Sanitary Survey- Review

Brancaster – 2023

Document No. – *J0591/23/06/20*

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Client	Food Standards Agency (FSA)
Project Title	Sanitary Survey Review
Document Title	Sanitary Survey Review of Brancaster
Document Number	J0591/23/06/20
Revision	3.0
Date	18 September 2023

Revisions

Revision No.	Date	Comment
0.1	26 June 2023	Draft for internal review
1.0	26 June 2023	Draft for client review
2.0	11 August 2023	Draft for secondary consultation
3.0	18 September 2023	Final

Document QA and Approval

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Initial Consultation

Consultee	Date of consultation
Kings Lynn and West Norfolk Borough Council	May 2023
Environment Agency	May 2023
Eastern Inshore Fisheries and Conservation Authority	May 2023
Brancaster Staithe Fisherman's Society	May 2023

Consultation on draft report

Consultee	Date of consultation
Kings Lynn and West Norfolk Borough Council	August 2023
Eastern Inshore Fisheries and Conservation Authority	August 2023

A sanitary survey relevant to the bivalve mollusc beds in Brancaster was undertaken in 2014 in accordance with Regulation (EC) 854/2004 (which was replaced by retained EU Law Regulation (EU) 2017/625, with sanitary survey requirements now specified in retained EU Law Regulation (EU) 2019/627). This provided appropriate hygiene classification zoning and monitoring plan based on the best available information with detailed supporting evidence.

In line with regulatory and EU guidance the Food Standards Agency undertake targeted sanitary survey reviews to ensure public health protection measures continue to be appropriate. This report provides a review of information and recommendations for a revised sampling plan if required. Carcinus Ltd. (Carcinus) undertook this work on behalf of the FSA. Carcinus Ltd accepts no liability for any costs, losses or liabilities arising from the reliance upon or use of the contents of this report other than by its client.

Dissemination

Food Standards Agency, Kings Lynn and West Norfolk Borough Council. The report is publicly available via the Carcinus Ltd. website.

Recommended Bibliographic Citation:

Carcinus Ltd., 2023. Review of the Brancaster 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 retained EU Law Regulation (EU) 2019/627.

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1 Introduction

1.1 Background

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

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

1.2 Brancaster Review

This report reviews information and makes recommendations for a revised sampling plan for existing mussel (*Mytilus* spp.), Pacific oyster (*Crassostrea gigas*) and cockle (*Cerastoderma edule*) classification zones in the Brancaster BMPA (Figure 1.1). This review explores any changes to the main microbiological contamination sources that have taken place since the original sanitary survey was conducted and their impact on the classified shellfishery. Data for this review was gathered through a desk-based study and consultation with stakeholders.

An **initial consultation** with Local Authorities (LAs), Inshore Fisheries and Conservation Authorities (IFCAs) and the Environment Agency (EA) responsible for the production area was undertaken in May 2023. 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 August 2023. It is recognised that dissemination and inclusion of a wider stakeholder group, including local industry, is essential to sense-check findings and strengthen available evidence. The draft report is reviewed taking into account the feedback received.

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

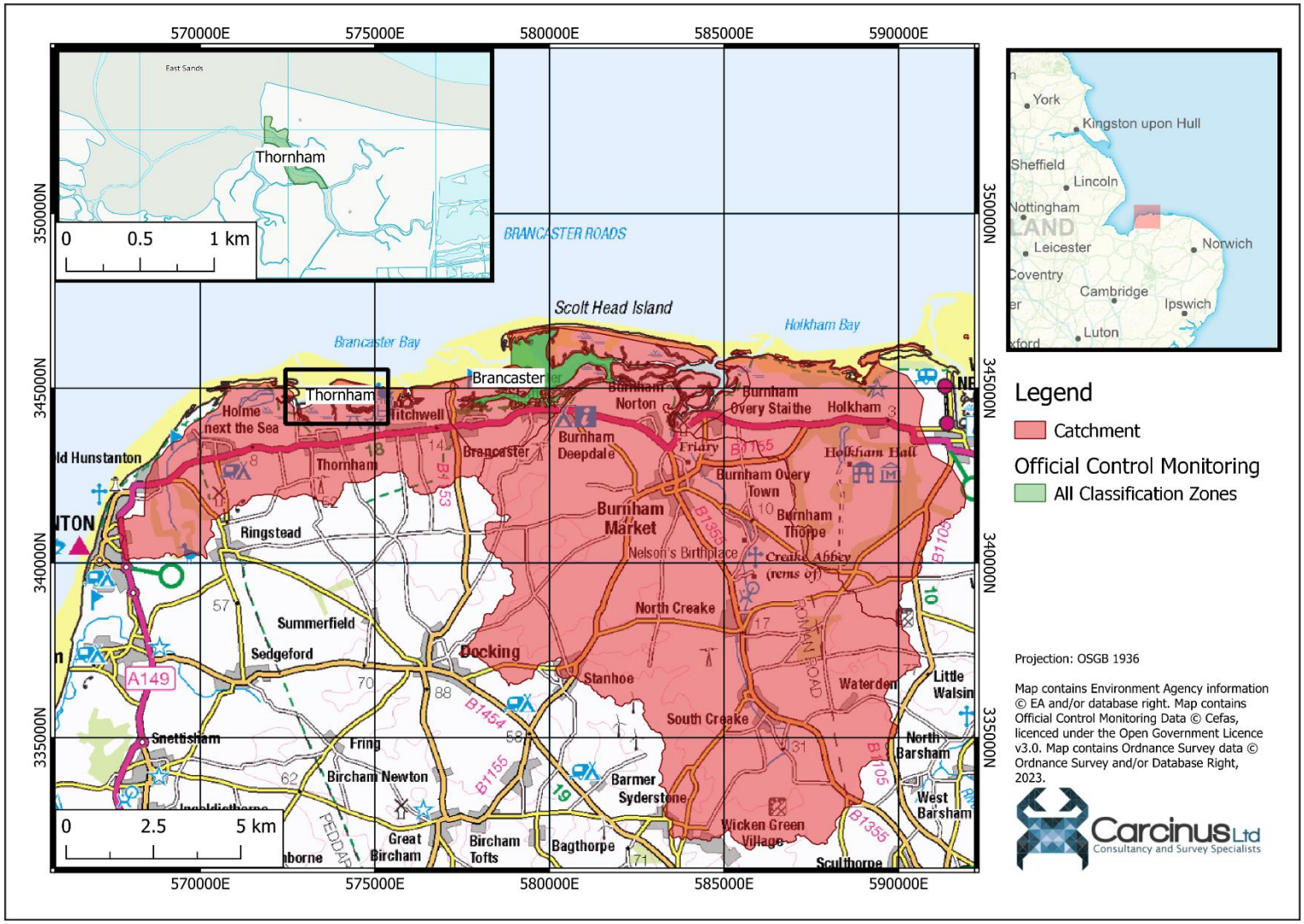


Figure 1.1 Location of the Brancaster BMPA. Inset map shows the location of Thornham Harbour.

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 May 2023;
- Only information that may impact on the microbial contamination was considered for this review; and
- Official Control monitoring data have been provided through a request to Cefas, with no additional verification of the data undertaken. The data are also available on the Cefas data hub[1]. Results up to and including May 2023 have been used within this study. Any subsequent samples have not been included.

2 Shellfisheries

2.1 Description of Shellfishery

The Brancaster BMPA is situated on the north Norfolk Coast, and comprises three main waterbodies, Thornham Harbour, Brancaster Harbour and Overy Creek (the latter two of which are connected via Norton Creek). The Wash BMPA (Cefas Reference: M004) is located approximately 10 km to the west, and the Blakeney BMPA (M006) is situated 10 km east.

The Local Enforcement Authority (LEA) responsible for this fishery in terms of food hygiene Official Control purposes (including sampling) is the Borough Council of Kings Lynn and West Norfolk (BCKLWN). The authors of this review understand that the fishery within Brancaster Harbour is managed by a cooperative, the Brancaster Staithe Fisherman's Society (BSFS), who allocate plots to individual fishermen. The fishery outside of Brancaster Harbour is within the Eastern Inshore Fishery and Conservation Authority's (E-IFCA) jurisdiction. Several E-IFCA byelaws apply to the cultivation of shellfish within the Brancaster BMPA (E-IFCA, 2020):

- Byelaw 3: *"No person shall fish for oysters, mussels, cockles, clams, scallops or queens except by hand or with a hand rake…".*
- Byelaw 4: *"No person shall remove from any fishery, or from one part of a fishery to another part thereof, any mussel (Mytilus edulis) less than 50 mm in length…".*
- Byelaw 8: *"The Committee may, for the purpose of protection of the fishery, fishery management and controlling the level of exploitation, and after consultation with persons or bodies appearing to them to represent local fisheries interests, close for a specifiable period any shellfish fishery, or part thereof, provided the Committee has been advised by fishery scientists who appear to them to be suitably qualified, as to the need for such action…".*

[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/.

During secondary consultation, the Food Business Operator (FBO) advised that the fishery within Brancaster Harbour is owned by the National Trust and is leased to the BSFS, and is not subject to E-IFCA byelaws.

The 2014 Sanitary Survey gave recommendations for the creation of Classification Zones for mussels, Pacific oysters and cockles, within the Brancaster and Thornham Harbours. There are currently active Classification Zones for all three species within Brancaster Harbour. A summary of the fishery for each species is summarised in the sections below.

2.1.1 Mussels

The 2014 Sanitary Survey describes that the fishery for mussels in the Brancaster area is a bed culture of seed stocks that are collected off the north Norfolk coast and ongrown in the lower intertidal and shallow subtidal. The initial consultation response from the Food Business Operator (FBO) states that the species continues to be harvested by hand, and the seed mussel stock originates from the North Norfolk Coast and The Wash. The 2014 Sanitary Survey recommended the creation of two Classification Zones for this species, *Brancaster Inner* and *Brancaster Outer*, but there is currently only one large CZ, *Brancaster*, classified.

No conservation controls other than the 50 mm minimum landing size apply. The current output (tonnage harvested) of this fishery is unknown.

2.1.2 Pacific oyster

The 2014 Sanitary Survey describes that Pacific oysters are cultured on trestles from (generally) triploid hatchery seed. The initial consultation response from the Food Business Operator (FBO) states that the species continues to be harvested by hand. The 2014 Sanitary Survey recommended the creation of three Classification Zones for this species, *Brancaster Inner*, *Brancaster Outer* and *Thornham*. The *Thornham* CZ was declassified in 2019, but an application to reclassify this CZ was received in May 2023 and so is included in this review. The area covered by the *Brancaster Inner* and *Brancaster Outer* CZs is currently covered by a single, large CZ, *Brancaster*.

There are no minimum landing sizes, close seasons or other conservation controls for the harvest of this species. The current output (tonnage harvested) of this fishery is unknown, as neither the LEA, E-IFCA or FBO were able to provide the details during consultation.

2.1.3 Cockles

The 2014 Sanitary Survey describes that the cockle fishery within the Brancaster BMPA is based on transplanted cockles from The Wash shellfishery, which are then ongrown. Harvesting of this species continues to be by hand, but based on information provided during initial consultation, we understand that this is a minority fishery within the BMPA. There is currently one CZ for this species, *Brancaster* and continued classification is required.

2.1.4 Other Species

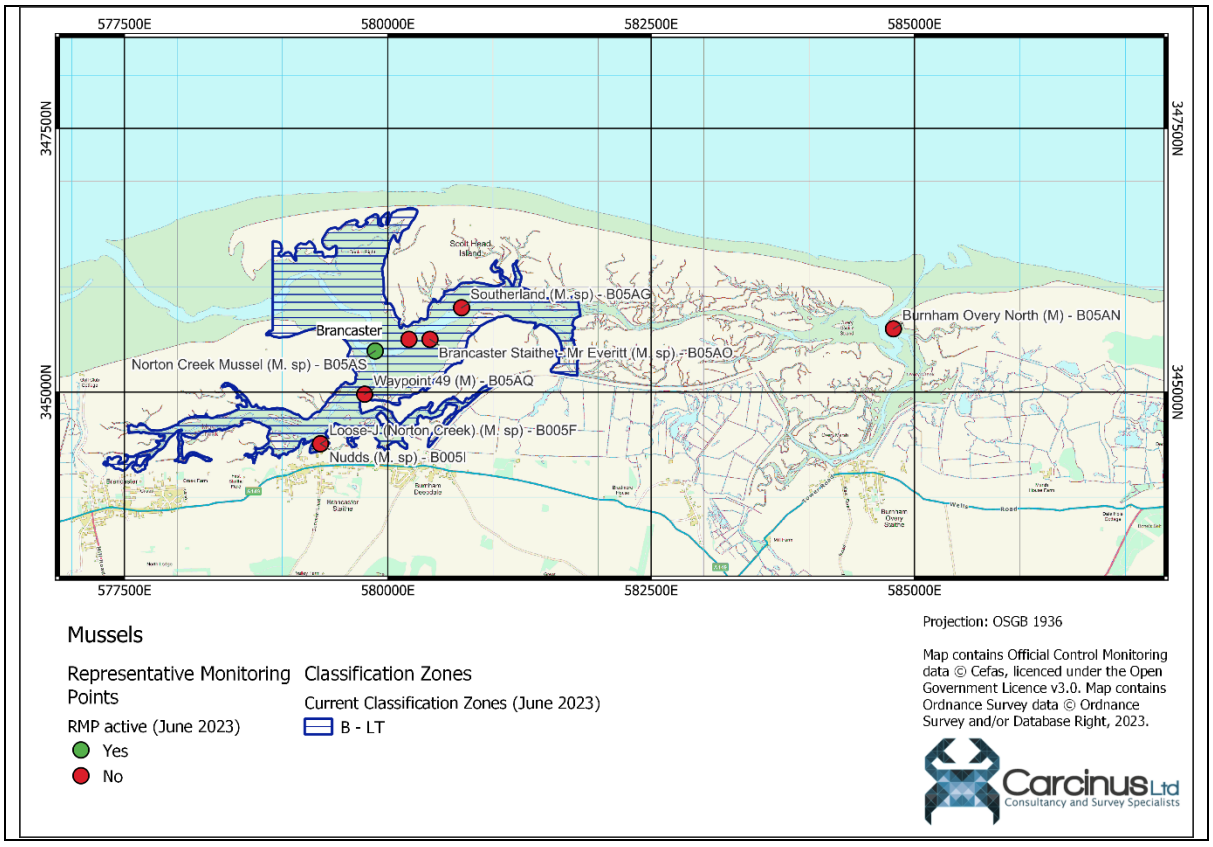
There are no bivalve species relevant to Official Control monitoring with suitable stocks for harvest or classification within the Brancaster BMPA.

2.2 Classification History

The 2014 Sanitary Survey recommended the creation of seven Classification Zones within the Brancaster BMPA, two each for Pacific oysters, mussels and cockles within Brancaster Harbour, and a single Pacific oyster Classification Zone within Thornham Harbour. There are currently three active Classification Zones within this BMPA, one each for Pacific oysters, mussels and cockles within Brancaster Harbour, as well as an application for reclassification of the Pacific oyster Classification Zone within Thornham Harbour, which has been declassified since 2019. The location and classification status of all active CZs, along with all RMPs sampled in the area since 2010, are presented in Table 2.1 and Figure 2.1.

Table 2.1 Summary of all currently active Classification Zones in the Brancaster BMPA.

Classification Zone	Species	Current Classification (As of June 2023)
Brancaster	Mussels	B-LT
	Pacific oysters	B-LT
	Cockles	B-LT
Thornham	Pacific oysters	N/A (application submitted in May 2023)



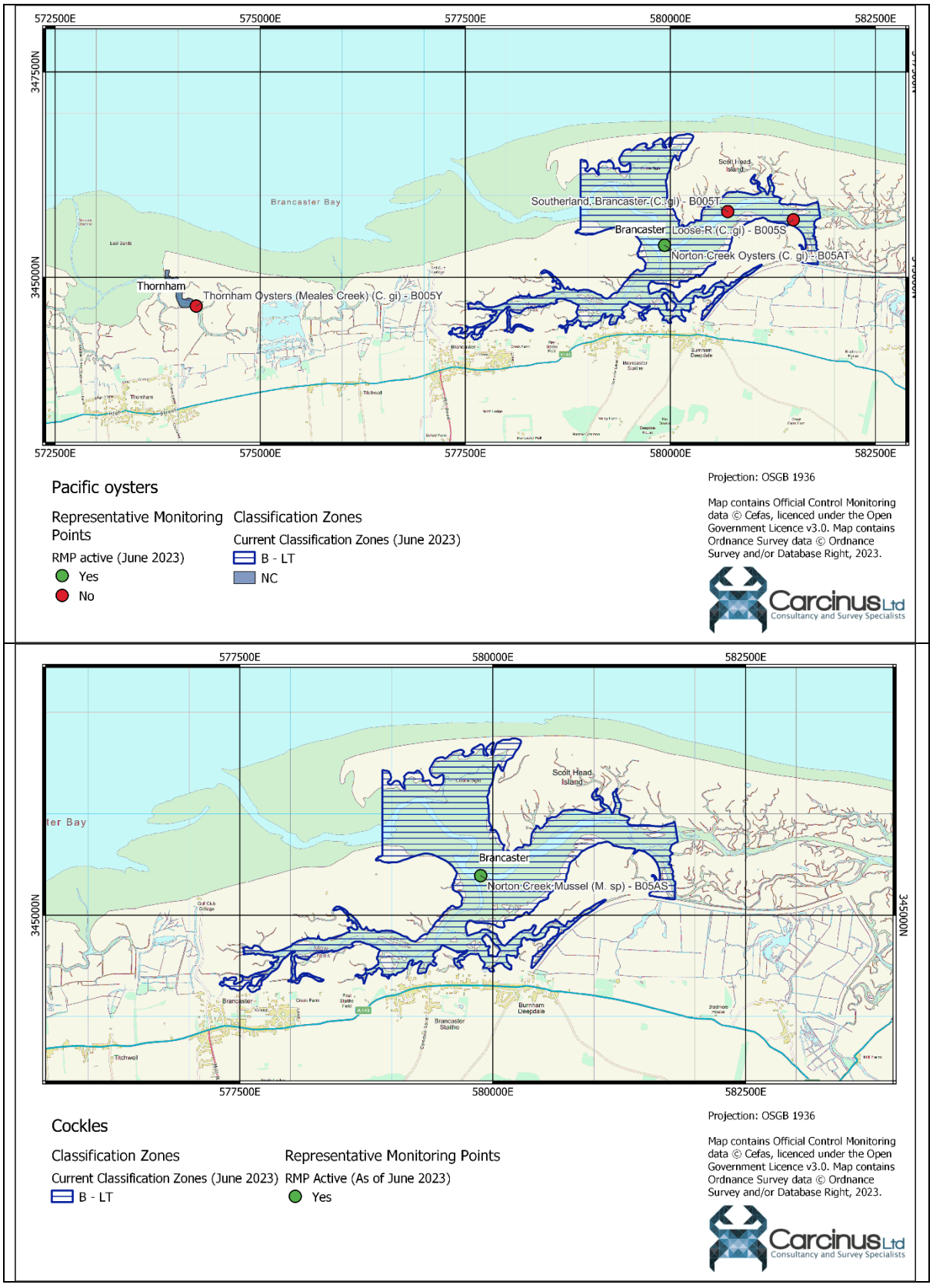


Figure 2.1 Current Classification Zones and associated Representative Monitoring Points in the Brancaster BMPA.

3 Pollution sources

3.1 Human Population

The 2014 Sanitary Survey cites population data for the catchment based on the 2011 Census of the United Kingdom. A subsequent Census was undertaken in 2021, and so the results of these two surveys have been compared to give an indication of population trends across the catchment in the last 10 years. Changes in human population density within Census Super Output Areas (lower layer) in the Brancaster catchment between 2011 and 2021 are shown in Figure 3.1.

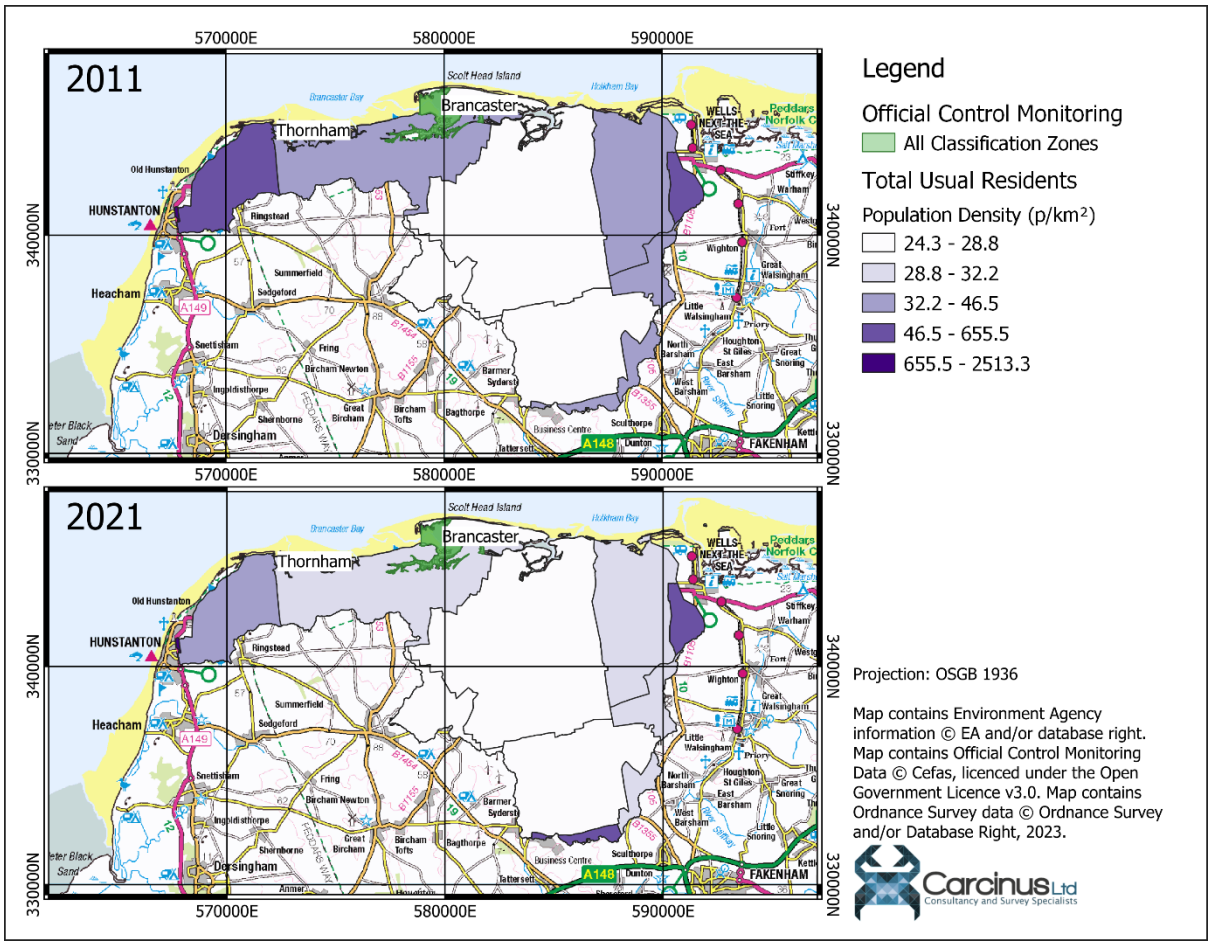


Figure 3.1 Human population density in Census Super Output areas (lower layer) wholly or partially contained within the Brancaster catchment at the 2011 and 2021 Censuses.

Figure 3.1 shows that the majority of the catchment is predominantly rural, with much of the catchment having population densities of less than 40 persons per km². The main population centres continue to be Hunstanton in the west of the catchment and Wells-next-the-Sea in the east of the catchment, though only a proportion of these conurbations are within the Brancaster catchment. At the 2011 Census, the population in Census Super Output Areas (lower layer) wholly or partially contained within the Brancaster catchment was 23,696. By the 2021 Census, the population had increased to 24,733, an increase of 4.38%. The Shellfish Water Action Plan for the Thornham Harbour and Norton Creek

Shellfish Water, published in 2021 by the Environment Agency, classifies the contribution of diffuse urban contamination as being 'low'[2], and the findings of this study support this assessment. BCKLWN provide an interactive map of the planning policies specified in their Local Plan, which indicates that there are few small parcels of land near the Brancaster BMPA designated for housing development, but these areas are only 1.2 Ha combined (BKLWN, 2023). The risk of urban diffuse contamination is not expected to increase significantly in the coming years.

The 2014 Sanitary Survey states that in 2010, approximately 694,000 trips were made to North Norfolk, with a total of 2.4 million nights stayed. Data from 2021 indicate that there were 1,765,000 overnight stays (although the publishers of these statistics note that the impact of the Covid-19 Pandemic is still being felt, as the number of stays in 2019 was 2,474,000) (Destination Research, 2023). Whilst both sets of statistics are for the whole of Norfolk, the data do show that there will be a seasonal fluctuation in population size, with highest numbers in summer months. An increase in population would be expected to increase the loading to the wastewater treatment network. During initial consultations, it was stated that many people chose to work from their second homes during the Covid-19 Pandemic, but that sampling results during this time were good. This suggests that the existing network has sufficient capacity to handle an increase in population size. Full details of the changes to the wastewater treatment network are discussed in the next section.

Analysis of changes to Census data for the catchment suggests that the area continues to be very rural, with a low risk of contamination from urban sources as the main population centres are in the far west and east of the catchment. Overall, the recommendations made in the 2014 Sanitary Survey to account for the impact of human populations remains valid.

3.2 Sewage

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

[2] Low contribution: estimated to account for less than 10% of contamination affecting a particular shellfish water.

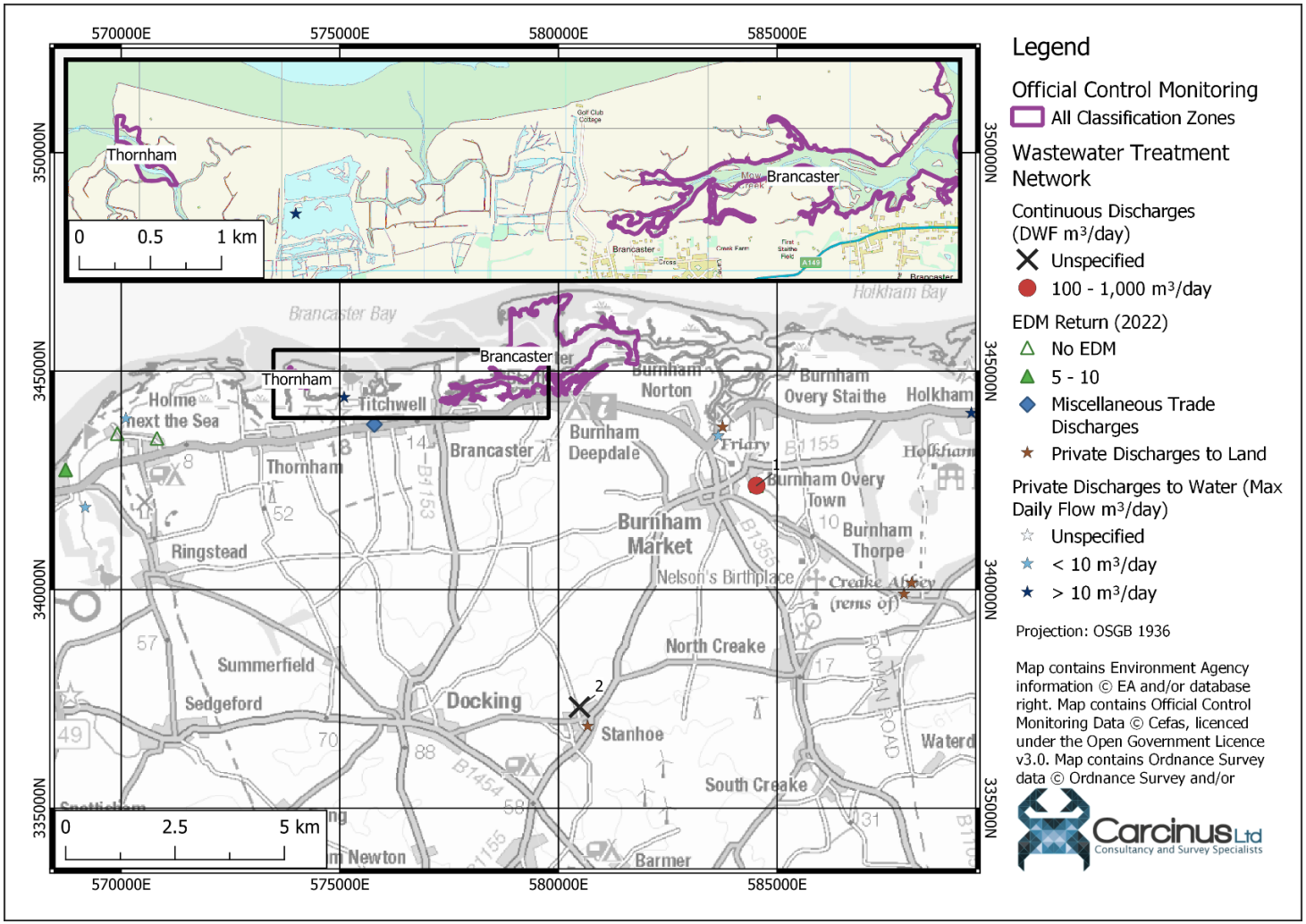


Figure 3.2 Locations of all consented discharges in the vicinity of the Brancaster catchment. Details of continuous discharges are provided in Table 3.1.

Table 3.1 Details of all continuous discharges in the vicinity of the Brancaster BMPA.

ID	Discharge Name	Receiving Water	Outlet NGR	Treatment	Dry Weather Flow (m^3/day)	Distance from centre of nearest CZ (km)
1	BURNHAM MARKET WATER RECYCLING CTR	THE RIVER BURN	TF 84530 42380	UV DISINFECTION	780	5.86
2	PREMISES REAR 1 STATION ROAD	GW VIA INFILTRATION SYSTEM	TF 80480 37310	BIODISC	Unspecified	8.23

The 2014 Sanitary Survey describes that the main water company discharge in the catchment is Burnham Market STW, which was upgraded to receive UV disinfection in 2013. The consented discharge volume from this outfall has reduced from 838 m^3/day to 780 m^3/day, although as the outfall is nearly 6 km from the centre of the *Brancaster* CZ, the overall impact of this discharge continues to be minimal. The other discharge in the vicinity of the BMPA, Premises to the rear of 1 Station Road does not have a consented Dry Weather Flow, but the database lists the Maximum Flow from this outfall as 11 m^3/day. This discharge is considered to have no impact on the bacteriological health of the BMPA, given the distance and small consented discharge volume.

In addition to the water company owned discharges, the 2013 Sanitary Survey identified a total of five intermittent discharges. Intermittent discharges comprise Combined Storm Overflows (CSOs), Storm Tank Overflows (STOs) and Pumping Station Emergency Overflows (PSs). During AMP6 and AMP7, Event Duration Monitoring (EDM) was installed at several of the discharges within the catchment. Summary data for 2020, 2021 and 2022 was published by the Environment Agency in March 2021, March 2022 and March 2023 respectively (Environment Agency, 2022). Details of this EDM return for intermittent discharges in the vicinity of the Brancaster BMPA for 2022 are presented in Appendix I.a.

The 2014 Sanitary Survey did not provide any spill information for the intermittent discharges identified in that report, as no data was available. The only intermittent discharge of relevance to the bacteriological water quality of the Brancaster BMPA is the Burnham Market STW Storm Overflow, which spilled 7 times for a total of 4.7 hours in 2022. However, in 2021 this outfall spilled 105 times for a more than 1500 hours. The Shellfish

Water Action Plan for this shellfish water notes that there is likely to be minimal impact of this discharge, as it is nearly 6 km from the nearest CZ. During initial consultations, the EA stated that in 2021, they issued a temporary Local Enforcement Position to allow the Water Company to discharge very dilute sewage directly to the River Burn. This was due to recent high rainfall, high groundwater levels and sewer inundation causing a significant risk of internal property flooding. A plan to reduce inundation was required, but no further information was available to the authors of this review. There are a few intermittent discharges in Old Hunstanton and Holme next the Sea, but these have no connectivity with the Brancaster BMPA.

The Shellfish Water Action Plan identifies that overall, water company discharges will have a 'medium'[3] contribution on the Norton Creek (Brancaster Harbour) Shellfish Water, but that the contribution on the Thornham Harbour Shellfish Water will be 'low'. The findings of this desktop assessment support that conclusion.

In addition to the water company owned infrastructure, there continue to be a few small private discharges in the vicinity of the Brancaster BMPA. Limited details of these discharges can be provided due to data protection requirements, but the assessment of the impact from these discharges is considered to be small compared to other sources of contamination discussed elsewhere in this report.

Overall, the wastewater treatment network of the Brancaster area continues to be relatively sparse, reflecting the small population size. There have been no improvements/upgrades of note to the infrastructure, but the impact continues to be small. No updates to the sampling plan are necessary, as the recommendations made in the 2014 sanitary survey to account for the impact of this source of pollution remains valid.

3.3 Agricultural Sources

The 2014 Sanitary Survey cites livestock population data for the Brancaster catchment areas based on the 2010 Livestock Census. Data at the same spatial resolution was not freely available to the authors of this review, and so a data request was made to the Farming Statistics Office for the Department for Environment, Food and Rural Affairs (DEFRA) for livestock populations within the catchment presented in Figure 1.1 for 2013 and 2021, the next two census years. Figure 3.3 presents the changes in livestock populations within the Brancaster catchment between 2013 and 2021, based on the June Survey of Agriculture and Horticulture[4].

The data presented in Figure 3.3 show that the populations of cattle and pigs increased between 2013 and 2021, but that the populations of the other two groups fell. The data also shows that pigs are the dominant livestock group in terms of population size, with a larger

[3] Medium contribution: estimated to account for 10 – 39% of the contamination affecting a given shellfish water.

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

population than the other three groups combined. It should be noted that the June Survey represents a snapshot of livestock populations in a single day, but populations will vary throughout the year. Highest numbers of animals will occur in spring, following the birthing season, and the lowest in autumn and winter when animals are sent to market.

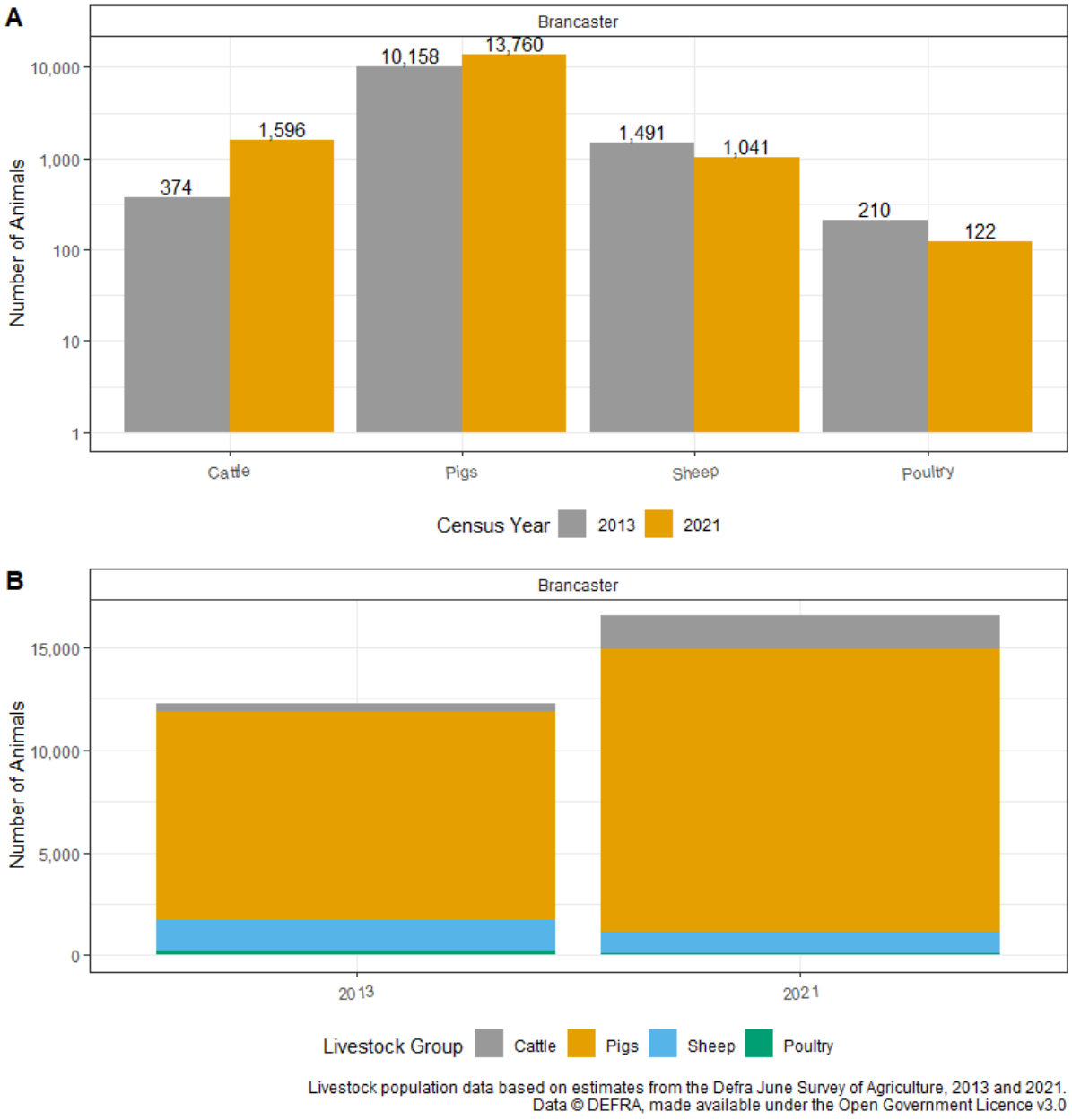


Figure 3.3 Changes in livestock populations within the Brancaster catchment. Panel A shows populations broken down by different livestock groups and panel B shows the aggregated population.

The principal route of contamination of coastal waters by livestock is surface runoff carrying faecal matter. The change in land cover of the Brancaster catchment between 2012 and 2018 is shown in Figure 3.4. Figure 3.5 shows the land cover in 2018 adjacent to the CZs of the Brancaster BMPA.

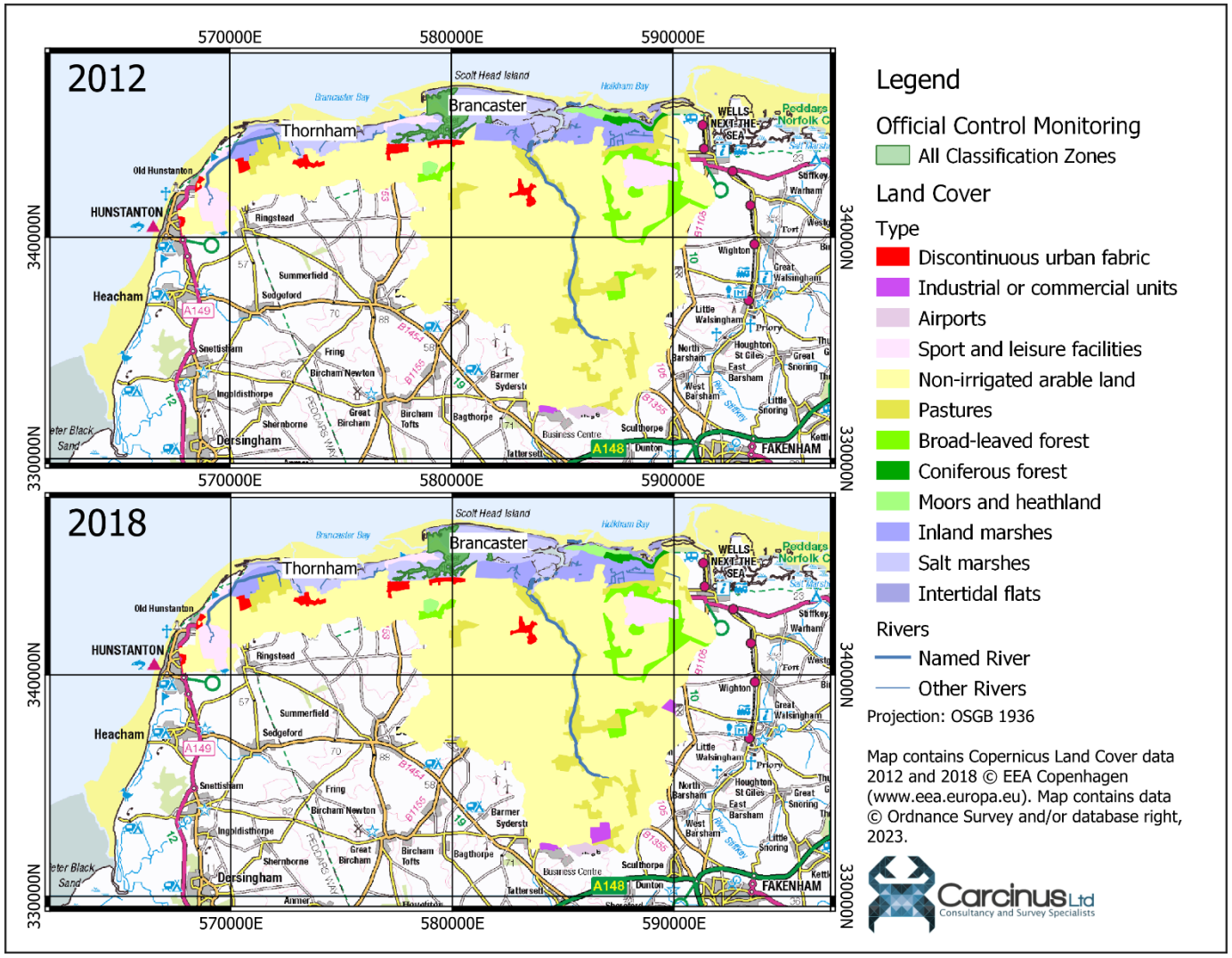


Figure 3.4 Land cover change between 2012 and 2018 for the Brancaster catchment.

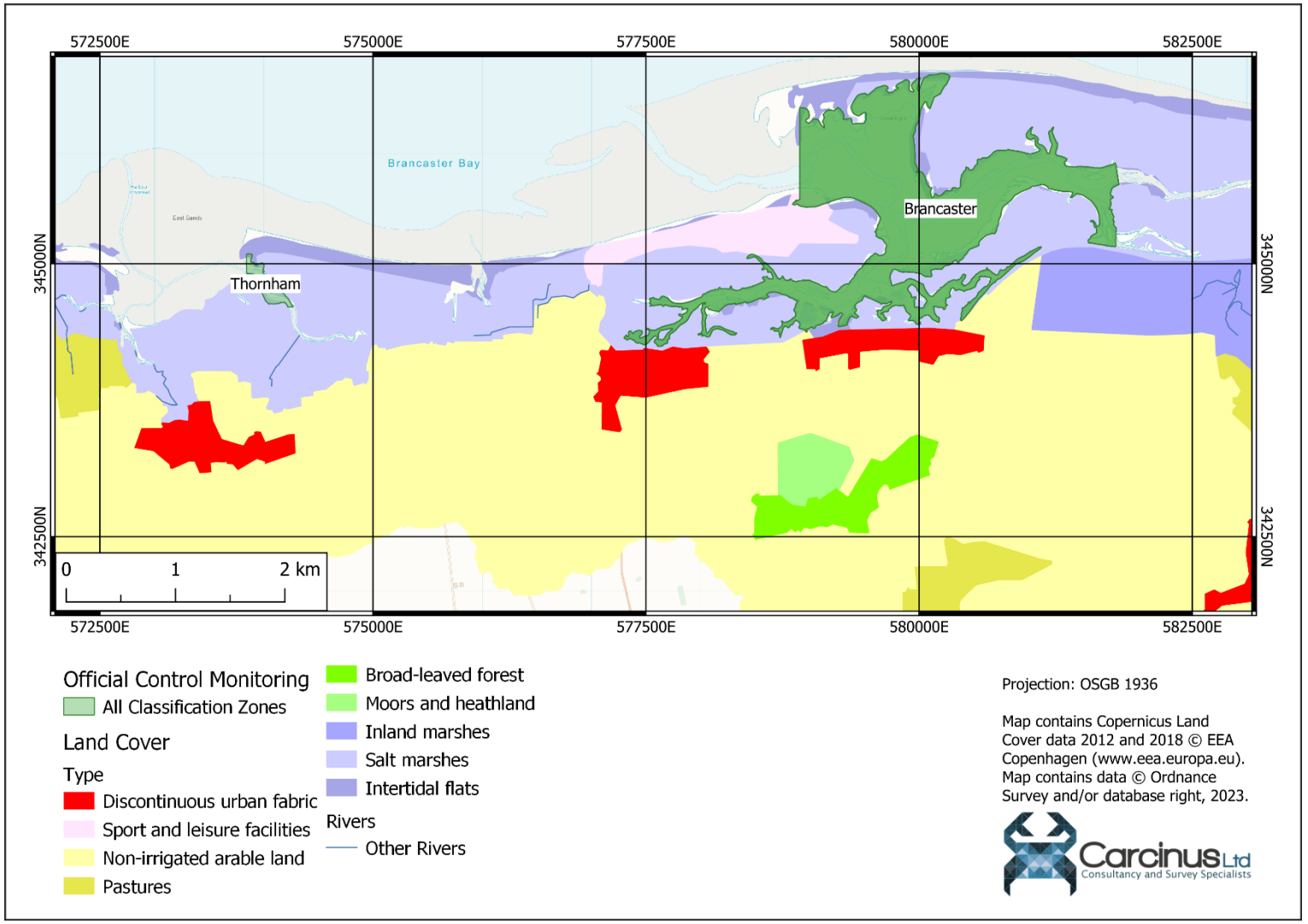


Figure 3.5 Land cover in the vicinity of the Brancaster BMPA in 2018.

Figure 3.4 suggests that the land cover across the catchment remained very similar between 2012 and 2018. It also confirms that the catchment is predominantly rural, with very few urban conurbations and significant areas of arable farmland, with some areas for pasture. The 2014 Sanitary Survey states that there are some fields reserved for grazing that border the rivers of the catchment, and the information presented in Figure 3.4 supports this. 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, but may contribute to background levels of *E.coli*.

Arable farmland can also represent a risk to the bacteriological health of a shellfishery, particularly where slurry is applied to fields, and Figure 3.5 shows that the land immediately adjacent to the CZs in both Brancaster Harbour and Thornham Harbour is arable. 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. During initial Consultation, the EA confirmed that there have been no agricultural-related pollution incidents within 3 km of this BMPA in the last five years.

The Shellfish Action Plan for this area states that agricultural sources have a medium impact on the contamination levels within the BMPA. The findings of this desktop assessment support that conclusion. There has been a small increase in livestock populations since the 2014 Sanitary Survey was published, but large areas of the catchment remain reserved for arable farmland and so there remains risk of agricultural runoff carrying microbiological contamination to the shellfishery. The peak times of year for this source of contamination are likely to be autumn months, due to increased rainfall and application of slurry during these times. The recommendations made in the original sanitary survey to account for this

source of contamination remain valid. It should be noted that stakeholders in the area do not have concerns about this source of contamination within the BMPA.

3.4 Wildlife

The 2014 Sanitary Survey describes that the Brancaster BMPA contains a variety of habitats, including significant areas of sand dune, saltmarsh, coastal lagoons, tidal creeks and mud flats which will attract a variety of wildlife. The 2014 report identifies that the most significant wildlife aggregation in terms of its impact on shellfish hygiene was overwintering waterbirds (waders and wildfowl). This group are important to the bacteriological health of a BMPA given that they frequently forage (and therefore defecate) directly on intertidal shellfish beds.

Figure 3.6 shows the temporal trend in total overwintering waterbird counts from the winter of 2002/2003 – 2021/2022 (the most recent for which data are available). It shows that the dominant group in terms of population size is generally wildfowl, but occasionally waders have a larger population. In the five winters to 2013/14, the average total count of overwintering waterbirds (including gulls/terns) was 189,220 (Holt *et al.*, 2015). In the five winters to 2021/22, the average total count had fallen to 144,651, a decrease of over 23%. However, the area does still support internationally significant populations of more than 10 species.

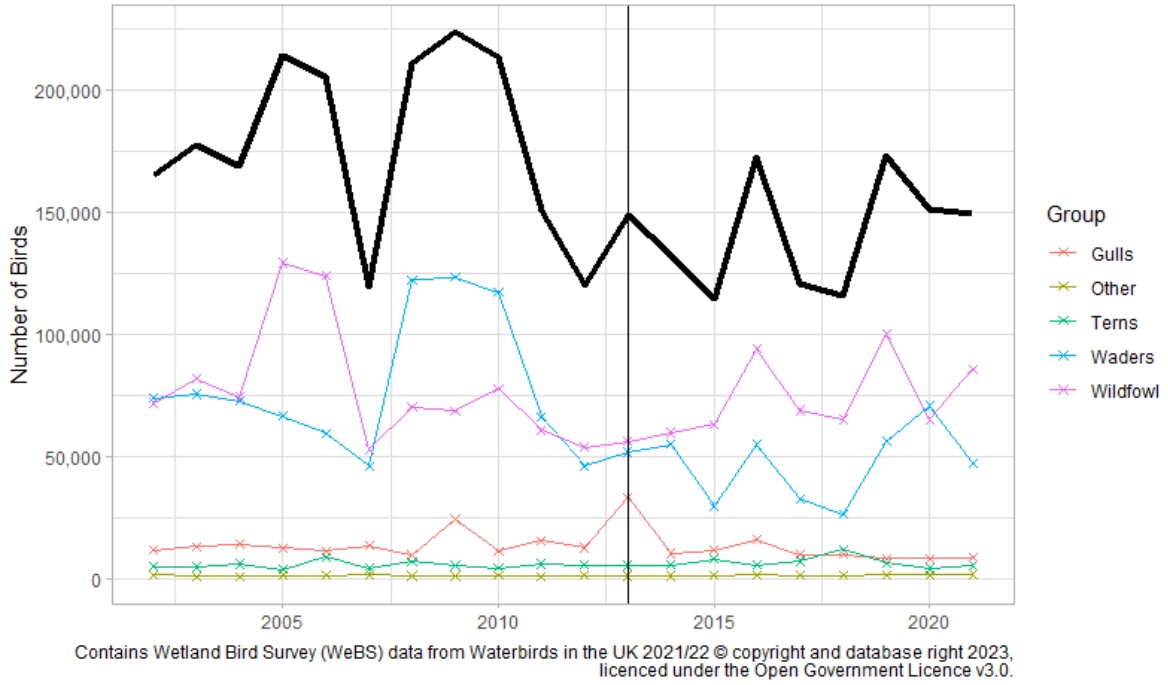


Figure 3.6 Temporal trend in waterbird counts from the north Norfolk coast. Data from the Wetland Bird Survey (Austin et al.*, 2023).*

The largest aggregations of waterbirds, and therefore the highest risk of contamination, 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. During initial

consultations, it was indicated that nesting birds are present on the beach and birds are regularly found feeding on the marsh. 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. This situation has not changed since the original sanitary survey was published.

The Wash (10 km west of the BMPA) supports the largest common/harbour seal (*Phoca vitulina*) colony in the UK, with 7% of the national population (JNCC, 2015). The most recent Special Committee on Seals (SCOS) report (SCOS, 2022) indicates that the population has decreased compared to the long term average, but a significant population remains. During initial consultations, it was stated that there is a small colony (approx. 40 animals) at Titchwell Creek. These animals show wide foraging ranges and may contaminate the shellfishery from time to time, although the spatial and temporal variability in their distribution makes it impossible to account for the potential contamination their faeces would cause in any updated sampling plan.

The Shellfish Action Plan for this waterbody classifies Animal/Bird contamination as being of 'medium' contribution to overall levels of contamination in the shellfishery. Waterbird populations are the main wildlife group likely to contribute significant amounts of bacteriological contamination to the BMPA, although it remains challenging to account for the pollution from wildlife in any updated sampling plan, due to the spatial and temporal variability of the pollution source. Some minor impacts from seals may occur, but again it is not possible to reliably account for this in any updated sampling plan.

3.5 Boats and Marinas

The discharge of sewage from boats is a potentially significant source of contamination to the shellfish beds within the 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. Their geographical positions are presented in Figure 3.7.

The 2014 Sanitary Survey describes that there are three small harbours within the survey area (from west to east, Thornham Harbour, Brancaster Harbour and Overy Creek). Satellite imagery shows that numerous moorings remain within Thornham Harbour and Brancaster Harbour. Moorings also remain within Overy Creek but these are outside that considered within this review as no Classification Zones are present.

No impacts from merchant shipping are expected as there are no commercial ports, the area has complicated, narrow and shallow subtidal channels and the legislation[5] governing the overboard discharge from merchant shipping has not changed. There is however a small fishing fleet in the area, with three vessels under 10 m and two over 10 m listing Brancaster Staithe as their home port (gov.uk, 2023). This is one vessel fewer than reported in the 2014 Sanitary Survey.

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

During initial consultations, the authors of this review were advised that there are only a few yachts of a sufficient size to contain on board toilets known to be present within the area, and these are infrequently used. However, during secondary consultations a fisherman advised that there is local concern regarding the potential of contamination from private vessels. Vessels and other small craft that do not contain on board toilets are unlikely to contribute to microbiological contamination within the BMPA. Any impacts are likely to be greater in Brancaster Harbour rather than Thornham Harbour as there are more moorings, and will be greatest in summer months. It should be noted that stakeholders in the area do not have concerns about this source of contamination within the BMPA.

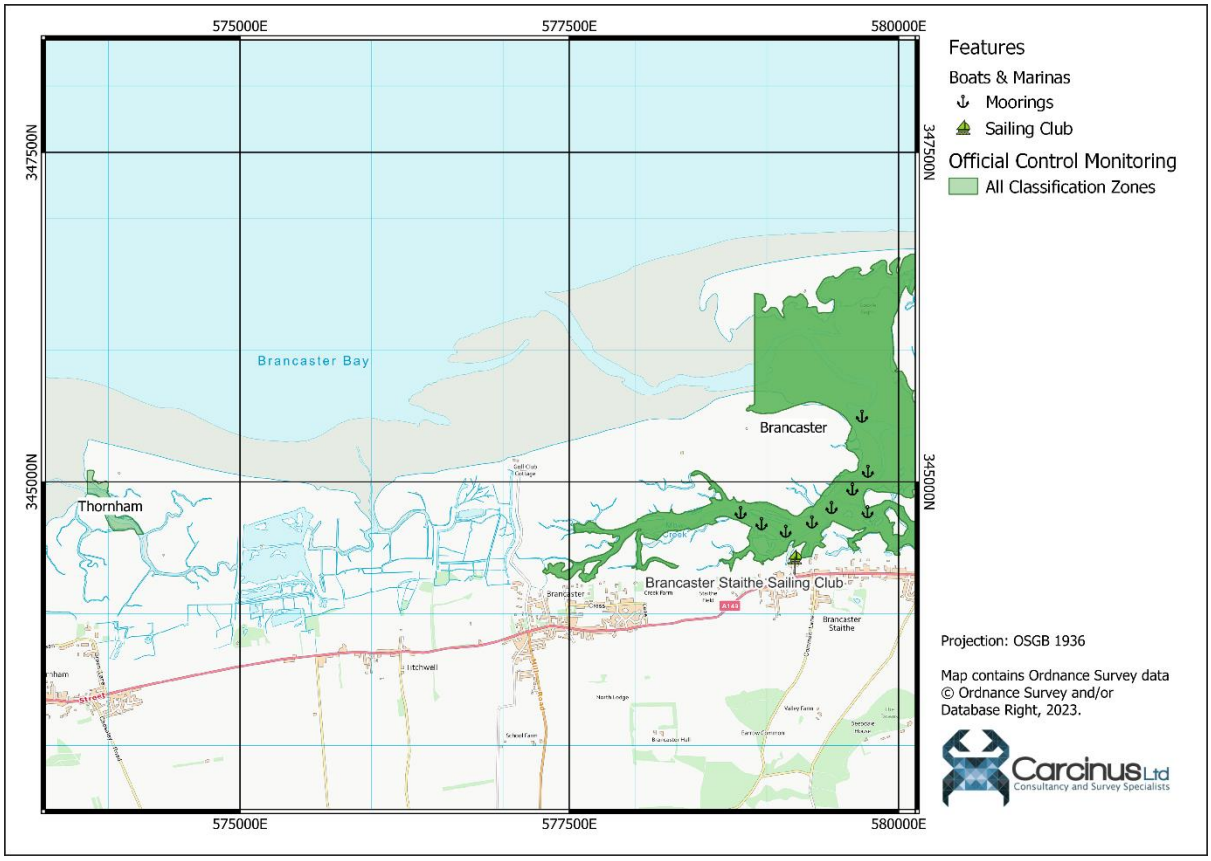


Figure 3.7 Locations of boats, marinas and other boating activities in the vicinity of the Brancaster BMPA.

3.6 Other Sources of Contamination

Utility misconnections are when foul water pipes are wrongly connected and enter surface waters without treatment, potentially putting raw sewage directly into watercourses via surface water drains. There is limited urban fabric immediately adjacent to the shellfishery (Figure 3.5), and the Shellfish Water Action Plan for this area states that these are not considered to be a significant issue for the shellfishery.

During initial consultations, the authors of this review were advised that dog walking is very common throughout the area, but that waste bins are commonly available. Areas of

saltmarsh will reduce the level of dog walking in these areas. Overall, the risk of this source of contamination is considered to be like that described in the 2014 Sanitary Survey and no update to the sampling plan is required on this basis.

4 Hydrodynamics/Water Circulation

The Brancaster BMPA consists of a complex system of tidal creeks, and as a result of this the patterns of water circulation in the region are similarly complex. The main freshwater inputs in the area are the River Burn, which drains to the coast at Burnham Overy, and the River Hun, which reaches the outer reaches of Thornham Harbour via a tidal creek. There are also some field drains in the low-lying reclaimed farmland that is common throughout the area, but it is likely that tidal circulation will be the dominant force of water circulation in the area. The tidal creeks in the area continue to be shallow, which will limit the dilution potential of point discharges, but will mean that a large proportion of the water within them is exchanged on each tidal cycle, so pollution will be flushed relatively quickly. Ebbing tides will carry contamination from shoreline sources northwards toward the North Sea, and flooding tides will carry contamination from farther out in the creeks inland. The 2014 Sanitary Survey describes that point sources of contamination will not impact neighbouring tidal creeks, so the Thornham Harbour area will not be impacted by contamination sources from Brancaster Harbour and *vice versa*.

There is no evidence that the patterns of water movement within the Brancaster BMPA will have changed significantly since the 2014 Sanitary Survey was published. No update to the sampling plan is necessary, as the recommendations made in the 2014 Sanitary Survey to account for the impact of water circulation within the Harbour continue to be valid.

5 Rainfall

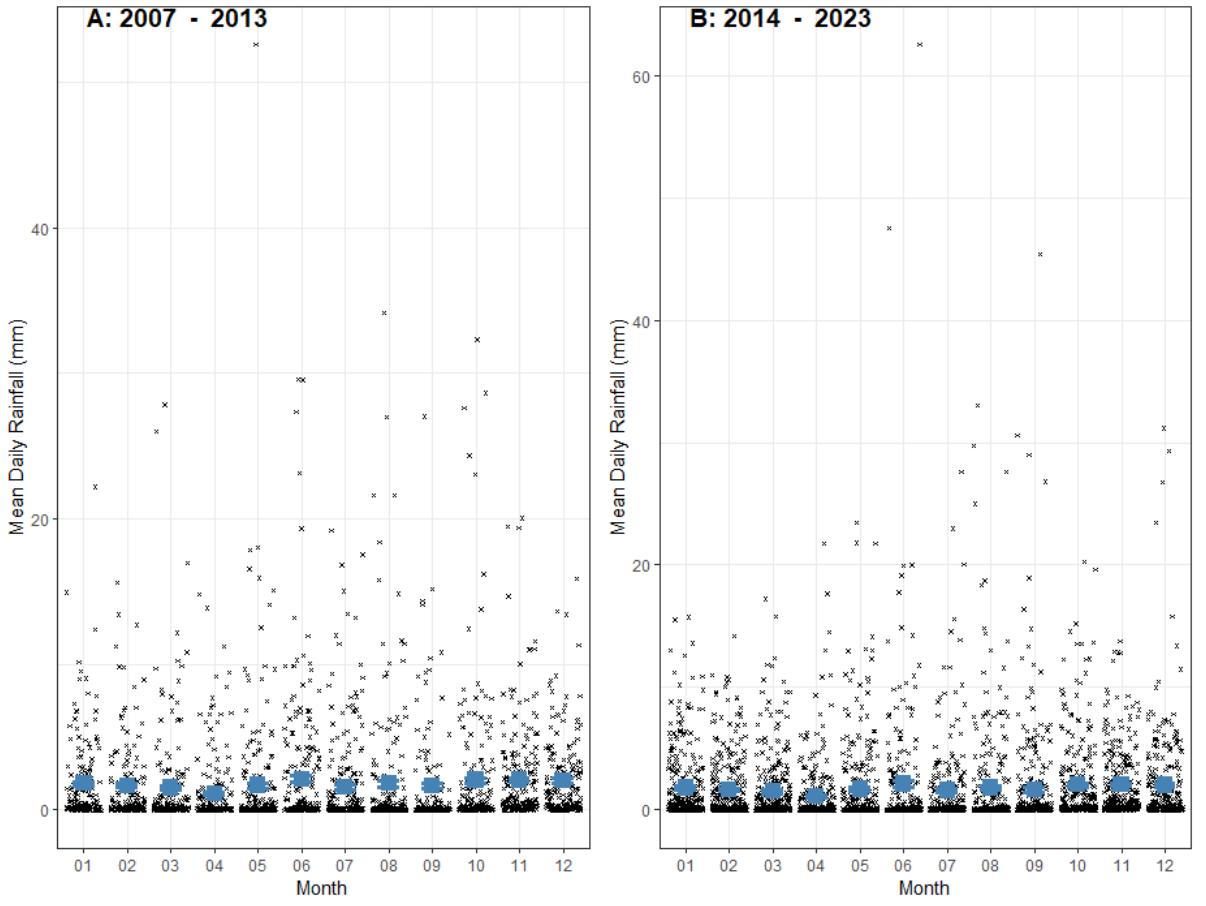
A complete record of the rainfall data for the Burnham Overy Town (ID: 202566) rainfall station at NGR TF84520 42260 was downloaded from the Environment Agency's hydrology data explorer[6]. This station was chosen as it is the closest monitoring station to the BMPA, approximately 5 km from the *Brancaster* CZ. The data were subdivided into 2007 – 2013 (pre-sanitary survey) and 2014 – 2023 (post-sanitary survey) and processed in R (R Core Team, 2021). These data were used to determine whether any changes in rainfall patterns had occurred since the original sanitary surveys were published. 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 the period preceding and following the 2014 Sanitary Survey.

Period	Mean Annual Rainfall	Percentage Dry Days	Percentage Days	Percentage Days

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

			Exceeding 10 mm	Exceeding 20 mm
2007 - 2013	596.686	46.867	24.52	15.915
2014 - 2023	591.06	45.378	24.709	16.163



Archive Daily Rainfall from the Burnham Overy Town (#202566) at NGR TF8452042260
Data accessed from the Environment Agency's Hydrology Data Explorer, licenced under the Open Government Licence v3.0.

Figure 5.1 Mean daily rainfall per month at the Burnham Overy Town monitoring station.

The data show that the rainfall levels in the area have remained very similar, with the change in average annual rainfall only 5 mm. Whilst the rainfall levels have fallen slightly, the percentage of days with heavy (>10 mm) and extremely heavy (>20 mm) rain has increased slightly. This area is notably dryer than other areas of the country, with nearly half days having no rainfall whatsoever. Two sample t-tests indicated that there was no significant difference ($p > 0.05$) in the mean daily rainfall per month for the 2007 – 2012 and 2013 – 2023 periods.

Rainfall leads to increased faecal loading through two factors: elevated levels of surface runoff and increased spill events from intermittent discharges, particularly during periods of heavy rain. Rainfall levels during both periods were greatest in winter months (November – February), and so levels of runoff etc. would be expected to be greatest during this time.

However, as the rainfall patterns have remained (statistically) similar across the two time periods, significantly altered bacterial loading due to these factors is unlikely and as such sampling plan 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 Brancaster BMPA since 2010 are presented spatially in Figure 6.1 and summary statistics are presented in Table 6.1. This data was obtained through a request to Cefas, but is freely available on the datahub[1].

A total of 12 RMPs have been sampled within the BMPA since 2010. Of these, only two are currently in use (Norton Creek Mussel B05AS and Norton Creek Oyster B05AT) and have been sampled since December 2018 and February 2019 respectively. Sampling at seven of the ten other RMPs ceased in 2018 or 2019. Sampling at Burnham Overy North B05AN stopped in 2011, prior to the publication of the 2014 Sanitary Survey, sampling at Nudds B005I stopped in July 2014, and sampling at the Waypoint 49 B05Q stopped in June 2016. The RMP for the declassified *Thornham Creek* CZ, Thornham Oysters B005Y, was used up until the declassification of that zone. The original sanitary survey, published in February 2014, recommended that sampling be started at the B05AS and B05AT RMPs. The gap between the publication of the 2014 Sanitary survey and the starting of sampling at the B05AS and B05AT RMPs was caused by ongoing discussions agreeing the final placement of RMPs.

The monitoring results from the two RMPs currently in use (B05AS & B05AT) have been broadly similar, with around half of the results exceeding the 230 *E. coli* MPN/100 g threshold. These RMPs located only 50 m from one another, and so this pattern not surprising. The 1.9% of the results from the Pacific oyster B05AT RMP have exceeded the 4,600 *E. coli* MPN/100 g threshold, but none of the mussel B05AS RMP results have. When considered geographically, there appears to be a slight trend of RMPs located in more inshore areas returning higher concentrations of *E. coli* within shellfish flesh. This pattern is to be expected as most of the pollution sources identified originate from the coastline.

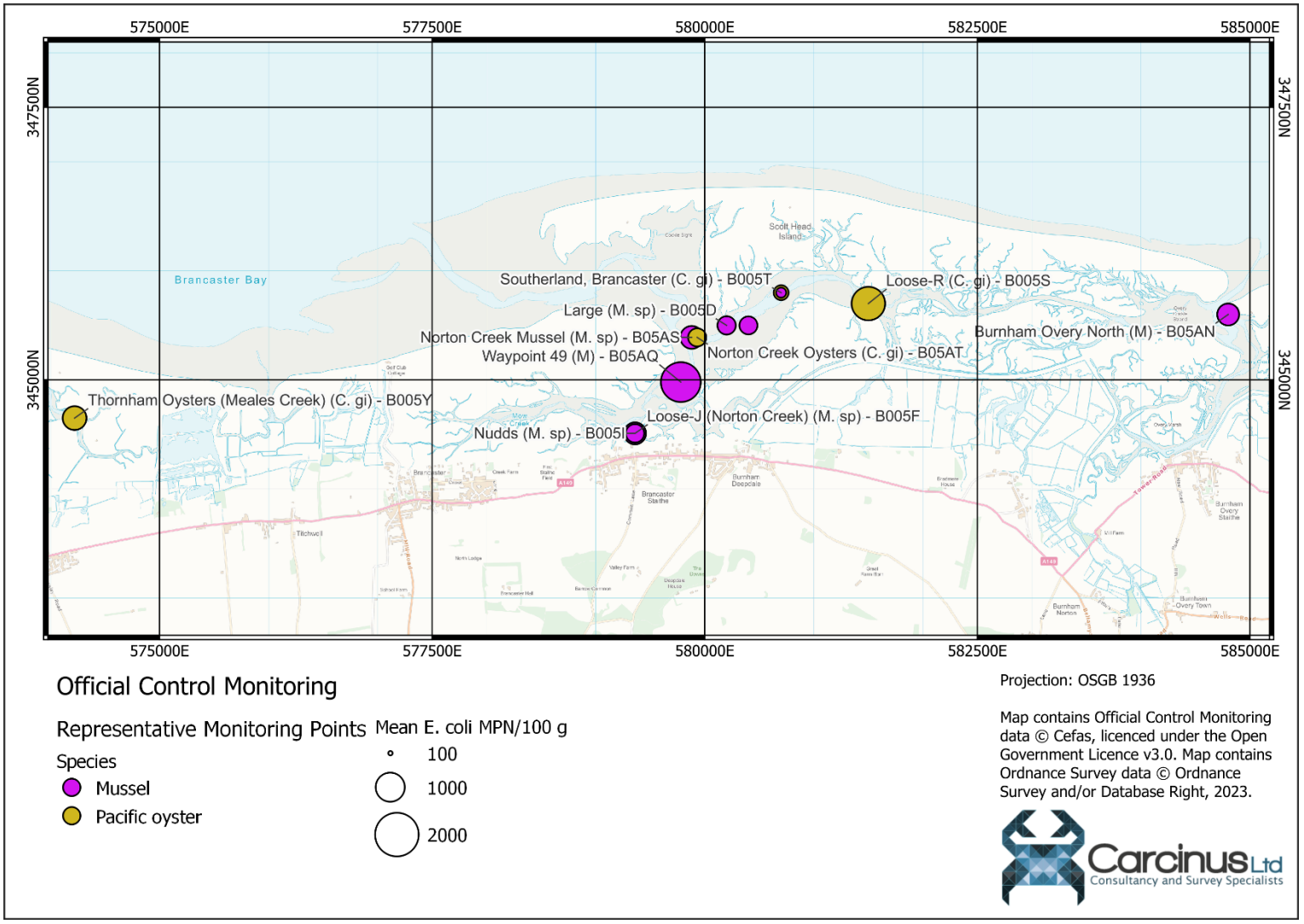


Figure 6.1 Mean E. coli results from Official Control monitoring at bivalve RMPs in the Brancaster BMPA.

Table 6.1 Summary statistics from official control monitoring at bivalve RMPs in the Brancaster BMPA.

RMP (Species)	NGR	Species	No. Samples	First Sample	Last Sample	Mean	Min Value	Max Value	% > 230	% > 4,600	% > 46,000
Brancaster Staithe - Mr Everitt (M. sp) - B05AO	TF80404550	Mussel	21	01/03/2010	06/08/2018	481.9048	40	2300	47.62	0.00	0.00
Burnham Overy North (M) - B05AN	TF84804560	Mussel	12	11/01/2010	21/07/2011	639.1667	90	1300	75.00	0.00	0.00
Large (M. sp) - B005D	TF80204550	Mussel	26	11/01/2010	11/06/2018	494.7308	20	3300	50.00	0.00	0.00
Loose-J (Norton Creek) (M. sp) - B005F	TF79364451	Mussel	30	10/05/2010	05/11/2018	644.0333	20	4900	50.00	3.33	0.00
Loose-R (C. gi) - B005S	TF81504570	Pacific oyster	58	01/02/2010	02/01/2019	1269.034	18	24000	51.72	3.45	0.00
Norton Creek Mussel (M. sp) - B05AS	TF79884539	Mussel	54	03/12/2018	03/05/2023	680.037	45	3300	59.26	0.00	0.00
Norton Creek Oysters (C. gi) - B05AT	TF79934539	Pacific oyster	53	04/02/2019	03/05/2023	487.6038	18	4900	49.06	1.89	0.00
Nudds (M. sp) - B005I	TF79364451	Mussel	14	01/02/2010	14/07/2014	499.2857	20	1700	42.86	0.00	0.00

RMP (Species)	NGR	Species	No. Samples	First Sample	Last Sample	Mean	Min Value	Max Value	% > 230	% > 4,600	% > 46,000
Southerland (M. sp) - B05AG	TF80704580	Mussel	19	12/04/2010	10/09/2018	262.6842	20	780	36.84	0.00	0.00
Southerland, Brancaster (C. gi) - B005T	TF80704580	Pacific oyster	57	11/01/2010	03/12/2018	380.0526	20	3500	40.35	0.00	0.00
Thornham Oysters (Meales Creek) (C. gi) - B005Y	TF74224465	Pacific oyster	105	05/01/2010	05/11/2018	725.419	20	5400	64.76	1.90	0.00
Waypoint 49 (M) - B05AQ	TF79784498	Mussel	9	17/03/2014	09/02/2016	1706.667	130	5400	88.89	22.22	0.00

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

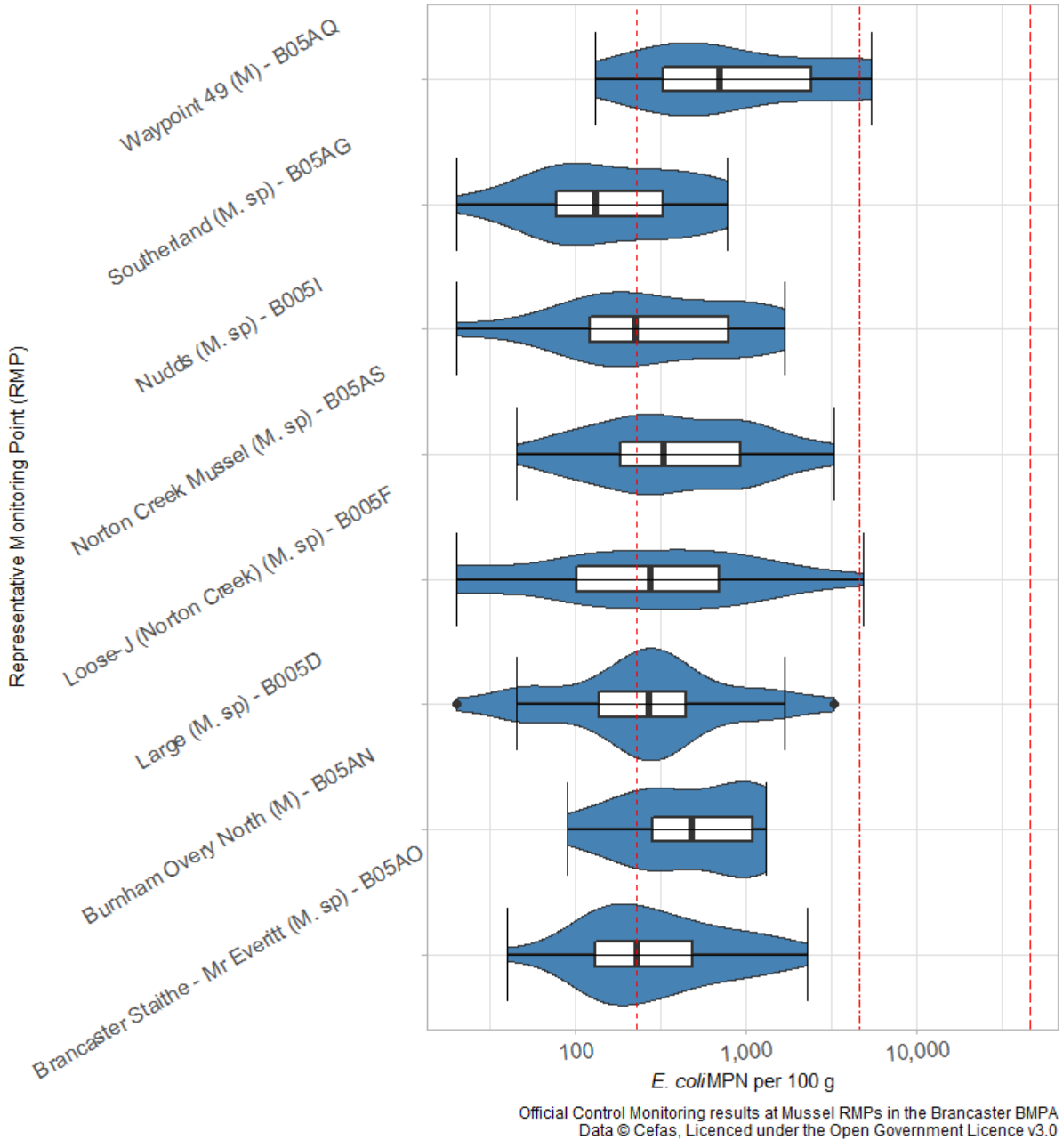


Figure 6.2 Box and violin plots of E. coli concentrations at mussel RMPs sampled in the Brancaster BMPA since 2010. Central line indicates median value, box indicates lower-upper quartile range and whisker indicates minimum/maximum values, excluding outliers. Boxplots are overlaid on the distribution of the monitoring data. Horizontal dashed lines indicate classification thresholds at 230, 4,600 and 46,000 E. coli MPN/100 g.

The highest median *E. coli* concentration was found at Waypoint 49 B05AQ and the lowest at Southerland B05AG (Figure 6.2), further supporting the conclusion contamination in this BMPA is found on a gradient with the highest contamination levels in inshore areas, gradually reducing as you move closer to the North Sea. Waypoint 49 B05AQ returned significantly higher monitoring results than Brancaster Staithe – Mr Everett (B05AO), Large B005D, Loose-J (Norton Creek) B005F, Norton Creek Mussel (B05AS) and Nudds B0005I. No other significant differences were found.

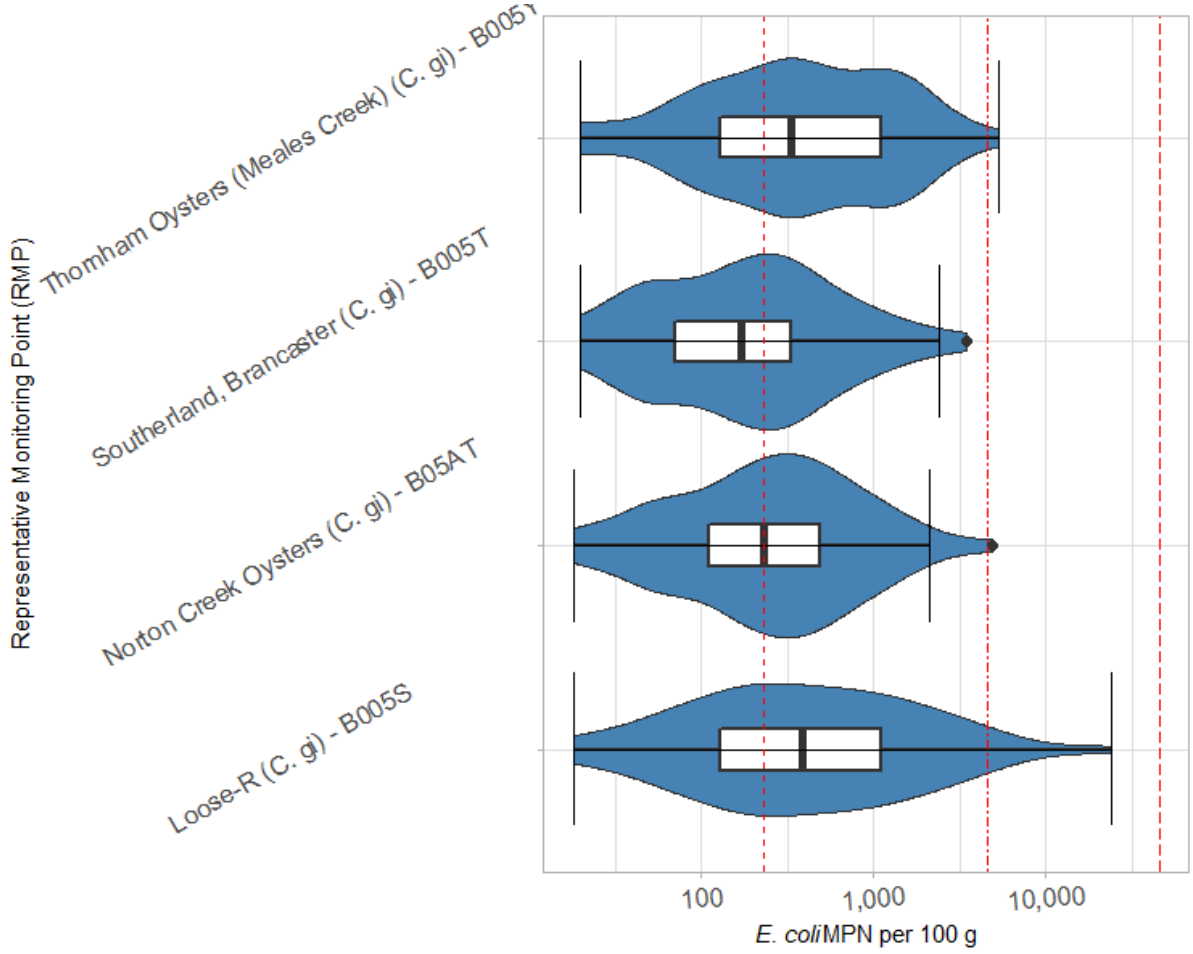


Figure 6.3 Box and violin plots of E. coli concentrations at Pacific oyster RMPs sampled in the Brancaster BMPA since 2010. Central line indicates median value, box indicates lower-upper quartile range and whisker indicates minimum/maximum values, excluding outliers. Boxplots are overlaid on the distribution of the monitoring data. Horizontal dashed lines indicate classification thresholds at 230, 4,600 and 46,000 E. coli MPN/100 g.

The median *E. coli* concentrations in the Pacific oyster RMPs were much more similar than the mussel data (Figure 6.3). The highest median concentration was at Loose-R B005S and the lowest at Southerland, Brancaster B005T. No significant differences were found in the data.

6.1.2 Overall temporal pattern in results

The overall temporal pattern in shellfish flesh monitoring for mussels and Pacific oysters are presented in Figure 6.4 and Figure 6.5 respectively.

The plotted monitoring data from the mussel RMPs (Figure 6.4) indicates that generally the monitoring results across the Brancaster BMPA have been consistent across time and similar to one another. The trend lines for all RMPs fall around the 230 *E. coli* MPN/100 g threshold. The monitoring data also show that the RMP recommended in the 2014 sanitary survey, Norton Creek Mussel B05AS has returned broadly similar results to those RMPs no longer sampled, and has also remained consistent since sampling began in December 2018.

The plotted monitoring data from the Pacific oyster RMPs (Figure 6.5) indicates a similar pattern to that of the mussel data, with the trend lines all falling around the 230 *E. coli* MPN/100 g threshold. The data from the Norton Creek Oysters (B05AT) RMP indicates that shellfish flesh hygiene at this monitoring location has been declining in recent years although the classification has remained stable within class B-LT threshold. It is not clear what is causing elevated contamination levels, but monitoring results are still better (lower *E. coli* concentrations) than the mussel RMP 50 m away (also a stable class B-LT).

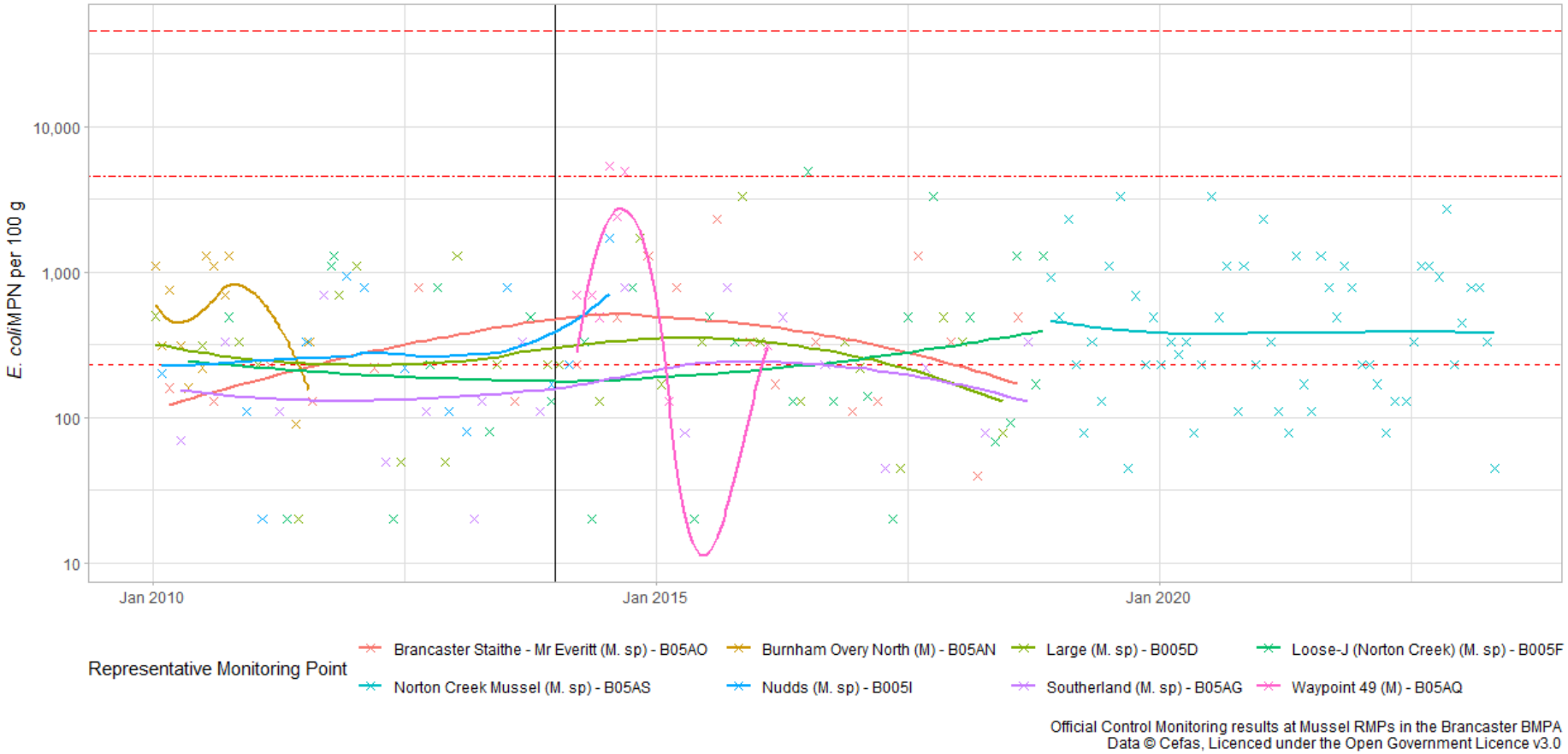


Figure 6.4 Timeseries of E. coli levels at mussel RMPs sampled in the Brancaster BMPA since 2010. Scatter plots are overlaid with a loess model fitted to the data. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 E. coli MPN/100 g respectively.

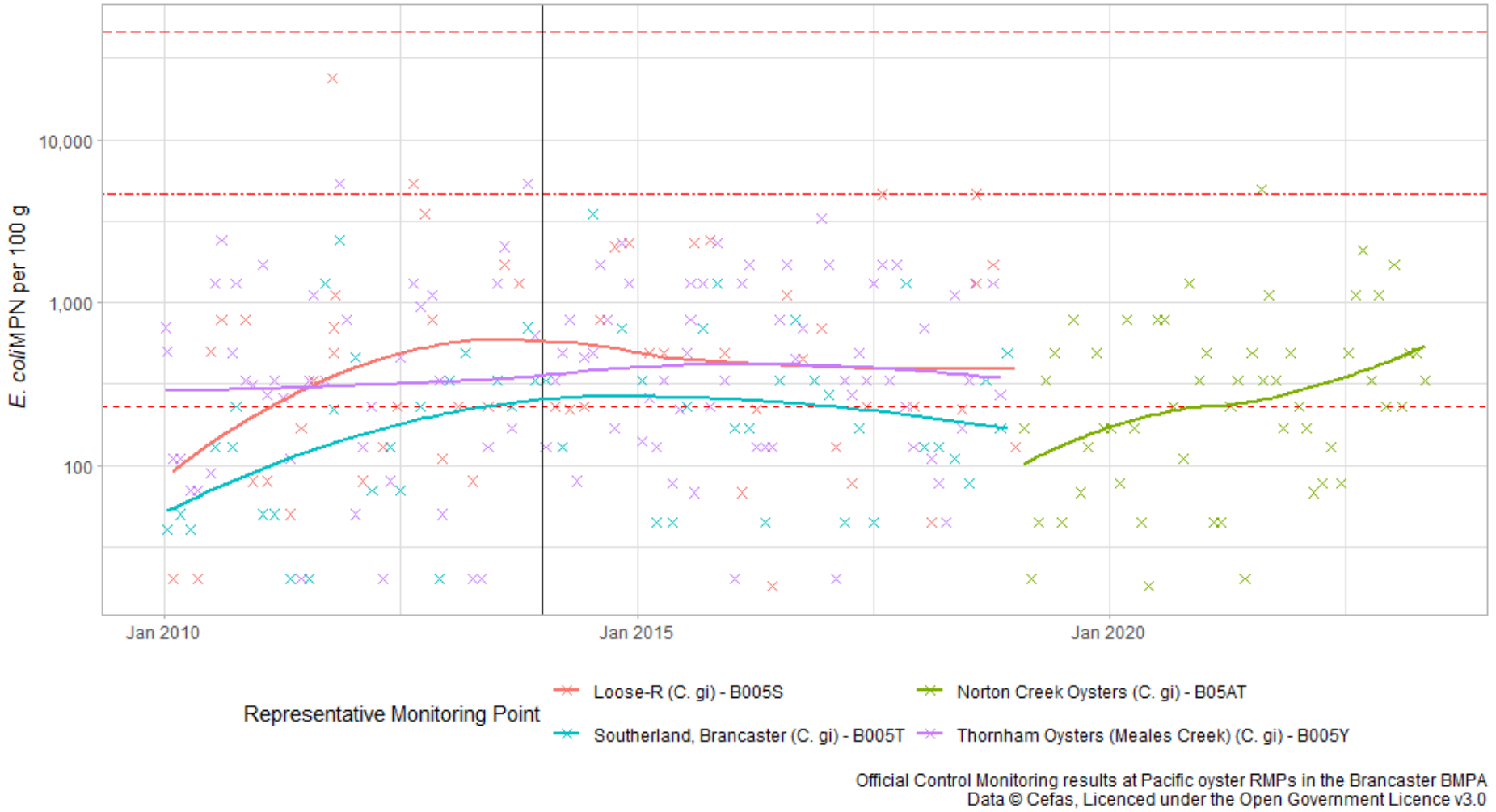


Figure 6.5 Timeseries of E. coli levels at Pacific oyster RMPs sampled in the Brancaster BMPA since 2010. Scatter plots are overlaid with a loess model fitted to the data. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 E. coli MPN/100 g respectively.

6.1.3 Seasonal patterns of results

The seasonal patterns of *E. coli* levels at RMPs in the Brancaster BMPA were investigated and are shown for mussels in Figure 6.6 and for 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.

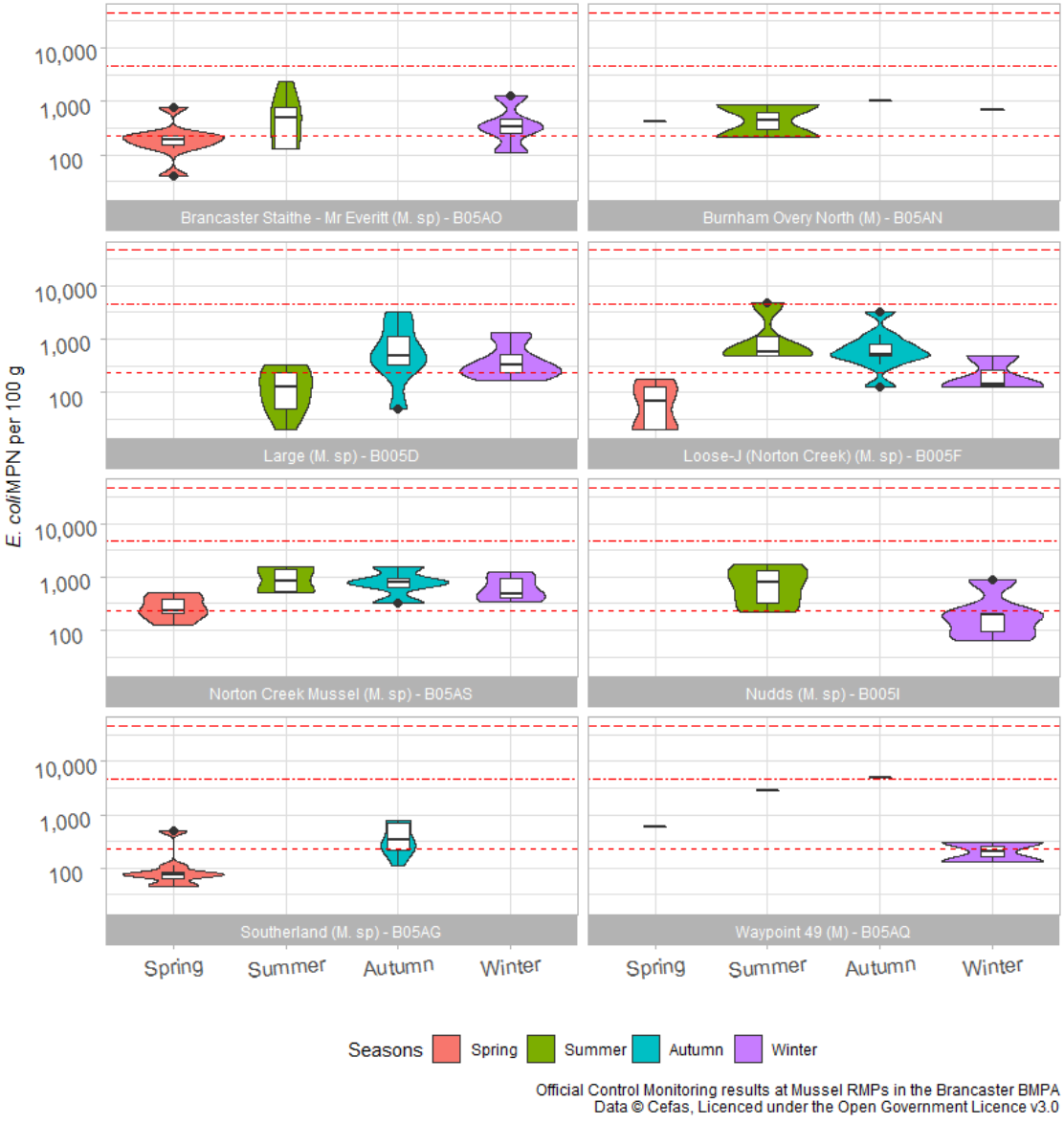


Figure 6.6 Box and violin plots of E. coli levels per season at mussel RMPs sampled within the Brancaster BMPA since 2010. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 E. coli MPN/100 g.

When the mussel data is pooled across the 8 RMPs, Official Control monitoring results collected in autumn and summer were significantly higher than those collected in spring. This suggests that pollution sources that dominate at these times of year, including agricultural runoff, are significant in this BMPA and should be given consideration in any updated sampling plan.

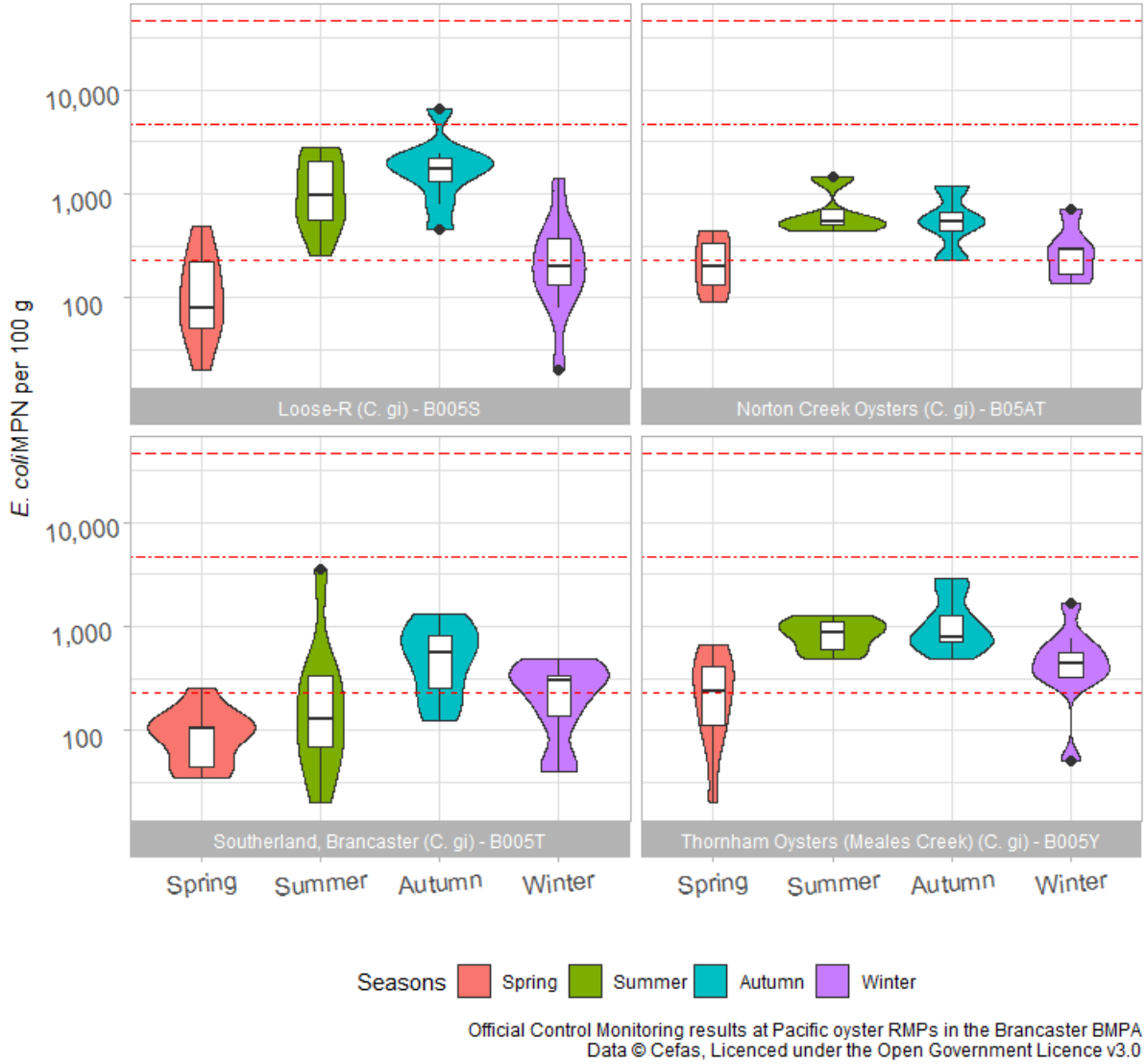


Figure 6.7 Box and violin plots of E. coli levels per season at Pacific oyster RMPs sampled within the Brancaster BMPA since 2010. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 E. coli MPN/100 g.

The seasonal pattern of monitoring results from Pacific oyster RMPs (Figure 6.7) is similar to that of the mussel RMPs (Figure 6.6) When the data from Pacific oyster RMPs was pooled across the different RMPs, monitoring results in spring and winter were significantly lower than monitoring results collected in summer and autumn. This pattern is also reflected when the monitoring data for each individual RMP is considered independently.

6.1.4 Action States

No Action States have been triggered within the Brancaster BMPA since the 2014 Sanitary Survey was published.

6.2 Bathing Water Quality Monitoring

The status of EC bathing waters near to and within the BMPA is also of relevance. However, there are no monitoring stations within 10 km of the BMPA and therefore the monitoring data from these locations, Hunstanton (old Hunstanton) and Wells has no bearing on the sampling plan for the Brancaster BMPA.

6.3 Local Water Quality Monitoring

During initial consultations, the authors of this review were provided with data from ongoing water and shellfish flesh quality monitoring within Brancaster Harbour. The locations of the monitoring points are shown in Figure 6.8.

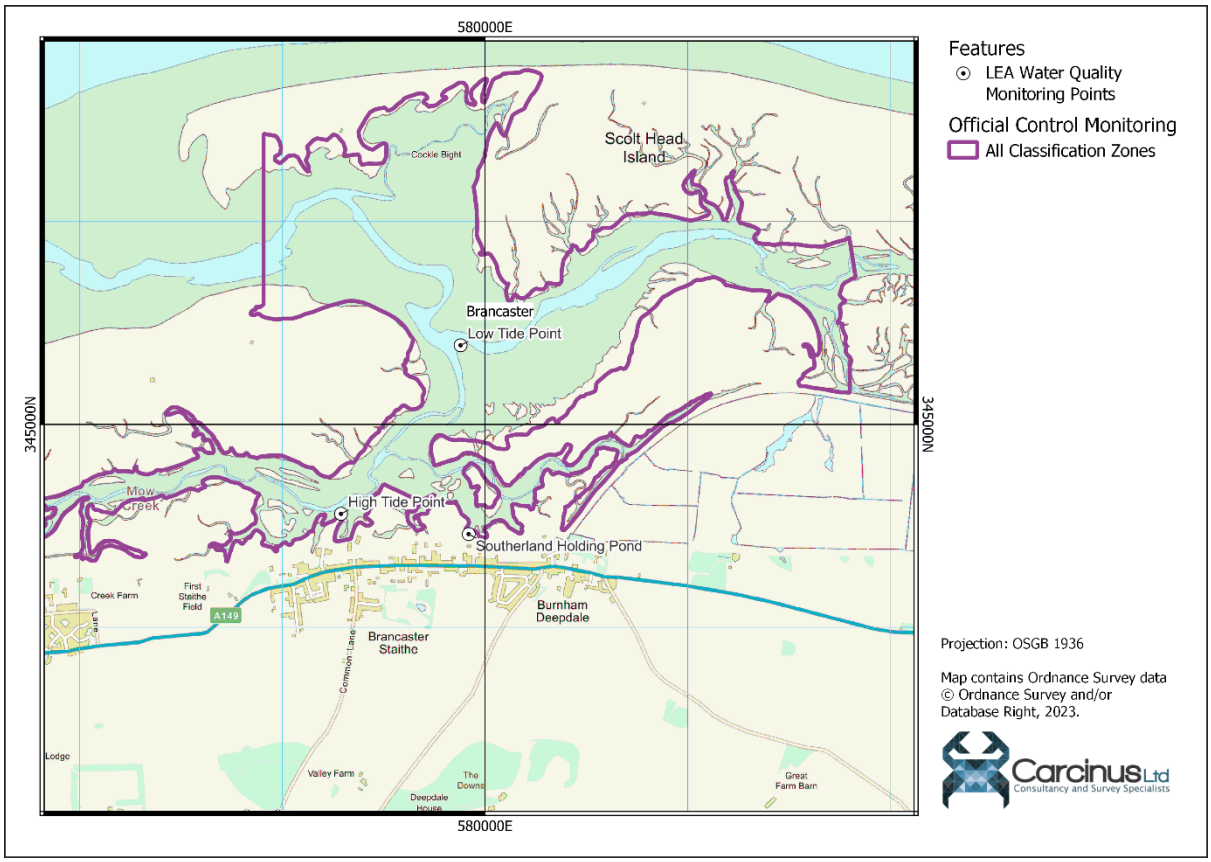


Figure 6.8 LEA water and shellfish flesh quality monitoring points within Brancaster Harbour.

A timeseries from seawater quality monitoring at two locations, one taken at high water near the coastline, and one taken at low water in the middle of the harbour, is shown in Figure 6.9. This figure indicates that generally *E. coli* concentrations in the sea water are quite low, but that samples collected at low water have returned higher concentrations of *E. coli* than those collected at high water.

Figure 6.9 Timeseries of LEA water quality monitoring. Scatter plots are overlaid with a loess model fitted to the data.

Figure 6.10 presents a timeseries of shellfish flesh monitoring from within the Southerland Holding pond. The data show that *E. coli* levels are generally quite low, which is to be expected as this holding pond is in a body of water that is relatively isolated from the rest of the harbour.

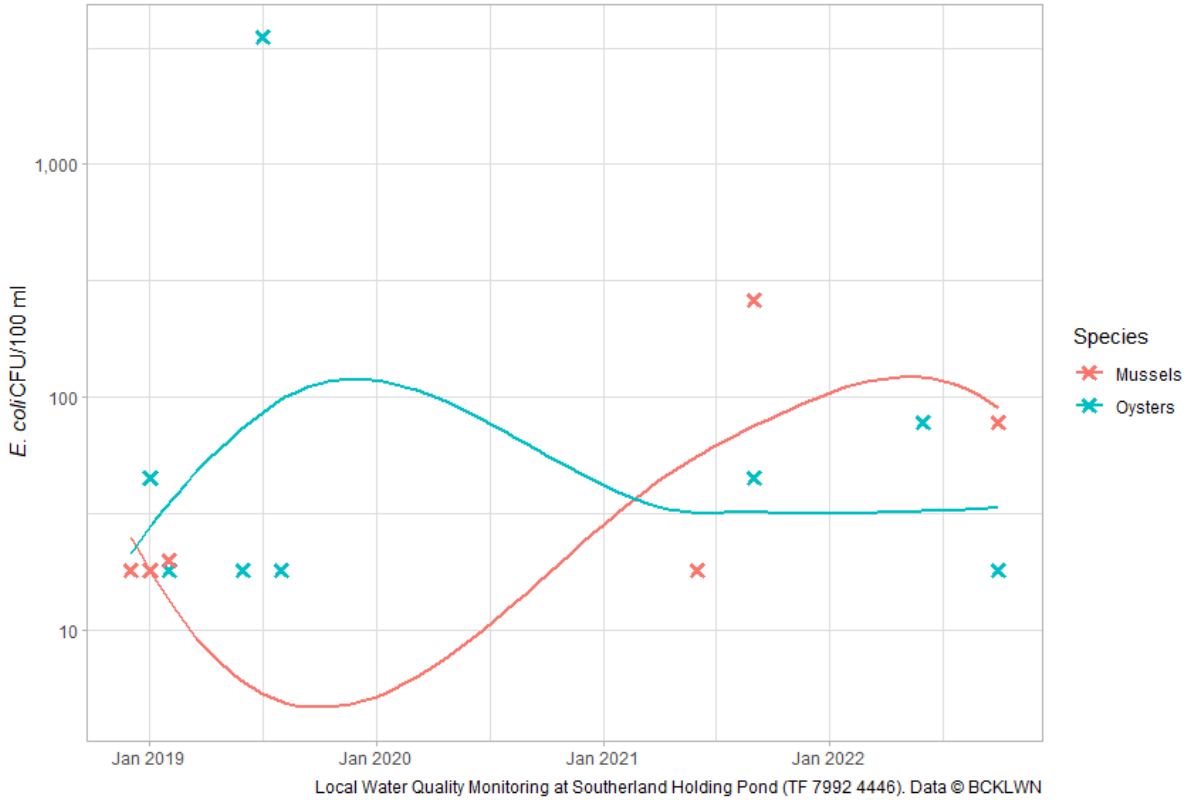


Figure 6.10 Timeseries of LEA monitoring of shellfish flesh within the Southerland Holding Pond.

7 Conclusion and overall assessment

The Brancaster BMPA is situated on the north Norfolk coast, and has historically comprised shellfisheries within three relatively distinct waterbodies. From west to east, these are Thornham harbour, Brancaster harbour (Norton Creek) and Overy Creek, although there is currently no commercial interest in shellfish harvesting within Overy Creek. The BMPA is currently classified for the harvest of Pacific oysters, mussels and cockles from within Brancaster harbour, although an application to reclassify a Pacific oyster CZ within Thornham harbour was received in May 2023.

The results of the 2021 Census were compared to that of the 2011 Census to give an indication of population trends within the catchment since the 2014 Sanitary Survey was published. These data show that the population is still small, at just under 25,000 people. There are some small hamlets and villages that run near to the shellfisheries, but the main settlements are at the western and eastern extremes of the catchment and so direct contamination is likely to be minimal. The area is likely to receive some seasonal influx of tourists, but no information has been received to date to suggest that the existing sewerage network is insufficient to handle this increase.

The sewage treatment network in the vicinity of the Brancaster BMPA is relatively sparse, with two continuous water company assets discharges treated effluent and two

intermittent discharges. There are also some private discharges in the catchment, but these have relatively small consented discharge volumes (<20 m^3/day). The impact of sewage discharges in the area is considered to be minimal, and no update to the sampling plan is necessary on this basis.

Data provided by Defra show that the livestock population of the catchment increased between 2013 and 2021, with pigs being the largest group in terms of their population. Land cover maps show that much of the catchment remains rural, with areas of arable farm land lying adjacent to the coastline and areas of pasture surrounding the main freshwater courses in the area, the River Hun and the River Burn. During initial Consultation, the EA confirmed that there have been no agricultural-related pollution incidents within 3 km of this BMPA in the last five years. No changes to the sampling plan recommended in the 2014 Sanitary Survey are recommended on this basis.

Overwintering bird population data from the Wetland Bird Survey shows that the total population of waterbirds is smaller than at the time of the 2014 Sanitary Survey, but the area still supports internationally significant populations of several species. It remains hard to reliably account for this source of pollution however as the aggregations of birds will shift from year to year based on the distributions of their prey. Significant populations of seals are present on the North Norfolk coast, and may from time to time forage within the tidal creeks of the Brancaster BMPA. The contamination these animals may cause is also challenging to account for in any updated sampling plan, but the contamination may occasionally be significant.

There is considered to be no impact from merchant shipping as there are no commercial ports within the Brancaster BMPA and the channel is narrow. There is a small fishing fleet that operates in the area. There remain a several moorings within Brancaster Harbour, and so there continues to be a small risk of microbiological contamination from pleasure craft of a sufficient size to contain on board toilets. Brancaster harbour is at a greater risk of contamination than Thornham harbour (as there are no moorings within this area), and the risk of this source of pollution will be highest in summer months as vessel numbers will be highest. No changes to the recommendations made in the 2014 Sanitary Survey are required on this basis.

There is Official Control monitoring data from 12 RMPs within the Brancaster BMPA that have been sampled since 2010, although currently only two are in use (B04AS and B04AT). Both of these RMPs were recommended in the 2014 Sanitary Survey, but sampling did not commence until late 2018 and early 2019. There appears to be a slight trend of RMPs positioned in more inshore areas returning higher concentrations of *E. coli* than those farther from the coast, suggesting that shoreline sources dominate in this BMPA.

Monitoring results collected in summer and autumn months have returned statistically significantly higher results than those collected at other times of year, suggesting that sources known to be more prevalent at these times (discharges from pleasure craft and agricultural runoff) should be taken into account in any updated sampling plan.

Based on the information available, there do not appear to be any significant knowledge gaps that would justify a shoreline survey. There have been no notable changes to sources of pollution since the 2014 Sanitary Survey was published. Results recorded at both current RMPs indicate stable classifications.

Having reviewed and compared the desk-based study with the findings of the original sanitary survey in 2014, the FSA is content a shoreline assessment was not required during this review.

8 Recommendations

Recommendations for the various classification zones within the Brancaster BMPA are described below and summarised in Table 9.1.

8.1 Mussels

Brancaster

The 2014 Sanitary Survey recommended that Brancaster harbour be divided into two distinct Classification Zones, forming one large contiguous zone that covered the entirety of Brancaster harbour. However, currently Brancaster Harbour is classified as a single CZ with an area of 2.99 km². During secondary consultations, the LEA advised that this recommendation was not done due to concerns over the practicality and safety of accessing an RMP in the subtidal channel. The current RMP position (B05AS at NGR TF 7988 4539) was decided in liaison with CEFAS as the best location to cover Norton Creek and Brancaster Channel, that was safe to access. The 2014 Sanitary Survey identified that the main sources of contamination affecting the inner zone would be birds, moored boats and land runoff, and recommended placing an RMP at the innermost part of this zone (at NGR TF 7931 4460). In the outer part of the zone, shoreline sources were also considered to be dominant and the RMP was recommended to be placed at the confluence of Norton Creek and the Brancaster Harbour channel (at NGR TF 7988 4539). This RMP replaced several other RMPs within Norton Creek. An RMP placed at the innermost part of Brancaster Channel would not be representative of where mussels are cultured in this CZ. On balance, it is recommended that the current RMP (B05AS at NGR TF 7988 4539) be retained as it will reflect contamination from both Norton Creek and Brancaster Channel.

8.2 Pacific oyster

Brancaster

As with mussels, the 2014 report recommended creating two distinct CZs within Brancaster for Pacific oysters, but currently there is one large CZ. The current RMP is placed on the trestles that sit at the confluence of Norton Creek and Brancaster Harbour. This RMP is currently in use, and provided that the position of oyster lays within the harbour have not changed since the situation described in the 2014 Sanitary Survey, it is recommended that this RMP be retained as it is representative of the contamination sources from both Norton Creek and Brancaster Channel.

Thornham

This CZ was declassified in 2019. An application to reclassify it was received in May 2023 and so a recommendation is provided within this report. The application specifies that the boundaries would be the same as the currently declassified zone. The 2014 Sanitary Survey identifies that contamination within the zone occurs on a gradient with highest concentrations occurring at the upstream end of the zone. It recommended placing an RMP at the upstream end of the trestle site (TF 7422 4465) would be representative of contamination in this CZ. The boundary should be moved downstream to align with this RMP position. At the time of writing, discussions were ongoing between FSA and the LEA to agree a final RMP location. The Application also specifies that the CZ should be for both native and Pacific oysters. A Cefas report into the use of indicator species (Cefas, 2014) found that it was suitable to use one species of oyster to represent the other. Classifying the CZ for native oysters based on the results of ten samples collected at least one week apart from an RMP located at the upstream end of the trestle site is appropriate.

8.3 Cockles

Brancaster

This CZ covers the entirety of Brancaster harbour and is currently classified based on the mussel samples. The Cefas report on the use of indicator species (Cefas, 2014) found that the accumulation capacity of cockles is equal to or exceeds that of mussels. During secondary consultation, the LEA stated that the cockle fishery within the Brancaster area is sporadic, only occurring every few years and harvested for a few weeks at a time when stock appears. The LEA advised that it is very unlikely that continued classification would be possible if relying on a cockle RMP. When cockle stocks are available, they represent an important fishery to fishers in the area. The LEA stated that when cockles do occur, they are further out to sea than the mussel RMP that is currently used to sample them. Contamination within this CZ is likely to occur on a gradient with higher levels further inland. On balance therefore, it is recommended that the mussel RMP is continued to be used.

9 General Information

9.1 Location Reference

Production Area	**Brancaster**
Cefas Main Site Reference	M005
Ordnance survey 1:25,000	Explorer 250 & 251
Admiralty Chart	5614.9

9.2 Shellfishery

Species	Culture Method	Seasonality of Harvest
Mussels (*Mytilus* spp.)	Bed Culture	Year Round
Pacific oyster (*Crassostrea gigas*)	Trestle Culture	Year Round

Cockles (*Cerastoderma edule*)	Wild	Year Round

9.3 Local Enforcement Authority(s)

Name	**Borough Council of Kings Lynn and West Norfolk** Kings Court Chapel Street Kings Lynn PE30 1EX
Website	www.west-norfolk.gov.uk
Telephone number	01553 616200
E-mail address	Food.safety@west-norfolk.gov.uk

9.4 Sampling Plan

*Table 9.1 Proposed sampling plan for the Brancaster 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
Brancaster (*Mytilus* spp.; *C. edule*)	B05AS	Norton Creek Mussels	TF 7988 4539	52°58.540'N 00°40.656'E	Mussels; **cockles**	Bed Culture	Hand (bagged)	Mussels	10 m	Monthly
Brancaster (*C. gigas*)	B05AT	Norton Creek Oysters	TF 7988 4539	52°58.540'N 00°40.656'E	Pacific oysters	Trestle Culture	Hand (bagged)	P. oysters	10 m	Monthly
Thornham (*C. gigas; Ostrea edulis*)	**B005Y**	**Thornham oysters**	**TF 7422 4465**	**52°58.254'N 00°35.580'E**	**Pacific oysters; native oysters**	**Trestle Culture**	**Hand (bagged)**	**P. oysters**	**10 m**	**Monthly**

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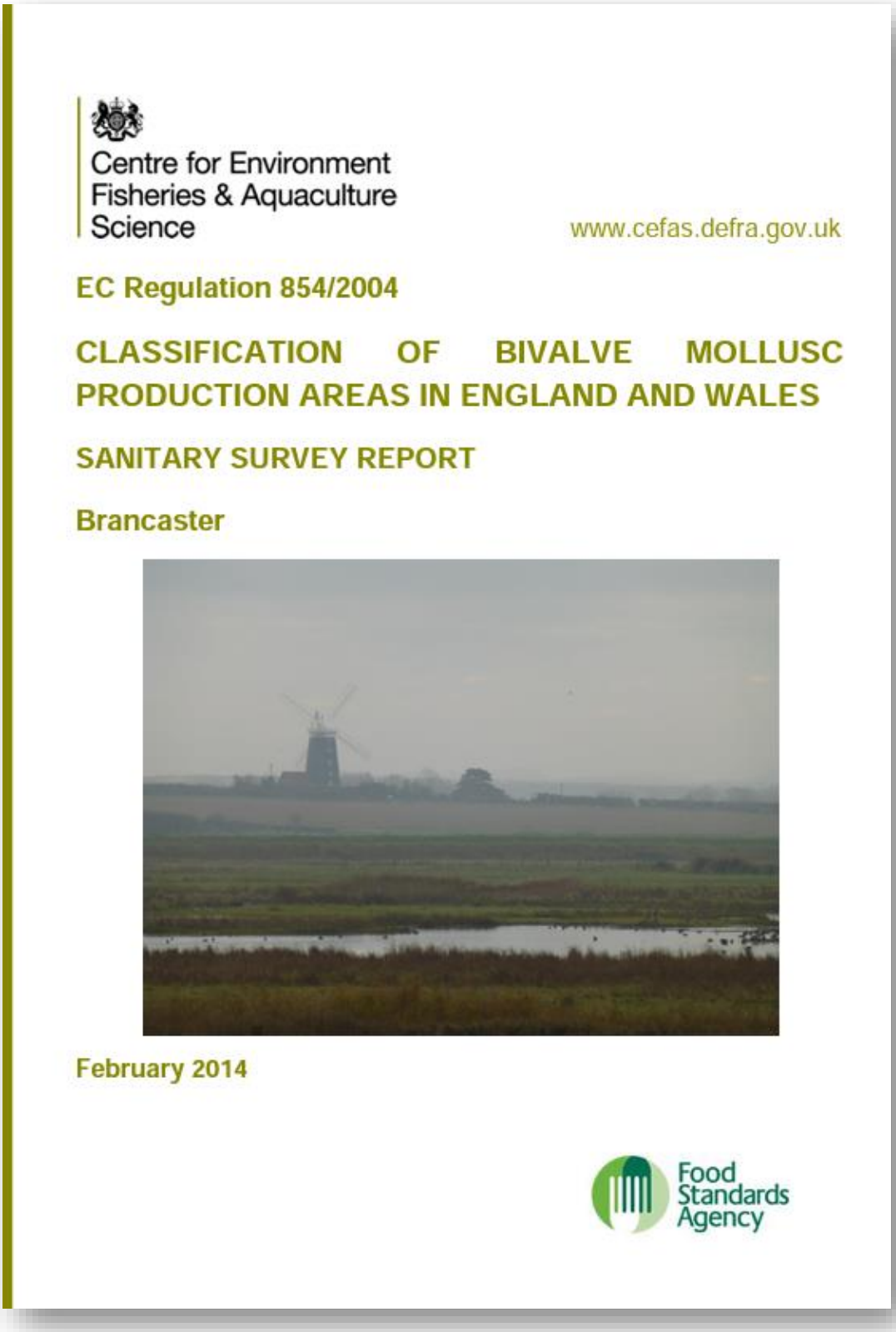
Appendices

a. Event Duration Monitoring Summary for 2022

Site Name	Permit Number	Discharge description	NGR	Total Duration of Spills in 2022	Number of Spills in 2022	Distance from centre of nearest CZ (km)
HUNSTANTON-SMUGGLERS LANE SP	ASENF12024	Storm discharge at pumping station	TF6873042740	8.90	11	5.73
BURNHAM MARKET STW	AEENF1265	Storm tank at WwTW	TF8453042380	4.47	7	5.86

b. Brancaster Sanitary Survey Report 2014



Centre for Environment Fisheries & Aquaculture Science

www.cefas.defra.gov.uk

EC Regulation 854/2004

CLASSIFICATION OF BIVALVE MOLLUSC PRODUCTION AREAS IN ENGLAND AND WALES

SANITARY SURVEY REPORT

Brancaster

February 2014

Follow hyperlink in image to view full report

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