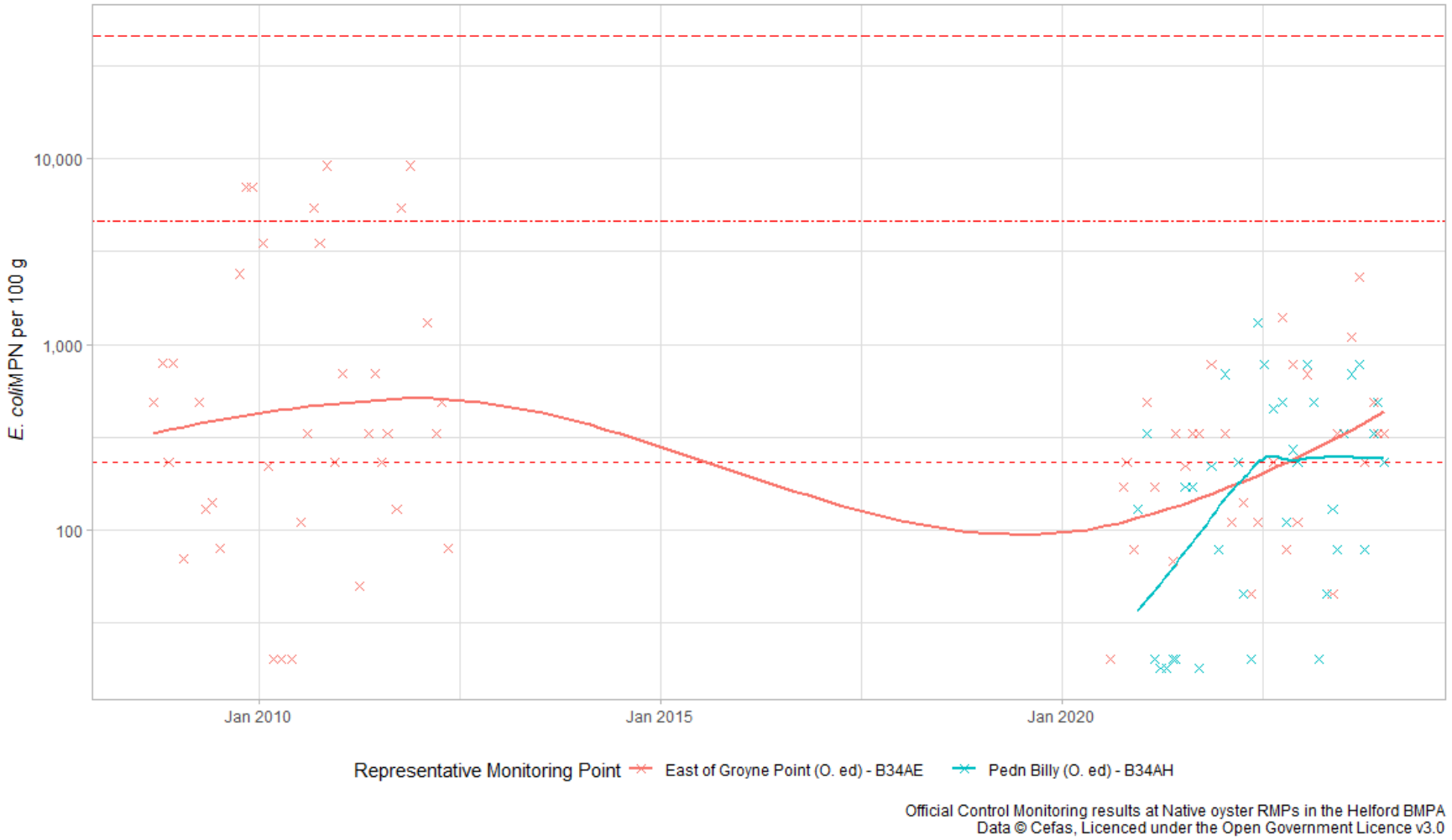

Figure 6.4 Timeseries of E. coli monitoring at native oyster RMPs sampled in the Helford BMPA since 2008. Scatter plots are overlaid with a loess model fitted to the data. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 E. coli MPN/100 g.

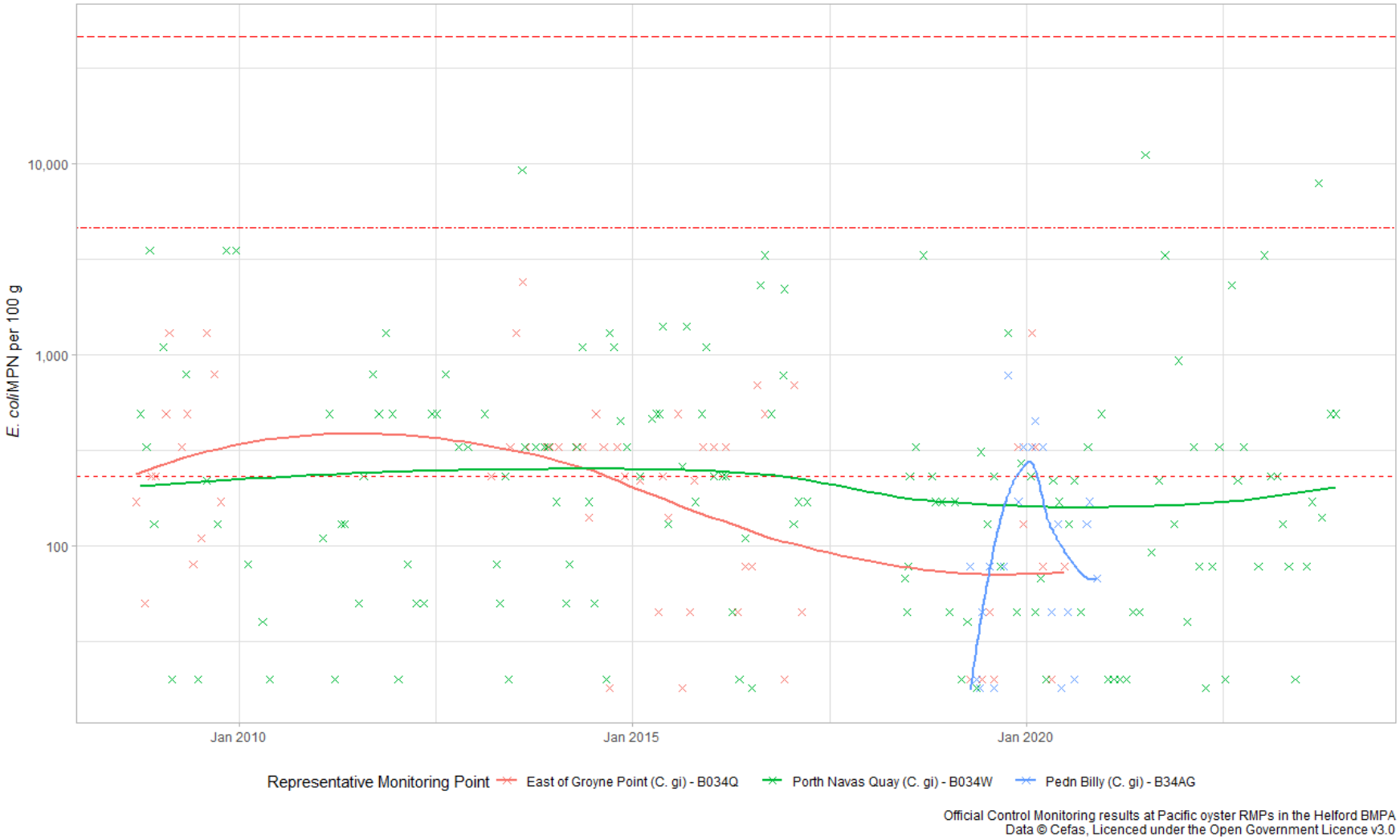

Figure 6.5 Timeseries of E. coli monitoring at Pacific oyster RMPs sampled in the Helford BMPA since 2008. Scatter plots are overlaid with a loess model fitted to the data. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 E. coli MPN/100 g.

6.1.3 Seasonal patterns of results

Seasonal patterns of *E. coli* flesh concentrations at RMPs in the Helford BMPA were investigated and shown for native oysters in Figure 6.6 and Pacific oysters in 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.

Within the native oyster data, monitoring results from Autumn months were significantly higher than those collected in Spring. This pattern is principally driven by a significant difference ($p = 0.027$) in the Autumn and Spring monitoring results at the East of Groyne Point (B34AE) RMP. There were no significant differences in the seasonally grouped data from the Pedn Billy (B34AH) RMP.

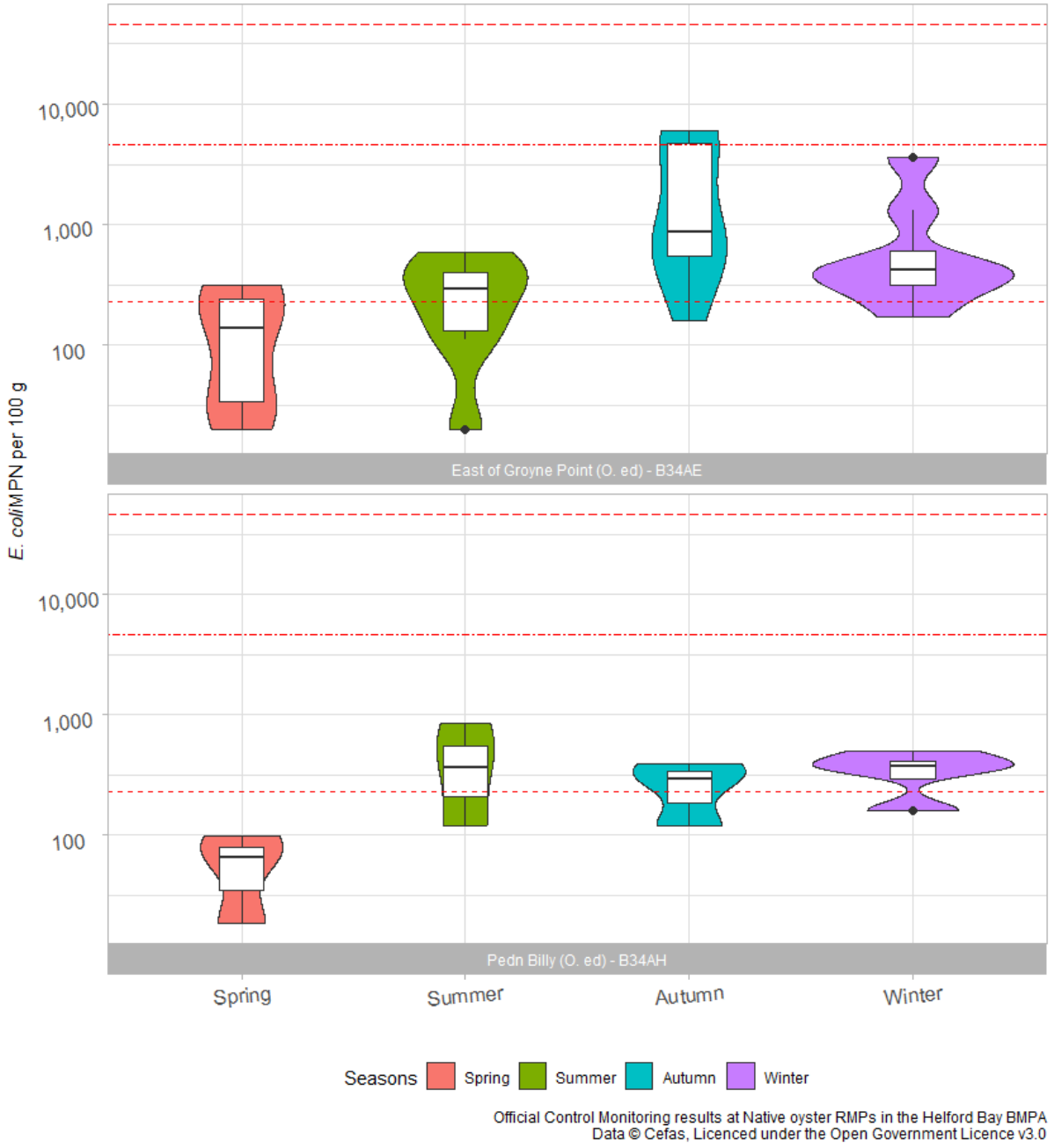

Figure 6.6 Box and violin plots of E. coli levels per season at native oyster RMPs sampled within the Helford BMPA. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g respectively.

When the data from Pacific oyster RMPs was pooled together (Figure 6.7), monitoring results from Autumn months were significantly higher than those from Spring ($p = 0.023$) and were markedly (but not significantly ($p > 0.05$)) higher than those from Summer. When the data from a single RMP was considered, no significantly different results were found. This suggests that across the catchment, contamination sources likely to be greatest in autumn months, such as agricultural runoff, are a significant contributing factor to patterns of *E. coli* concentration.

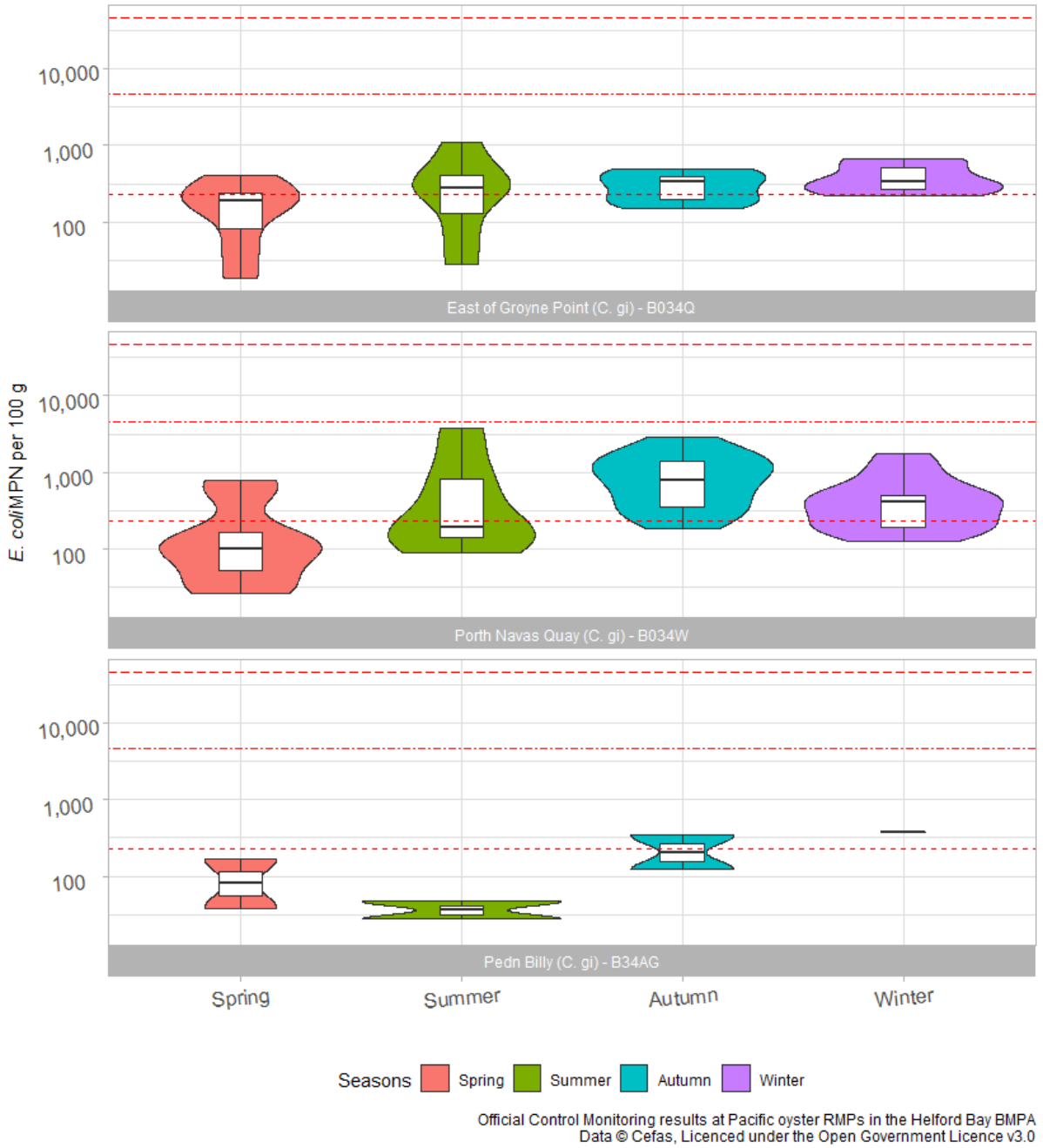

Figure 6.7 Box and violin plots of E. coli levels per season at Pacific oyster RMPs sampled within the Helford BMPA. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g respectively.

6.2 Action States

Since the publication of the 2014 Sanitary Survey Review of the Helford BMPA, the following Action States have been triggered within the BMPA.

- On 07 April 2016, a result of 35,000 *E. coli* MPN/100 g was recorded at the South of Porth Navas Bar (B34AC) RMP. A result of 13,000 *E. coli* MPN/100 g was also

recorded at the East of Groyne Point Mussel RMP. No subsequent monthly sampling had been conducted at the RMP but Action State sampling on 18 April and 03 May 2016 returned results of 220 and 20 *E. coli* MPN/100 g respectively. The high result was unique to mussels; the oyster RMP in the same location returned a result of 450 *E. coli* MPN/100 g from samples collected on 07 April. There were no grounds to waive the result in accordance with the required waiver criteria.

The investigation that followed the above action state events described above did not identify exceptional (above the 1-in-5-year threshold) rainfall or pollution incidents linked to water company assets. The RMPs referred to in this section are no longer active.

6.3 Bathing Water Quality Monitoring

There are no designated bathing waters or associated bathing water quality monitoring points within the Helford Estuary. The closest are at Meanporth (NGR: SW 78980 29570) and Porthallow (NGR: SW 79740 23260). These are both more than 4 km from the Helford BMPA, farther north and south of the estuary entrance respectively. The Meanporth bathing water has been classed as 'good' since 2019, whereas the Porthallow bathing water has been classed as 'excellent'. It should be noted that bathing water sampling only occurs during the bathing water season, which falls within the summer period (May to September inclusive) and therefore may not represent the potential for increased faecal loading during winter months. Limited inference can be drawn from the monitoring results from these two locations given their distance from the CZs of the Helford BMPA.

7 Conclusion and overall assessment

The Helford BMPA is located within the estuary of the same name, situated on the east coast of the Lizard Peninsula in south Cornwall. The BMPA is currently classified for native and Pacific oyster harvesting. The BMPA has previously been classified for mussels, but these CZs were declassified in 2016. The oyster fishery has also been inactive since 2016 due to a variety of socio-economic factors, although classification monitoring has been maintained. Commercial harvestingis due to resume in the first half of 2024. The fishery will involve growing-on of seed oysters directly on the riverbed.

The results of the 2021 Census were compared to that of the 2011 Census to give an indication of changes in human population within the catchment since the publication of the 2014 Sanitary Survey Review. These data suggest that the population of the catchment increased by approximately 22% between 2011 and 2021. The catchment remains very rural, with the majority of the catchment having a population density of less than 100 people per square kilometre. The main population centres of the catchment are the eastern half of the town of Helston, at the head of the estuary, as well as the small villages/hamlets of Constantine, Porth Navas, Trebah and Mawnan Smith. Urban associated runoff is not considered to be a significant source of contamination within this area. The area does receive a significant increase in population each year with tourism, predominantly in summer months.

There are no significant continuous water company owned discharges within the Helford catchment, reflecting the small population size. The three discharges that are present all have very low consented discharge volumes (<150 m^3/day). No upgrades to these discharges have occurred since the 2014 Review was published. At initial consultation, the EA advised there are currently no concerns over the existing wastewater treatment network's ability to deal with the influx of tourists each season. There are still some intermittent discharges throughout the catchment, and the EA advised during initial consultation that some upgrades to these have taken place, generally designed to improve storage capacity or increase the speed at which spills can be identified and stopped. During initial consultations, the EA advised that a potentially significant source of contamination in this shellfishery might be from privately owned and operated Septic tanks, including both consented and non-consented discharges. The presence of water company owned intermittent and privately owned discharges in the vicinity of the CZs should be taken into consideration in any updated sampling plan.

Livestock population data shows that there has been a significant decrease in poultry population between 2016 and 2021, but that the populations of cattle, pigs and sheep have been more stable, and there are still a large number of livestock reared within the catchment. Land cover maps show that much of the catchment remains reserved for either arable or pastural farmland, and the Shellfish Water Action Plan published by the Environment Agency considers agricultural contamination (runoff) to be a significant source of contamination within this shellfishery, particularly after periods of high rainfall (days with >20 mm rain or multiple consecutive days of >10 mm rain). This is supported by higher monitoring results in the Autumn months, during which rainfall and the number of grazing animals is likely to be greater. Slurry is also spread onto fields during this time of year. The mouths of watercourses throughout the bay, such as the Porth Navas Creek and the river Helford, can be considered point sources of this source of contamination.

Waterbird counts suggest that this estuary continues to support a population of waterbird species, but that the five-year average over-wintering count has fallen by 21% compared to the five years to 2014. Some minor impacts from either avian species or marine mammals may occur, but these are impossible to reliably predict and are therefore challenging to account for in any updated sampling plan.

There is no merchant shipping activity within the Helford estuary and only nine vessels list the estuary as their home port. The main source of contamination from boats will be from recreational vessels of a sufficient size to contain onboard toilets. There continue to be large numbers of moorings present throughout the estuary, and the only marina in the estuary, at Porth Navas Quay, does not provide any pump out facilities. The greatest impacts are likely to occur in summer months, when vessel numbers are at their highest, but it is impossible to accurately predict the timing or volumes of any contamination. In the absence of any other direct sources of contamination, the presence of a significant aggregation of moorings within a CZ should be taken into consideration in any updated sampling plan.

There is monitoring data available for five RMPs sampled within the Helford BMPA, two for native oyster and three for Pacific oyster. Monitoring results from RMPs farther up the main estuary channel or side channels tended to return higher monitoring results, suggesting that fluvial inputs and land runoff are the main sources of contamination to this BMPA.

A Shoreline Survey of Helford BMPA was conducted in March 2024 to address the main knowledge gaps identified in this report, namely the impact of privately owned septic tanks in the estuary, as well as any small streams and rivers that may be carrying agricultural runoff over the CZs. No private septic tanks were noted during the shoreline survey at properties on the river banks, and so it is unlikely to be a main source of contamination to the CZ. That being said, there may still be private septic tanks present throughout the catchment which have not been accounted for in the shoreline survey. Any potential contamination/run-off from these is likely to experience significant dilution before reaching the BMPA due to distance. There are a total of seven creeks draining into the Helford River, and a number of streams/outfalls were identified either draining directly to the river or into one of the creeks. Some land runoff from pastural land and woodland was noted on the day, however all water samples taken from small streams and outfalls returned low *E. coli* concentrations (<800 CFU / 100 ml). A water sample result of 2,900 CFU/ 100 ml was received downstream of Gweek Wharf, however any potential contamination from this source will experience dilution/die-off before reaching the nearest CZ (*East of Groyne Point*) due to the distance from it. No significant wildlife aggregations were observed, although one seal was seen. The overwhelming majority of boats moored throughout the Helford were deemed too small to contain onboard toilets. None of the findings of the shoreline survey (Appendix II) had an influence on RMP placement for the sampling plan recommended at the end of this report.

8 Recommendations

Recommendations for the various classification zones within the Helford BMPA are summarised below and a recommended sampling plan is provided in Table 9.1.

8.1 Pacific oyster

Porth Navas Quay

This CZ covers an area of 0.13 km² and is situated within Porth Navas Creek. The 2014 Sanitary Survey Review describes that this zone is used as a holding area for oysters prior to being marketed. At secondary consultation, the LA and harvester requested that the CZ be extended slightly to reflect the extent of the harvester's operations. The boundaries have been updated to reflect this. (Figure 9.1). n. The 2014 Review recommended moving the RMP more into Porth Navas Creek to capture contamination originating from farther upstream. The current RMP is approximately 40m from that recommended in the 2014 Review to enable access on foot. . . Figure 9.1 This RMP position should remain unchanged as it will still reliably capture potential contamination to this CZ.

East of Groyne Point

This CZ covers an area of 0.38 km² and is the farthest up-estuary of any CZ in the Helford BMPA. During initial consultations it was identified that this was the main area of industry activity within the BMPA. The current RMP used to classify this zone is a sample bag containing native oysters at the up-estuary extent. A Cefas report into the use of indicator species has suggested that the native oysters can be used to represent Pacific oysters and *vice versa* (Cefas, 2014). The current RMP is well placed to capture contamination from up-estuary sources, and this should be retained moving forward.

South of Porth Navas Bar

This CZ covers an area of 0.48 km² and is situated downstream of both the *Porth Navas Quay* and *East of Groyne Point* CZs. The 2014 Sanitary Survey Review identified that the Porth Navas creek was likely to be the dominant source of contamination within the CZ, and recommended placing the RMP at Pedn Billy, in the mouth of Porth Navas Creek. The current RMP location is slightly closer to land than the position recommended in the 2014 Review. The Pedn Billy RMP is also a sample bag containing native oysters. During initial consultations, the FBO indicated that much of this area is not used for harvesting. At secondary consultation, the LEA could not confirm why the RMP position has moved slightly but suggested it may be due to the shallow bar which runs close to the mouth of Port Navas Creek. This could have made sampling difficult at certain stages of tide and caused the sample bag to rest on the riverbed floor.

At secondary consultation, the harvester confirmed that currently there are no plans to harvest many oysters from this CZ. The geographical distribution of mean Official Control monitoring results suggests that there are generally higher levels of contamination farther upstream. Given there is minimal harvest of oysters from the *South of Porth Navas Bar* CZ, it would be appropriate from a public health point of view to merge the *South of Porth Navas Bar* and *East of Groyne Point* CZs, and sample both from the East of Groyne Point RMP, as this would reduce the sampling pressure on the LEA. The new Classification Zone should be referred to moving forwards as Helford Estuary, and samples should be taken from the East of Groyne Point RMP (Table 9.1; Figure 9.1). It is possible that the waters covered by the *South of Porth Navas Bar* CZ could receive a higher classification than the *East of Groyne Point* CZ and so if oyster cultivation expands in this area in the future, the CZs could be re-split and the previous boundaries/RMPs used.

8.2 Native oyster

All Pacific oyster CZs are also classified for native oysters. It is considered appropriate to maintain classification of all oyster CZs based on samples from either species. Currently *Porth Navas Quay* is classified based on Pacific oyster samples and the other two CZs are classified using native oyster samples. Moving forwards, the *Porth Navas Quay* should continue to be classified using Pacific oysters, and the new *Helford Estuary* CZ should be classified using Native oysters.

9 General Information

9.1 Location Reference

Production Area	**Helford**
Cefas Main Site Reference	M034
Ordnance survey 1:25,000	Explorer 103
Admiralty Chart	No 147 / No 2400.11

9.2 Shellfishery

Species	Culture Method	Seasonality of Harvest
Native oyster *Ostrea edulis*	Cultured	Year Round
Pacific oyster *Crassostrea gigas*	Cultured	Year Round

9.3 Local Enforcement Authority(s)

Name	**Cornwall Port Health Authority** The Docks Falmouth TR11 4NR
Website	https://www.cornwall.gov.uk/environment/cornwall-port-heath-authority
Telephone number	01872 323090
E-mail address	porthealth@cornwall.gov.uk

9.4 Recommended Sampling Plan

*Table 9.1 Proposed sampling plan for the Helford 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
Porth Navas Quay (N oyster; P oyster)	B034W	Porth Navas Quay	SW 7551 2764	50°06.38'N, 05°08.45'W	Pacific oyster; Native oyster	Hand/Bagged	Bagged	P. oyster	10 m	Monthly
~~**East of Groyne Point (N oyster; P oyster)**~~	~~B34AE~~	~~East of Groyne Point~~	~~SW 7445 2643~~	~~50°05.70'N, 05°09.30'W~~	~~Pacific oyster; Native oyster~~	~~Dredge~~	~~Bagged~~	~~N. oyster~~	~~10 m~~	~~Monthly~~
~~**South of Porth Navas Bar**~~	~~B34AH~~	~~Pedn Billy~~	~~SW 7537 2692~~	~~50°05.983'N, 05°08.55'N~~	~~Pacific oyster; Native oyster~~	~~Dredge~~	~~Bagged~~	~~N. oyster~~	~~10 m~~	~~Monthly~~
Helford Estuary (N oyster; P oyster)[11]	**B34AE**	**East of Groyne Point**	**SW 7445 2643**	**50°05.70'N, 05°09.30'W**	**Pacific oyster; Native oyster**	**Dredge**	**Bagged**	**N. oyster**	**10 m**	**Monthly**

[11] Covers waters previously classified as *East of Groyne Point* and *South of Porth Navas Bar*.

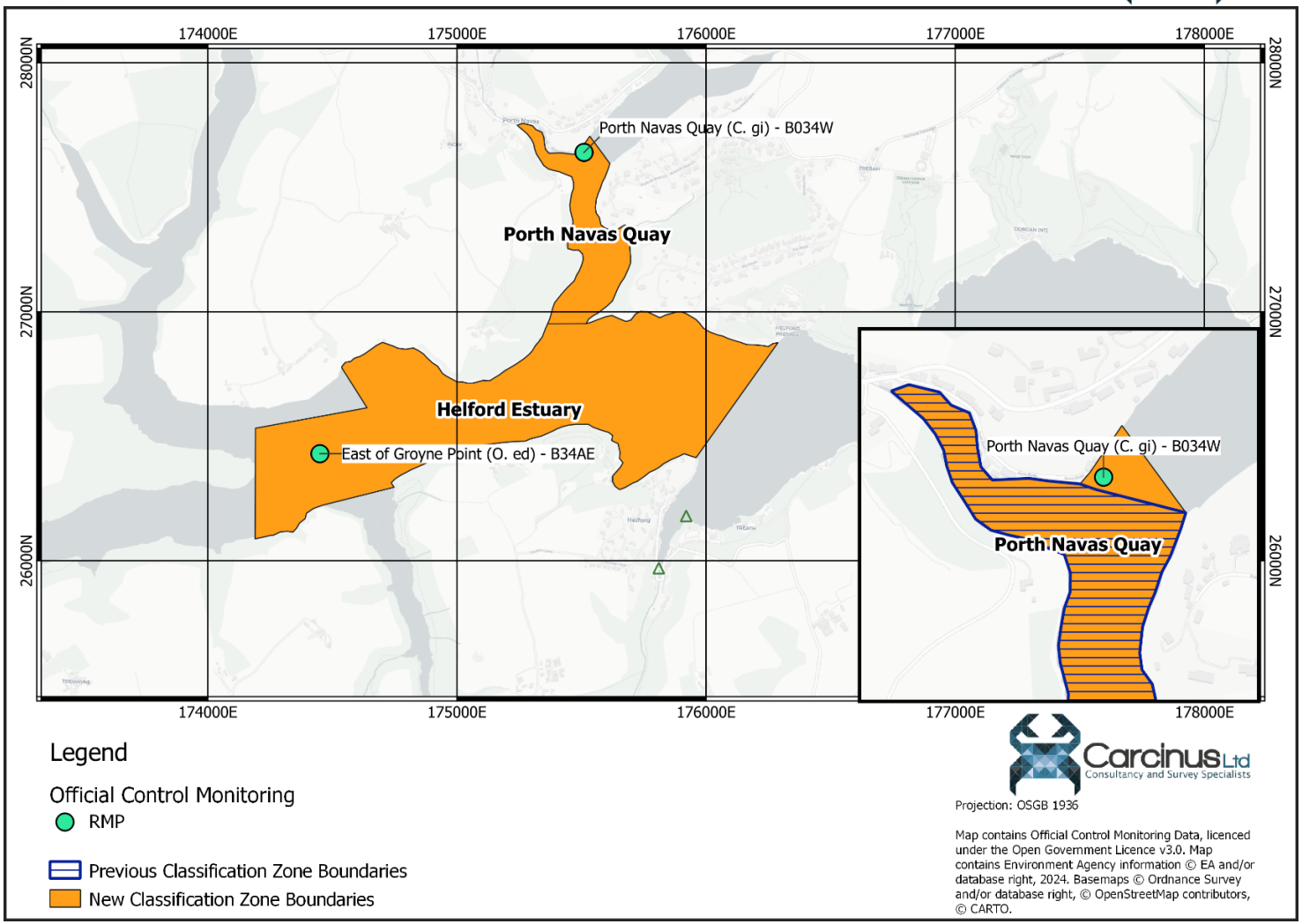

Figure 9.1 Map showing new CZ boundaries, combining East of Groyne Point and South of Porth Navas Bar to Helford Estuary, and extending Porth Navas Quay to reflect current operations.

10 References

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Appendices

Appendix I. EDM Return for 2022

Site Name	EA Permit	Type of discharge	Outlet NGR	Total Duration (Hours) of Spills in 2022	Number of Spills in 2022	Distance (km) to centre of nearest CZ
SHIPWRIGHTS SPS_PSCSOEO_HELFORD	303454	Storm discharge at pumping station	SW75842620	0	0	0.47
CONSTANTINE STW_SO_CONSTANTINE	302487	Inlet SO at WwTW	SW73682886	40.59	48	2.34
PENBOTHIDNO ESTATE_CSO_CONSTANTINE	302789	SO on sewer network	SW73662886	0.68	4	2.36
CONSTANTINE BRIDGE SPS_PSCSOEO_FALMOUTH	302096	Storm discharge at pumping station	SW72922902	83.39	22	3.07

Helford Shoreline Survey

Report context

This report is designed to be read in conjunction with the desk-based assessment, to which this forms an appendix. It details the findings of the shoreline survey undertaken over two consecutive days in March 2024 but does not repeat details of contamination sources detailed in the main report unless there is a specific need to (i.e., where there are differences between the situation described in the desk-based assessment and those observed during the shoreline survey). The desk-based assessment is based on data sources (including Official Control monitoring) up to and including January 2024. The description of the shellfishery presented within this report is based on the information contained in the desk-based assessment and information gathered during the Shoreline Survey.

The shoreline survey of the Helford Bivalve Mollusc Production Area (BMPA) was recommended in the desk-based assessment due to uncertainty over the impact of privately owned septic tanks in the estuary, as well as the presence of small streams and rivers that may be carrying agricultural runoff over the Classification Zones (CZs). The CZs of the Helford BMPA are located in the mouth of the Helford estuary on the south coast of Cornwall, near the villages of Helford and Porth Navas. The shoreline survey boat element covered the area from Mawnan and followed the riverbanks to the North, travelling up into creeks and streams where the tide allowed. The boat element finished through Treath and to the north of St Anthony-in-Meneage. The survey path on foot followed the South West Coast Path on the north banks of the estuary, before crossing to the southern side, on the second day of surveying, to walk to the village of Helford (Figure I). The route followed was similar to that of the 2014 Shoreline Survey. There are currently six active CZs in the Helford BMPA, 3 each classified for native and Pacific oysters. The *Porth Navas Quay CZ* is long-term class B, and the *East of Groyne Point* and *South of Porth Navas Bar* CZs are both B classification.

General Information

Date (time):

19 – 20 March 2024 (08:00 – 15:30; 08:00 – 11:00)

BMPA surveyed:

Helford (Cefas Site Reference: M034)

Weather:

Overhead	Beaufort	Precipitation in 7 days preceding survey[1]	Precipitation during survey
Cloudy	3 - 4	38.8 mm	3.8 mm (19 March PM)

Tidal predictions (times in GMT, heights relative to Chart Datum):

	19 March 2024[2]	
Low	06:22	2.15m
High	13:00	3.70m

[1] Based on Wendron Rainfall gauge NGR SW6778930711
https://environment.data.gov.uk/hydrology/station/322a215f-fd23-4b66-a44f-57c21b456d07

[2] Helford River (Entrance) Tide Times for 19th March 2024 | Tide Times

Low	19:10	2.25m

Objectives

The shoreline survey is a physical survey of potential sources of contamination. During the survey, samples of environmental waters or anthropogenic inputs to the area were collected for bacteriological (*E. coli)* testing to evaluate potential differences in levels of contamination entering the shellfish harvesting area, to confirm the location of previously identified sources of potential contamination and to identify other potential sources of contamination that were not apparent in the desk-based assessment. A full list of recorded observations is provided in Table I and the locations of these observations are presented in Figure I. Photographs taken during the shoreline survey are referenced in Table I and presented in Figure III to Figure XXXVI.

The shoreline survey was conducted over two days with all surveyors working together to survey the same area of shoreline, maximising safety whilst on site. Day one of the survey (19 March 2024) was conducted by boat on a rising tide. Access to the majority of the shoreline was possible as the rigid-hulled inflatable boat (RHIB) could travel up all creeks and areas which may not have been accessible by foot. Overhead conditions during day one of the survey were broken clouds with sunny intervals in the morning. At approximately 2pm some rainfall occurred. 38.8 mm of rainfall fell in the 7 days preceding the survey, and 3.8 mm fell on day one of the survey (see Weather:).

At approximately 4pm on day one of the survey, surveyors were able to access the South West Coast Path at St Mawnan and St Stephen's Church, Mawnan. The route followed the path round to the Helford passage car park. The South West Coast Path is a public footpath and so access for this entire route was straightforward. On day two of the survey (20 March 2024), the second part of the route planned to be done on foot was covered. This stretched from St-Anthony-in-Meneage to the Helford ferry crossing in the village of Helford. Overhead conditions on day two were clear with regular sunny intervals and no rainfall during the survey.

A series of outfalls were observed to be flowing on the dates of the survey directly into the estuary, and water samples were taken where possible (i.e. safe access and sufficient flow). Water samples were taken from streams seen running into the estuary directly, or into other water channels ultimately flowing into the estuary. Water samples were also taken at the 3 RMPs in the BMPA. All water samples were kept cool and transported to the Food, Water and Environmental Microbiology (FEW) Laboratory at Porton Down (FEW Porton), and tested for *E. coli* concentrations following established testing protocols (Method Ref: FNES39 (W2)). Laboratory analysis results and sample locations are presented in Table II and Figure II.

Description of Fishery

A full shellfish stock assessment is beyond the scope of a shoreline survey, and this report only presents observations made during the survey. The Helford BMPA is wholly contained within the Helford estuary on the South coast of Cornwall. At the time of writing, there are six Classification Zones, three each for native and pacific oysters. The current output from the shellfishery is negligible, although the harvester hopes to resume the operation in 2024. Three RMPs serve the six CZs and water samples were taken at all three during the Shoreline Survey. The concentration of *E. coli* at each RMP was as follows: East of Groyne Point 30 CFU/100 ml (Figure IX); Pedn Billy 10 CFU/100 ml (Figure XIX); Porth Navas Creek 280 CFU/100 ml (Figure XXI). Shellfish flesh samples were taken at Pedn Billy RMP and East of Groyne Point RMP by the sampling officers on 20 March 2024 (separate to the Shoreline Survey) and the results were <18 MPN/100 g and 20 MPN/100 g respectively.

Sources of contamination

Sewage discharges

Continuous discharges

The desktop assessment identified that there are five continuous water company owned discharges within the Helford catchment. Of these, one discharges into the Helford Creek, one into Lestraines River, two directly into Helford River, and one into a tributary of the Helford River. No pipe into the river could be seen at low water for the Helford STW outfall (Figure XXIII), although a water sample was taken within the vicinity and returned a result of 50 CFU/ 100ml (WS19). More detail of the continuous discharges in the Helford catchment is provided in the main report.

Intermittent discharges

Four intermittent discharges were identified in the desk-based assessment with EDM data: Shipwrights SPS, Constantine STW, Penbothidno Estate CSO, and Constantine Bridge SPS. A number of intermittent discharges are also present in the catchment with no EDM. WS09 was taken within the vicinity of the Gweek (Bovis) STW at Constantine Quay Boatyard (Figure XII; WS09) and returned an *E. coli* result of 1,100 CFU/ 100ml. Another sample was taken as close to the Ford PS as possible by boat (tide dependent) (Figure XXIV; WS20) and returned an *E. coli* result of 160 CFU/ 100 ml. On day two of the survey, no evidence of the Ford PS infrastructure was found on foot (Figure XXXV).

Initial consultations with the Environment Agency identified septic tanks discharging to the groundwater or soakaway rather than the main sewerage network as a potentially significant source of contamination. Many properties have set-ups of this kind throughout the catchment due to their age. During the shoreline survey, no properties along the banks of the Helford were observed to have septic tanks of this kind (although these could have been underground / behind properties and so not visible to surveyors). The EA also advised that it is possible for some non-consented septic tanks to be present in the catchment. Given none were noted from the boat or on-foot elements of the shoreline survey, the surveyors deemed these tanks are likely to be further inland and therefore potential contamination from these sources will experience die-off during run-off from land to water before reaching the CZs.

Freshwater inputs

Water courses draining to the Helford BMPA are described in the main report. The main watercourse draining to the Helford estuary is the Helford River, which in turn has many small creeks fed by streams draining into it. There are seven creeks on the Helford; Ponsontuel Creek, Mawgan Creek (Figure XVI), Polpenwith Creek, Polwheveral Creek (Figure X), Frenchman's Creek (Figure XVIII), Port Navas Creek (Figure XX) (leading to Anna Meris Creek Figure XXII), and Gillan Creek. In addition, there were several small streams/outfalls carrying land runoff from the pastural fields and woodland areas surrounding the river's banks (Figure III; Figure IV; Figure VI; Figure VII; Figure VIII; Figure XIII; Figure XVII; Figure XXV; Figure XXVI; Figure XXVII; Figure XXIX; Figure XXX; Figure XXXI; Figure XXXII; Figure XXXIII; Figure XXXIV).

Water samples were collected from all streams/drainage channels when safely accessible and with sufficient flow to do so. The area surrounding the Helford River and estuary is rural, with a small number of villages/settlements along the banks. Very limited livestock/silage was noted during the shoreline survey which limits the increased risk of faecal loading to the drainage channels. There was a spell of heavy rainfall in the days prior to the shoreline survey (see Weather:) which may be indicative of additional loading. That being said, the water samples taken at various outfalls on the

shoreline survey returned relatively low results of *E. coli* (minimum of 10 CFU/ 100 ml at Ferry Boat Inn (Figure VII); maximum of 800 CFU/ 100 ml at Cornish Sea Salt outfall (Figure XIII)).

Water samples were also taken from the 'mouths' of the streams/creeks within the survey area where they flowed into the main channel of the river. WS11 and WS12 (Figure XV; Figure XVI) returned *E. coli* results of 2,900 CFU/ 100 ml and 530 CFU/ 100 ml respectively. The result of 2,900 CFU/ 100 ml (water) recorded at WS11 is the highest level recorded throughout the shoreline survey. However, this sample still falls within the standards of a Class B shellfish bed set by the FSA (less than or equal to 4,600 CFU/ 100g (flesh) as these are measured in different substrates, direct comparison must be undertaken with caution). WS11 is upstream of all CZs, and downstream of Gweek, one of the villages surrounding the Helford estuary. The East of Groyne Point RMP (Figure IX) is likely to capture any contamination carried downstream from this potential source of contamination, and therefore the recommendation from the Sanitary Survey to keep this RMP remains valid.

Boats and Shipping

The desktop assessment identified that discharge of sewage from boats is a potentially significant source of contamination to the Helford BMPA. A number of moorings were present throughout the main body of the estuary (Figure V), and water samples were collected near to these. No vessels over 10 m are present in the estuary, and this was confirmed in the shoreline survey. One boat appeared to be in residence, although the number of boats lived in may increase in the summer months. Recreational boating activity is evidently popular due to the number of moorings and boats seen in the shoreline survey. The shoreline survey confirmed the conclusions of the desk-based assessment that the impact on microbiological contamination levels with the Helford BMPA from boats and marinas is potentially significant and should be taken into consideration in any updated sampling plan.

Livestock

Many of the fields backing onto the upper banks of the river and estuary were seemingly pasture however, very few livestock were actually seen. Some sheep were seen at the Cornwall seal sanctuary by boat (Figure XI), and cows (Figure XXVIII) and a horse (Figure XXXVI) were noted during the on foot part of the survey on the second day. All contamination/land runoff from the fields would likely enter the estuary from the drainage channels/creeks observed previously in this report. No evidence of slurry was seen during the shoreline survey, however some farms/ small holdings were present in the surrounding area.

Wildlife

The Helford Estuary falls into the Fal and Helford Special Area of Conservation (SAC). Merthen Wood, which runs alongside Polpenwith Creek, is a Site of Special Scientific Interest (SSSI). Areas of Intertidal Zone at the mouth of the Helford are also SSSIs, and the whole Helford River is locally protected as a Cornwall Area of Outstanding Natural Beauty. The Helford Estuary is designated for the presence of a number of over-wintering/wading birds; the black-throated diver (*Gavia arctica*), great northern diver (*Gavia immer*) and Slavonian grebe (*Podiceps auritus*). Limited numbers of birds were noted during the shoreline survey, although it was conducted outside of peak times for nesting birds.

The footpaths on the banks of the Helford River (South West Coast path) are popular routes for dog walkers, and many bins were seen along the path. Some beaches were closed to dog walkers in peak summer periods, which would limit the risk of contamination from dog fouling. This source of contamination continues to be considered minor as noted in the sanitary survey review.

One seal was seen during the shoreline survey from the boat on day one (no photo; ID 9 Table I). No other marine mammals were noted.

Other potential source of contamination

During the shoreline survey, some pipes were seen downstream of Gweek Wharf (Figure XIV). No flow was observed on the day of survey, so no water sample was taken.

Conclusion

The Shoreline Survey of the Helford BMPA was conducted in March 2024 to address the main knowledge gaps identified in the main report, namely the impact of privately owned septic tanks in the estuary, as well as any small streams and rivers that may be carrying agricultural runoff over the CZs. No private septic tanks were noted during this shoreline survey at properties on the river banks, and so it is unlikely to be a main source of contamination to the CZ. Those present throughout the catchment away from the banks of the Helford are likely to experience significant dilution/die-off due to distance before reaching the CZ. Septic tanks do not need consideration in any updated sampling plan.

There are a total of seven creeks draining into the Helford River, and a number of streams/outfalls were sampled during the shoreline survey. Some land runoff from pastural land and woodland was noted on the day, however all water samples taken from small streams and outfalls returned low *E. coli* concentrations (<800 CFU / 100 ml). A water sample result of 2,900 CFU/ 100 ml was received downstream of Gweek Wharf (WS11). The East of Groyne Point RMP is in a suitable location to capture contamination from this source, and any potential contamination from this source will experience dilution/die-off before reaching the nearest CZ (*East of Groyne Point*) due to distance. Additionally, two more water samples returned results >1,000 CFU/100 ml (WS09; WS14). The East of Groyne Point RMP is also well-situated to capture potential contamination from these sources as they are upstream from it's position. As with WS14, any potential contamination from these sources is likely to experience dilution and die-off due to distance before reaching the CZ.

No significant wildlife aggregations were observed, although one seal was seen. The overwhelming majority of boats moored throughout the Helford were deemed too small to contain onboard toilets. None of the findings of the shoreline survey had an influence on RMP placement for the sampling plan recommended at the end of this report, although it can be concluded that boats and moorings should be considered if the sampling plan is updated in the future.

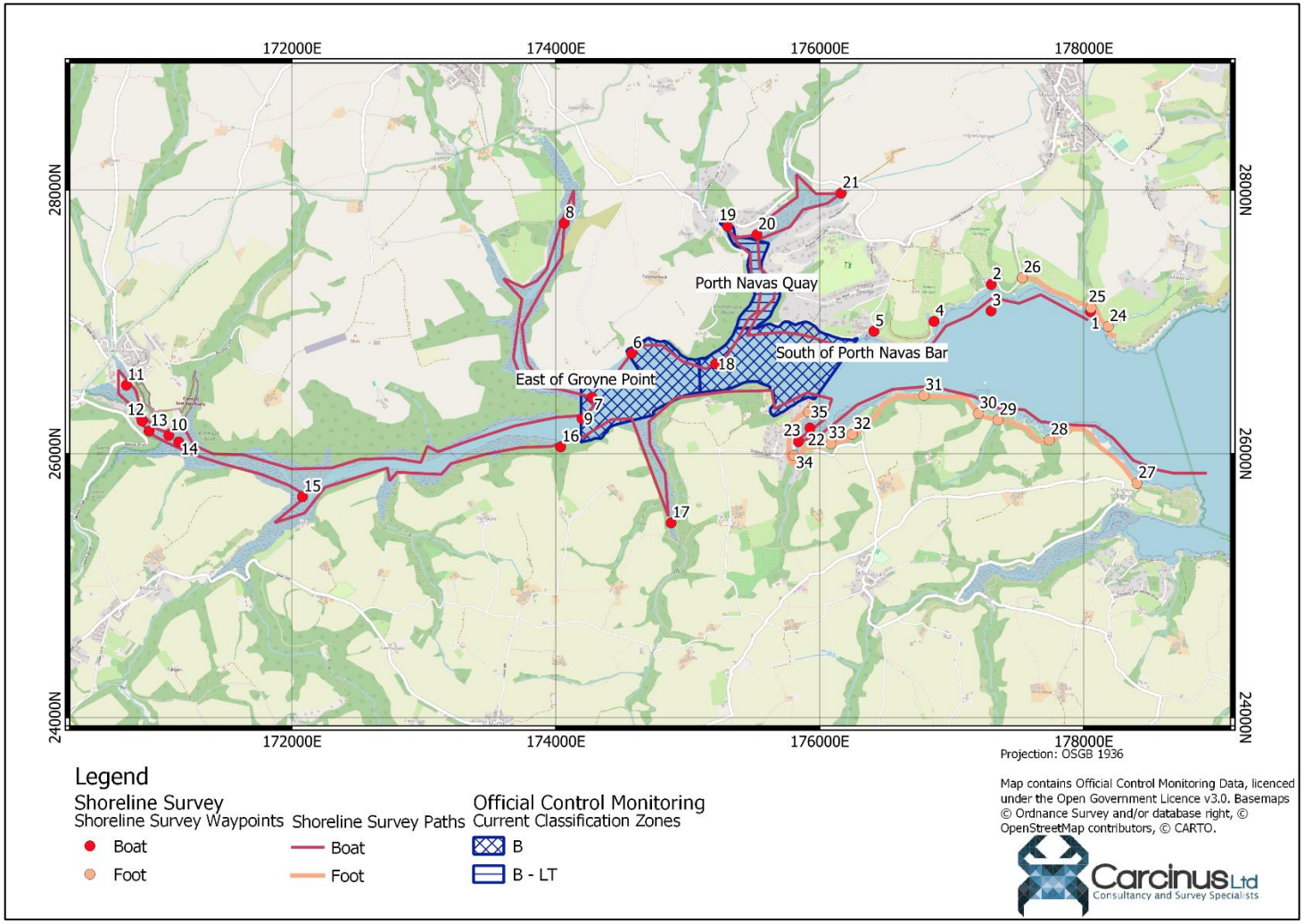


Figure I Locations of shoreline observations. See Table I for details.

Table I Details of shoreline observations.

GPS ID	Date & Time	Observation ID	Latitude	Longitude	Image	Description
495	19/03/2024 08:31	1	50.10221	-5.10511	Figure III	Port Saxon beach. Dogs present. Outfall - WS01
496	19/03/2024 08:42	2	50.10378	-5.11571	Figure IV	Durgan beach outfall - WS02
497	19/03/2024 08:46	3	50.10198	-5.11562	Figure V	Durgan. Moorings. 1 boat in residence. WS03
498	19/03/2024 08:53	4	50.1011	-5.12162	Figure VI	Trebah garden. Private beach. Outfall. WS04
499	19/03/2024 09:04	5	50.10026	-5.12794	Figure VII	Ferry boat inn. Helford Passage. WS05
500	19/03/2024 09:19	6	50.09807	-5.15345	Figure VIII	Suspected land runoff (No access) WS06
501	19/03/2024 09:24	7	50.09495	-5.15745	Figure IX	East of Groyne Point RMP WS07
502	19/03/2024 09:40	8	50.10673	-5.16119	Figure X	Scott's Quay – Polwheveral Creek. WS08
503	19/03/2024 09:56	9	50.09347	-5.15841	No photo	Seal Swimming
504	19/03/2024 10:18	10	50.09113	-5.20205	Figure XI	Cornwall Seal Sanctuary. Sheep in field behind. 2 pipes in water.
505	19/03/2024 11:28	11	50.09443	-5.20677	Figure XII	WS09 Constantine quay boatyard (within the vicinity of Gweek Bovis STW)
506	19/03/2024 11:56	12	50.09204	-5.20493	Figure XIII	WS10 outfall Cornish sea salt
507	19/03/2024 12:02	13	50.09138	-5.20416	Figure XIV	Pipes (no flow) Downstream of Gweek wharf.
508	19/03/2024 12:08	14	50.09073	-5.20096	Figure XV	WS11 mouth of inlet

GPS ID	Date & Time	Observation ID	Latitude	Longitude	Image	Description
509	19/03/2024 12:27	15	50.08735	-5.18763	Figure XVI	WS12 Mouth of channel downstream. Mawgan Creek
510	19/03/2024 12:43	16	50.09149	-5.16055	Figure XVII	WS13 stream in small bay
511	19/03/2024 13:01	17	50.08663	-5.14853	Figure XVIII	WS14 Upstream of Frenchman's Creek
512	19/03/2024 13:13	18	50.09758	-5.14454	Figure XIX	WS15 Pedn billy RMP
513	19/03/2024 13:24	19	50.10699	-5.14388	Figure XX	WS16 Upstream end of Porth Navas Creek
514	19/03/2024 13:29	20	50.10651	-5.14074	Figure XXI	WS17 Porth Navas Creek RMP
515	19/03/2024 13:42	21	50.10957	-5.13201	Figure XXII	WS18 Upstream of Anna Meris Creek (boats)
516	19/03/2024 13:59	22	50.09348	-5.13426	Figure XXIII	WS19 Helford STW outfall (no sign of pipe)
517	19/03/2024 14:05	23	50.09253	-5.13542	Figure XXIV	WS20 Upstream Helford Creek
518	19/03/2024 16:50	24	50.10125	-5.10316	Figure XXV	WS21 Stream from field
519	19/03/2024 16:57	25	50.10247	-5.10507	Figure XXVI	WS22 outfall on beach
520	19/03/2024 17:08	26	50.10433	-5.11247	Figure XXVII	Road drainage no sample
521	20/03/2024 09:27	27	50.09066	-5.09943	Figure XXVIII	Approx 40 cows in field
522	20/03/2024 09:45	28	50.09336	-5.1089	Figure XXIX	Stream to cove no sample
523	20/03/2024 09:53	29	50.09458	-5.11441	Figure XXX	Stream to cove no sample

GPS ID	Date & Time	Observation ID	Latitude	Longitude	Image	Description
524	20/03/2024 09:57	30	50.09496	-5.11652	Figure XXXI	Stream no sample
525	20/03/2024 10:07	31	50.09604	-5.12234	Figure XXXII	Stream on cliffside no sample
526	20/03/2024 10:21	32	50.09319	-5.12976	Figure XXXIII	Stream on road no sample
527	20/03/2024 10:25	33	50.09247	-5.13198	Figure XXXIV	Stream not enough flow
528	20/03/2024 10:38	34	50.09159	-5.13585	Figure XXXV	No sign of ford Pumping station
529	20/03/2024 10:49	35	50.09459	-5.13449	Figure XXXVI	Horse

Table II Water sample E. coli results.

Water Sample No.	Observation ID	Date/Time	NGR	*E. coli* (CFU/100 ml)
WS01	1	19/03/2024 08:31	SW7805327084	60
WS02	2	19/03/2024 08:38	SW7730327290	70
WS03	3	19/03/2024 08:46	SW7730027090	10
WS04	4	19/03/2024 08:52	SW7686727010	70
WS05	5	19/03/2024 09:00	SW7641226935	10
WS06	6	19/03/2024 09:19	SW7457826768	60
WS07	7	19/03/2024 09:23	SW7427726434	30
WS08	8	19/03/2024 09:37	SW7406527755	600
WS09	11	19/03/2024 11:22	SW7074726526	1100
WS10	12	19/03/2024 11:53	SW7086826255	800
WS11	14	19/03/2024 12:08	SW7114526097	2900
WS12	15	19/03/2024 12:27	SW7208325681	530
WS13	16	19/03/2024 12:44	SW7403326051	30
WS14	17	19/03/2024 13:01	SW7487525482	1300
WS15	18	19/03/2024 13:12	SW7521226687	10
WS16	19	19/03/2024 13:23	SW7530427732	450
WS17	20	19/03/2024 13:28	SW7552627668	280
WS18	21	19/03/2024 13:42	SW7616427982	190
WS19	22	19/03/2024 14:00	SW7592226193	50
WS20	23	19/03/2024 14:06	SW7584126018	160
WS21	24	19/03/2024 16:51	SW7818826971	190
WS22	25	19/03/2024 17:00	SW7805727113	140

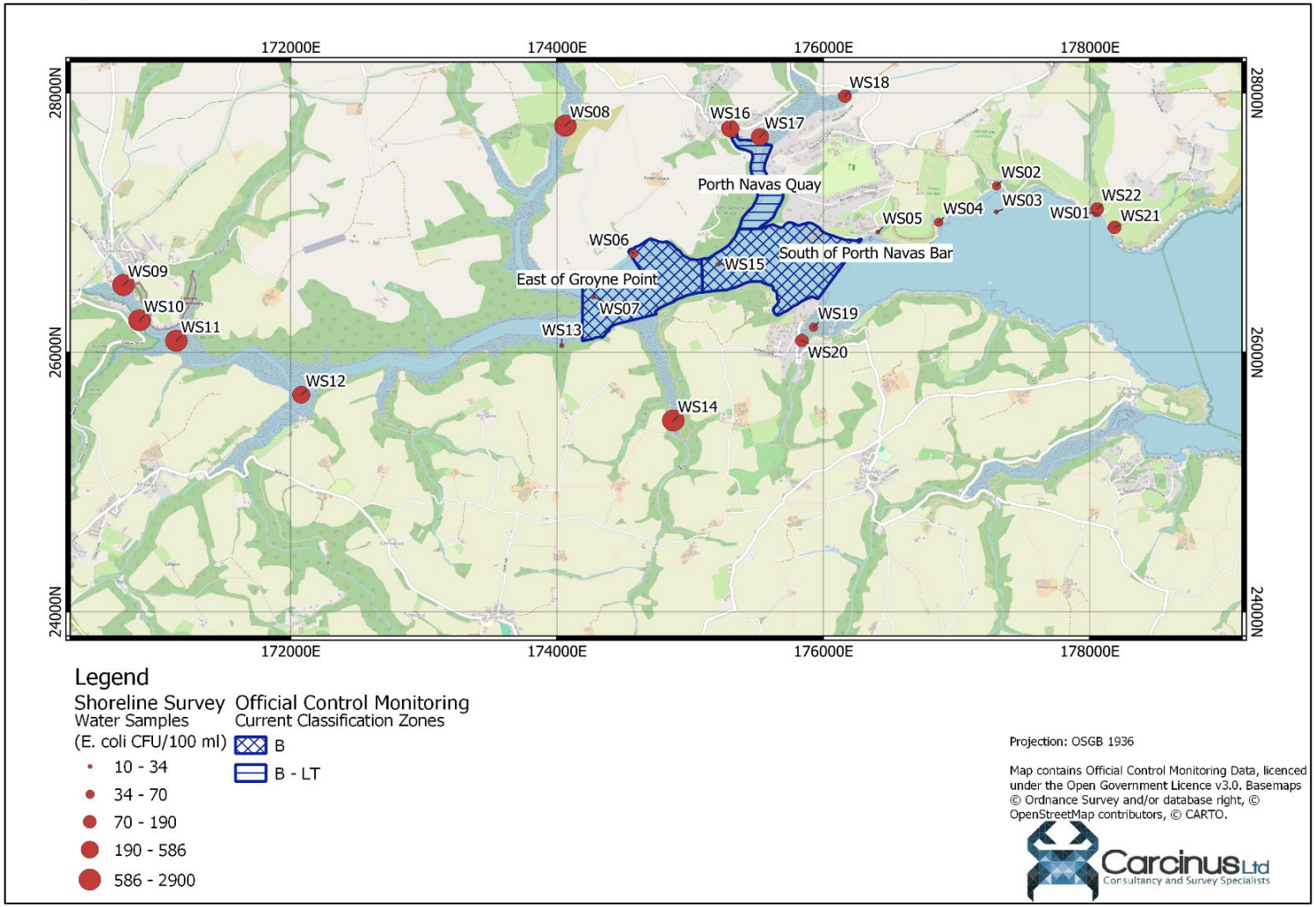


Figure II Water sample results.

Images

Figure III Port Saxon beach. Dogs present. Outfall. (ID 1: WS01)

Figure IV Durgan beach outfall. (ID 2: WS02)

Figure V Durgan. Moorings. 1 boat in residence. (ID 3: WS03)

Figure VI Trebah garden. Private beach. Outfall. (ID 4: WS04)

Figure VII Ferry boat inn. Helford Passage. (ID 5: WS05)

Figure VIII Suspected land runoff (No access) (ID 6: WS06)

Figure IX East of Groyne Point RMP (ID 7: WS07)

Figure X Scott's Quay – Polwheveral Creek. (ID 8: WS08)

Figure XI Cornwall Seal Sanctuary. Sheep in field behind. 2 pipes in water (ID 10)

Figure XII Constantine quay boatyard (ID 11: WS09)

Figure XIII Outfall Cornish sea salt (ID 12: WS10)

Figure XIV Pipes (no flow) Downstream of Gweek wharf (ID 13)

Figure XV Mouth of inlet (ID 14: WS 11)

Figure XVI Mouth of channel downstream. Mawgan Creek (ID 15: WS12)

Figure XVII Stream in small bay (ID 16: WS 13)

Figure XVIII Upstream of Frenchman's Creek (ID 17: WS 14)

Figure XIX Pedn Billy RMP (ID 18: WS 15)

Figure XX Upstream end of Porth Navas Creek (ID 19: WS 16)

Figure XXI Porth Navas Creek RMP (ID 20: WS 17)

Figure XXII Upstream of Anna Meris Creek (boats) (ID 21: WS 18)

Figure XXIII Helford STW outfall (no sign of pipe) (ID 22: WS 19)

Figure XXIV Upstream Helford Creek (ID 23: WS 20)

Figure XXV Stream from field (ID 24: WS 21)

Figure XXVI Outfall on beach (ID 25: WS 22)

Figure XXVII Road drainage no sample (ID 26)

Figure XXVIII Approx 40 cows in field (ID 27)

Figure XXIX Stream to cove no sample (ID 28)

Figure XXX Stream to cove no sample (ID 29)

Figure XXXI Stream no sample (ID 30)

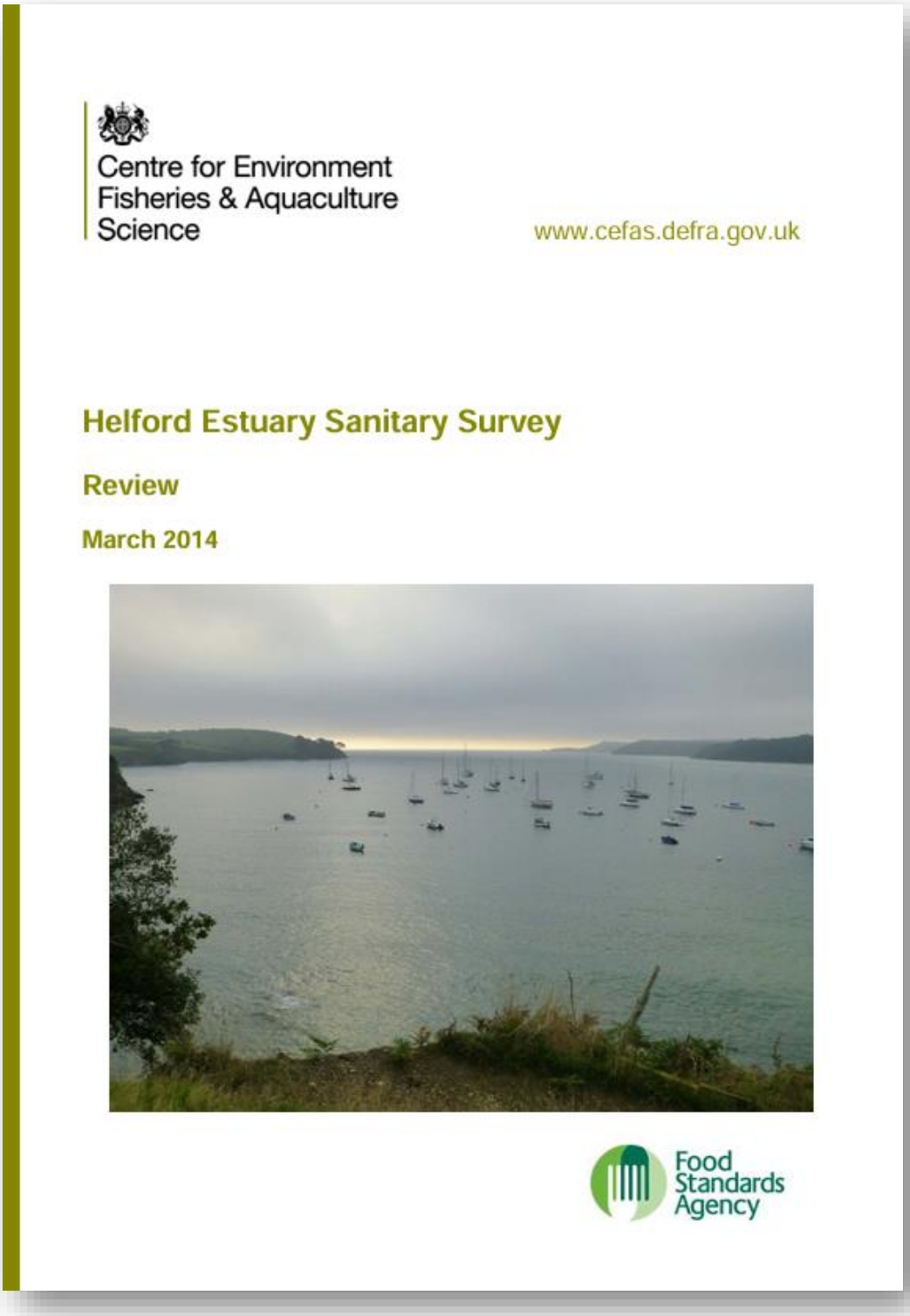
Figure XXXII Stream on cliffside no sample (ID 31)

Figure XXXIII Stream on road no sample (ID 32)

Figure XXXIV Stream not enough flow (ID 33)

Figure XXXV No sign of Ford Pumping station (ID 34)

Figure XXXVI Horse (ID 35)



Follow hyperlink in image to view full report.

About Carcinus Ltd

Carcinus Ltd is a leading provider of aquatic environmental consultancy and survey services in the UK.

Carcinus was established in 2016 by its directors after over 30 years combined experience of working within the marine and freshwater environment sector. From our base in Southampton, we provide environmental consultancy advice and support as well as ecological, topographic and hydrographic survey services to clients throughout the UK and overseas.

Our clients operate in a range of industry sectors including civil engineering and construction, ports and harbours, new and existing nuclear power, renewable energy (including offshore wind, tidal energy and wave energy), public sector, government, NGOs, transport and water.

Our aim is to offer professional, high quality and robust solutions to our clients, using the latest techniques, innovation and recognised best practice.

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Environmental Consultancy

Carcinus provides environmental consultancy services for both freshwater and marine environments. Our freshwater and marine environmental consultants provide services that include scoping studies, Environmental Impact Assessment (EIA) for ecological and human receptors, Habitats Regulations Appraisal (HRA), Water Framework Directive (WFD) assessments, project management, licensing and consent support, pre-dredge sediment assessments and options appraisal, stakeholder and regulator engagement, survey design and management and site selection and feasibility studies.

Ecological and Geophysical Surveys

Carcinus delivers ecology surveys in both marine and freshwater environments. Our staff are experienced in the design and implementation of ecological surveys, including marine subtidal and intertidal fish ecology and benthic ecology, freshwater fisheries, macro invertebrate sampling, macrophytes, marine mammals, birds, habitat mapping, River Habitat Surveys (RHS), phase 1 habitat surveys, catchment studies, water quality and sediment sampling and analysis, ichthyoplankton, zooplankton and phytoplankton.

In addition, we provide aerial, topographic, bathymetric and laser scan surveys for nearshore, coastal and riverine environments.

Our Vision

"*To be a dependable partner to our clients, providing robust and reliable environmental advice, services and support, enabling them to achieve project aims whilst taking due care of the sensitivity of the environment".*