Sanitary Survey- Review

Milford Haven – 2023

Document No. – *J0591/22/05/26*

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

Carcinus Ltd – Document Control Sheet

Client	Food Standards Agency (FSA)
Project Title	Sanitary Survey Review
Document Title	Sanitary Survey Review of Milford Haven
Document Number	J0591/22/05/26
Revision	3.0
Date	28 March 2023

Revisions

Revision No.	Date	Comment
1.0	12 September 2022	Draft for FSA Review
2.0	07 December 2022	Draft for secondary consultation
3.0	28 March 2023	Final

Document QA and Approval

	Name	Role	Date
Author	Joshua Baker	Senior Consultant	28 March 2023
Checked	Matthew Crabb	Director	28 March 2023
Approved	Matthew Crabb	Director	28 March 2023

Initial Consultation

Consultee	Date of consultation	Date of response
Pembrokeshire County Council	06 May 2022	12 May 2022
Natural Resources Wales	06 May 2022	18 May 2022

Consultation on draft report

Consultee	Date of consultation	Date of response
Pembrokeshire County Council	21 December 2022	19 January 2023
Dwr Cymru (Welsh Water)	21 December 2022	31 January 2023
Natural Resources Wales	21 December 2022	

A sanitary survey relevant to the bivalve mollusc beds in Milford Haven was undertaken in 2012 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, Pembrokeshire County Council. The report is publicly available via the Carcinus Ltd. website.

Recommended Bibliographic Citation:

Carcinus Ltd., 2022. Review of the Milford Haven 2012 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.

Contents

List of figures

List of tables

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 Food Standards Agency.

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 Milford Haven Review

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

An **initial consultation** with Local Authorities (LAs) and Natural Resources Wales (NRW) responsible for the production area was undertaken in May 2022. This supporting local intelligence is valuable to assist with the review and was incorporated in the assessment process.

Following production of a draft report, a wider **external second round of consultation** with LAs, Industry and other Local Action Group (LAG) members was undertaken in February and March 2023. It is recognised that dissemination and inclusion of a wider stakeholder group, including local industry, is essential to sense-check findings and strengthen available evidence. The draft report is reviewed taking into account the feedback received.

The review updates the assessment originally conducted in 2012 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.

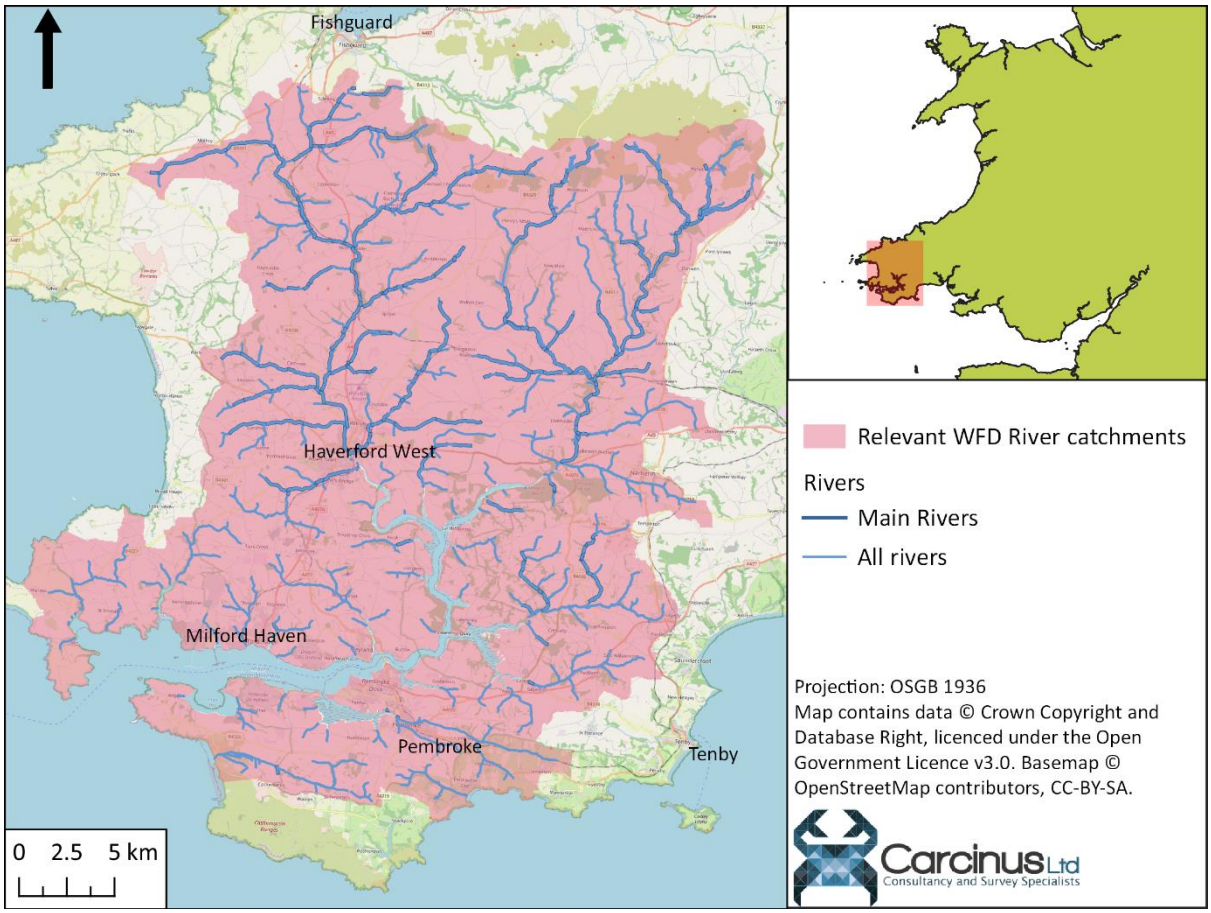


Figure 1.1 Location of Milford Haven.

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 Natural Resources Wales;
- The findings of this report are based on information and data sources up to and including May 2022;
- 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 May 2022 have been used within this study. Any subsequent samples have not been included.

2 Shellfisheries

2.1 Description of Shellfishery

The Milford Haven Bivalve Mollusc Production Area (BMPA) is situated within the Cleddau estuary, which is a large estuary complex in Pembrokeshire, southwest Wales. The original sanitary survey describes that it is the largest ria (drowned river valley) type estuary in the United Kingdom, and the diversity of intertidal and subtidal habitats supported a range of shellfisheries (Cefas, 2012). Currently, the only area of the complex that supports an active shellfishery is Angle Bay, on the south side of the estuary. There are no other BMPAs within the vicinity of Milford Haven, the closest are the Three Rivers, approximately 45 km east of the BMPA subject to this review, and the Car y Mor aquaculture site, 26 km north-west of Milford Haven. This review only provides a recommended sampling plan for the currently active Classification Zones within the BMPA, but it draws upon data sources that consider the entire catchment. This is so that the findings of this report can be drawn on should reclassification of historic zones be required in the future.

The shellfish beds within the Milford Haven BMPA are under the jurisdiction of the Local Enforcement Authority (LEA), Pembrokeshire District Council, for food hygiene purposes. The authors of this review are not aware of any several or regulating order that applies to the waters of the BMPA, nor any byelaws that govern harvesting of shellfish in the area.

At the time of the original sanitary survey in 2012, there were existing fisheries in place for mussels (*Mytilus* spp.) and native oysters, and this survey (Cefas, 2012) was prompted by an application to classify three areas for carpet shell clams (Veneridae), as well as a separate application to classify an area for razor clam harvest. That survey also describes that there were historic fisheries for wild cockles and Pacific oysters, but that these fisheries were not in operation at the time of writing.

There is currently only one area classified for shellfish harvest within the BMPA. The *Tethys* Classification Zone (CZ) is situated within Angle Bay, and is an aquaculture site supporting the harvest of cultured native and Pacific oysters. Approximately 0.75 tonnes of Pacific oysters are harvested per month from this BMPA, and harvest occurs year-round. Approximately 0.25 tonnes of native oyster are harvested per month, although only from September through to April of the following year.

2.2 Classification History

The original sanitary survey recommended the creation/classification of five zones for native oyster, three for mussels, six for cockles and one each for carpet shell and razor clams

[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/.

(sixteen Classification Zones in total, across much of the estuary complex). However, historic classification information provided by the Food Standards Agency (FSA) suggests that none of the zones recommended in the original sanitary survey were ever awarded full classifications, and that all were declassified in 2017.

The *Tethys* CZ was classified in 2020, following a provisional RMP assessment (Carcinus, 2019). It currently holds a Class A classification and has done since initial classification. The location of this zone, and its associated Representative Monitoring Point, is shown in Figure 2.1.

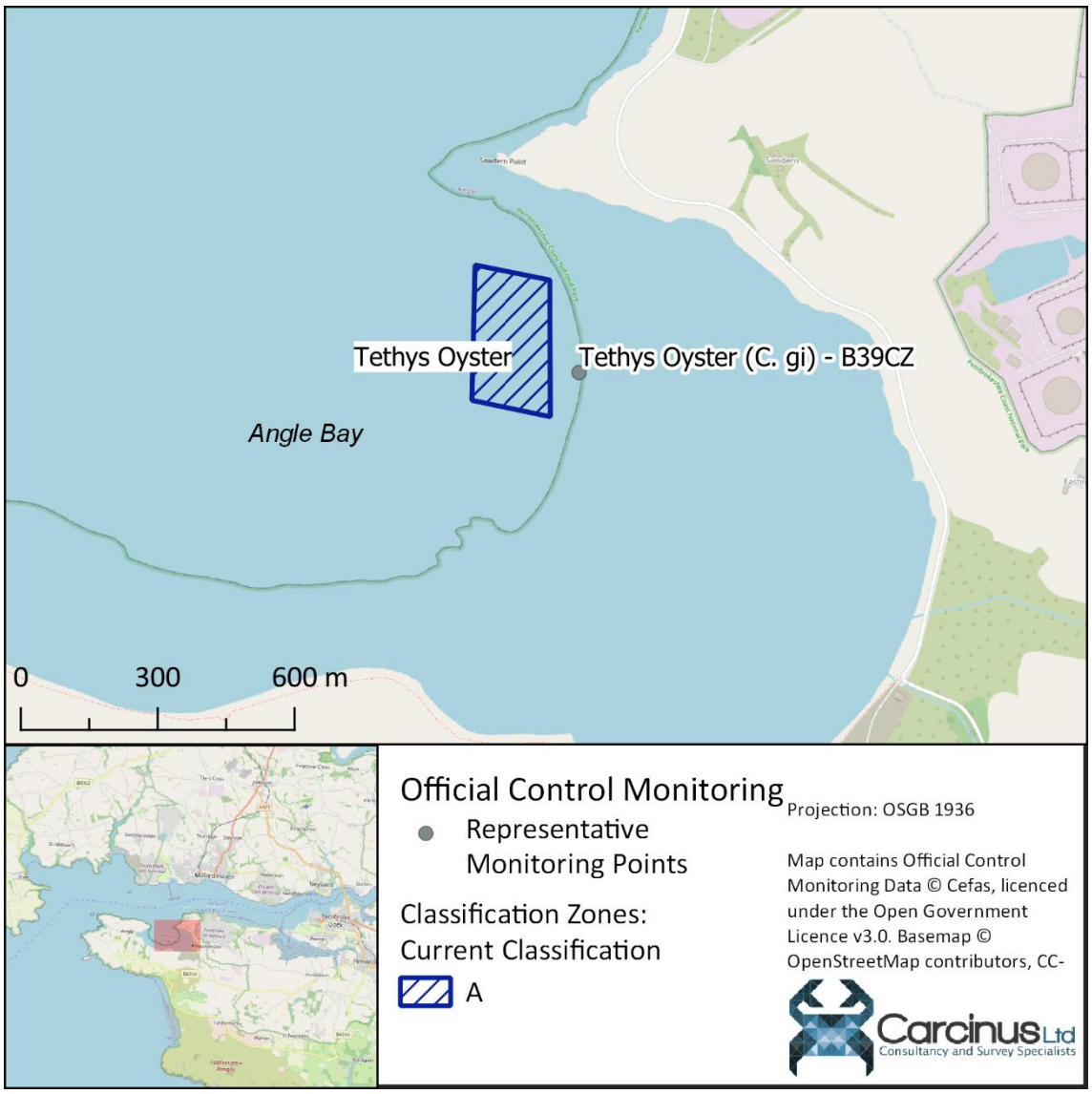


Figure 2.1 Current Classification Zones and Associated Representative Monitoring Points in the Milford Haven BMPA.

3 Pollution sources

3.1 Human Population

The 2012 Sanitary Survey presents human population distribution based on the findings of the 2001 Census of the United Kingdom. Since the publication of those data, the results of the 2011 Census have been made available, and so this data has been compared to that of the 2001 Census to give an indication of the changes in human population within the catchment. These Censuses have been used as no further population data are freely available[2]. Changes in human population density in census Super Output Areas (lower layer) wholly or partially contained within the Milford Haven catchment between the 2001 and 2011 censuses are shown in Figure 3.1

[2] Note – a full census of the United Kingdom was conducted in March 2021, although suitable data from this survey are not expected to be published until Winter 2022/23.

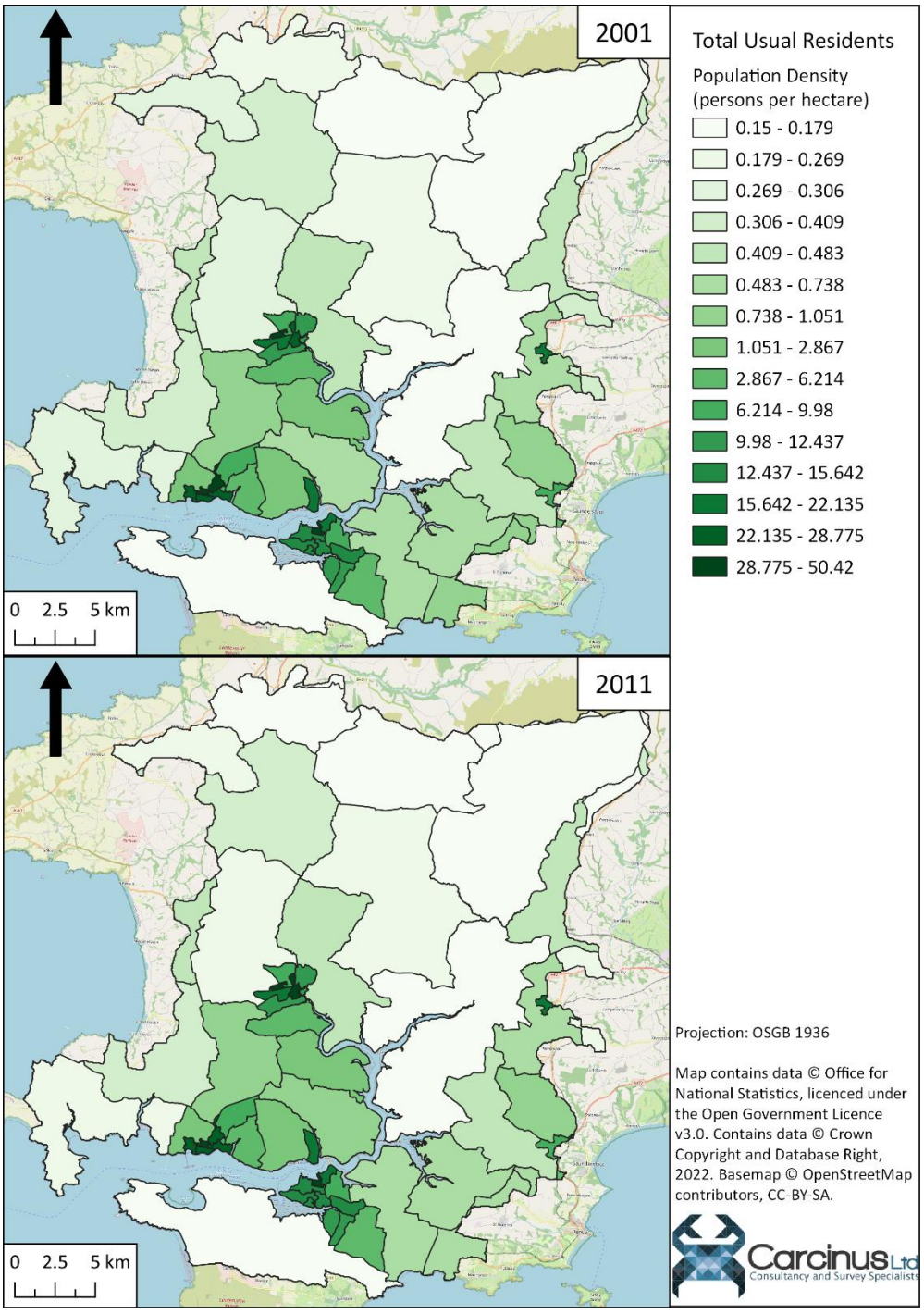


Figure 3.1 Human population density in 2001 and 2011 Census Super Output Areas (lower layer) that intersect the Milford Haven catchment.

Figure 3.1 suggest that the distribution of the main population centres within the catchment have not changed significantly, with the majority of the catchment having very low densities of <1 person per hectare. The main population centres remain Pembroke on the southern side of the estuary, Milford Haven on the northern side and Haverfordwest further inland, and these areas have population densities of >20 persons per hectare. The average population density is approximately 9 persons per hectare. Population centres close to

waterbodies pose a greater risk of bacteriological contamination of shellfisheries than those further inland, as they offer a more direct pathway for contamination.

The total population in Census Super Output Areas (lower layer) wholly or partially within the Milford Haven was 95,227 at the time of the 2001 Census. By the 2011 census, this had increased to 103,369, an increase of 8.55%. The 2011 Census was conducted one year prior to the publication of the original Sanitary Survey, and so could be considered more relevant to that document. Whilst the full results of the March 2021 Census have not yet been published, the UK Government provides periodic estimates of national population change and estimates that the total UK population will increase by 6.79% between 2011 and 2022 (ons.gov.uk, 2022).

An increase of this proportion would see the approximate population living in the Milford Haven catchment increase to 110,388 people. The potential for urban runoff remains greatest from the towns of Milford Haven and Pembroke as these are located directly adjacent to the shore, although it should be noted that there is no significant conurbation immediately adjacent to Angle Bay, where the only current Classification Zone sits. Impacts from sewage discharges would depend on the specific nature and locations of such discharges, changes to which are discussed in the next section. Consultation with the LEA did not indicate that any significant new housing developments had occurred that would be of relevance to the bacteriological health of the BMPA, although any increase in population size would be expected to increase the demand placed on the wastewater treatment network (WWTN), which without upgrades to assets on the network, would in turn increase faecal loading to coastal waters. During initial consultations, NRW stated that an existing development at Pennar Point (5 km east of the shellfish bed), treated by a private water treatment plant which has been producing poor quality effluent since its operating company went into liquidation in 2017. A new sewage pumping station is proposed for adjacent land, after which the existing problematic works will be abandoned. There is however no firm timescale for this work.

The original sanitary survey states that the county of Pembrokeshire received about 14 million visitor days per year (compared with a resident population of ~120,000). Statistics from 2019 suggest that the total visitor numbers have fallen to about 7 million total visitor trips, but that this still generates nearly £600 million for the local economy (Destination Research, 2019). Milford Haven Waterfront itself receives over 100,000 visitors each year (mhpa.co.uk, 2022), and the peak time of year is the summer months, with 50% of visitors coming between June and September. The number of tourists may well have increased in the last 2 years, as the Covid-19 pandemic has restricted foreign travel, although there are no data published yet to confirm or reject this. The increased population in summer months will correspond to an increased loading to the WWTN, and a potentially increased risk of contamination during these periods. However, there are no specific issues relating to this, including camping/campervans, known to the authors of this review.

Whilst there is no recently available population data for the catchment, it is likely that the human population will have increased by a small percentage since the original sanitary survey was published. However, the distribution of main population centres within the catchment have not changed and as such the main areas at risk of contamination remain the same as that described in the original sanitary survey.

3.2 Sewage

Details of all consented discharges within the Milford Haven catchment have been taken from the most recent update to NRW's national permit database (Natural Resources Wales, 2022). The locations of these discharges are shown in

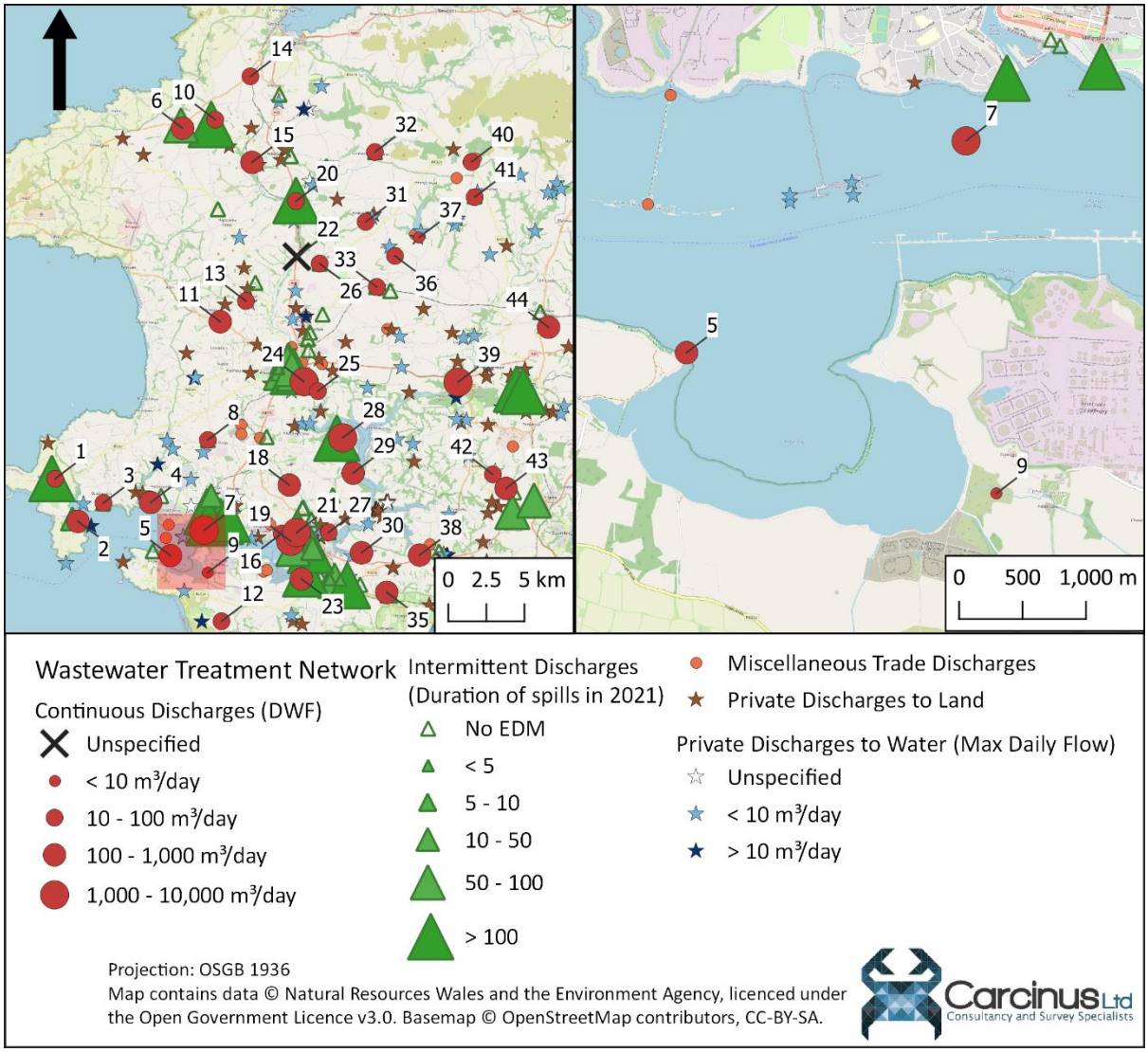


Figure 3.2 Locations of all consented discharges within the Milford Haven catchment. Numbers refer to continuous discharges, details of which are presented in Table 3.1.

Table 3.1 Details of continuous discharges within the Milford Haven catchment. Continuous discharges of primary relevance to the bacteriological health of the BMPA are highlighted in yellow.

ID	Discharge	Permit ref	Outlet NGR	Treatment	DWF (m^3/day)
1	MARLOES STW	BG0022701	SM 79970 08360	29: PACKAGE TREATMENT PLANT	56
2	DALE WWTW DALE MILFORD HAVEN PEMBS	BP0064001	SM 81470 05560	03: TERTIARY BIOLOGICAL	180
3	ST. ISHMAELS STW	BG0011501	SM 83140 06770	29: PACKAGE TREATMENT PLANT	79.4
4	HERBRANDSTON WWTW HERBRANDSTON	BG0016701	SM 86240 06800	01: BIOLOGICAL FILTRATION	122
5	ANGLE WWTW PEMBROKE PEMBROKESHIRE	BG0019601	SM 87555 03310	01: BIOLOGICAL FILTRATION	194
6	MATHRY STW NR FISHGUARD PEMBROKSHRE	BG0009701	SM 88339 31395	01: BIOLOGICAL FILTRATION	151
7	MILFORD HAVEN STW	BG0033101	SM 89760 04980	01: BIOLOGICAL FILTRATION	3850
8	TIERS CROSS WWTW	BG0013101	SM 89999 10909	01: BIOLOGICAL FILTRATION	90
9	RHOSCROWTHER STW	BG0029101	SM 90000 02200	01: BIOLOGICAL FILTRATION	3.8
10	CASTLEMORRIS WASTEWATER TREATMENT	BG0003501	SM 90488 31957	01: BIOLOGICAL FILTRATION	16.8
11	Keeston Wastewater Treatment Works	BP0087901	SM 90815 18678	01: BIOLOGICAL FILTRATION	129.2
12	CASTLEMARTIN STW	BG0034601	SR 90900 99000	ZZ: Unspecified	30.4
13	Camrose Wastewater Treatment Works	BG0004901	SM 92500 20040	ZZ: Unspecified	32
14	PANTEG STW	BG0014001	SM 92800 34800	ZZ: Unspecified	15.3
15	LETTERSTON WEST STW	BH0071101	SM 92900 29150	01: BIOLOGICAL FILTRATION	510
16	WATERSTON STW	BH0073901	SM 94850 04760	01: BIOLOGICAL FILTRATION	44
17	ST. TWYNNELLS WASTEWATER TREATMENT WORKS	BJ0079201	SR 94875 98049	ZZ: Unspecified	-1

ID	Discharge	Permit ref	Outlet NGR	Treatment	DWF (m^3/day)
18	ROSEMARKET STW MILFORD HAVEN	BG0000501	SM 95350 07950	01: BIOLOGICAL FILTRATION	124
19	PEMBROKE DOCK WASTEWATER TREATMENT	BP0250801	SM 95450 04250	01: BIOLOGICAL FILTRATION	7670.3
20	WOLFSCASTLE STW	BH0068601	SM 95800 26600	01: BIOLOGICAL FILTRATION	77.3
21	NEYLAND WWTW NEYLAND PEMBROKESHIRE	BH0069602	SM 95832 04826	03: TERTIARY BIOLOGICAL	1274
22	TREFFGARNE STW	BN0071601	SM 95850 22950	ZZ: Unspecified	-1
23	HUNDLETON WWTW INLET STORM OVERFLOW	BH0066901	SM 96152 01782	01: BIOLOGICAL FILTRATION	105.3
24	MERLINS BRIDGE STW	BJ0087401	SM 96330 14740	03: TERTIARY BIOLOGICAL	7221
25	UZMASTON WWTW UZMASTON PEMBS	BN0267101	SM 97237 14126	01: BIOLOGICAL FILTRATION	14
26	SPITTAL WWTW SPITTAL PEMBS	BG0016901	SM 97348 22501	01: BIOLOGICAL FILTRATION	81.4
27	BURTON FERRY WWTW NEYLAND PEMBS	BN0021602	SM 97947 04840	01: BIOLOGICAL FILTRATION	82
28	HOOK WwTW	BN0000402	SM 98863 11054	01: BIOLOGICAL FILTRATION	1087
29	LLANGWM STW	BG0042201	SM 99550 08730	01: BIOLOGICAL FILTRATION	289.6
30	COSHESTON STW	BG0046401	SN 00100 03500	01: BIOLOGICAL FILTRATION	129.8
31	AMBLESTON STW	BG0001101	SN 00370 25240	01: BIOLOGICAL FILTRATION	30.5
32	PUNCHESTON Wastewater Treatment Works	BG0017601	SN 00980 29830	01: BIOLOGICAL FILTRATION	36.4
33	Clarbeston Wastewater Treatment Works	BG0014501	SN 01096 20967	01: BIOLOGICAL FILTRATION	84
34	TREWENT PARK PS FRESHWATER EAST PE	BP0060301	SS 01630 97120	01: BIOLOGICAL FILTRATION	118.3
35	LAMPHEY WWTW LAMPHEY NEAR PEMBROKE	BG0022401	SN 01758 00900	01: BIOLOGICAL FILTRATION	134
36	WALTON EAST STW	BN0083801	SN 02300 23000	ZZ: Unspecified	16.4

ID	Discharge	Permit ref	Outlet NGR	Treatment	DWF (m^3/day)
37	LLYS Y FRAN WWTW LLYS Y FRAN PEMBS	BP0366401	SN 03886 24216	29: PACKAGE TREATMENT PLANT	9.9
38	CAREW/MILTON WWTWS PEMBROKESHIRE	BP0044201	SN 03920 03349	01: BIOLOGICAL FILTRATION	245
39	NARBERTH WEST STW	BP0215901	SN 06440 14710	01: BIOLOGICAL FILTRATION	1100.8
40	ROSEBUSH WwTW	BN0267001	SN 07329 29171	ZZ: Unspecified	22
41	MAENCLOCHOG STW CLYNDERWEN	BG0000401	SN 07537 26866	01: BIOLOGICAL FILTRATION	59.1
42	REYNALTON WWTW REYNALTON PEMBS	BN0280301	SN 08730 08653	02: HIGH RATE BIOLOGICAL	11.2
43	LANGDON WWTW BEGELLY PEMBROKESHIRE	BG0012001	SN 09598 07726	01: BIOLOGICAL FILTRATION	848
44	CLYNDERWEN STW	BG0029501	SN 12390 18320	05: CHEMICAL & BIOLOGICAL	182.8
45	LLANDDEWI VELFREY STW	BG0013201	SN 14210 16830	ZZ: Unspecified	92

There are several continuous discharges within the Cleddau estuary, and the original sanitary survey identified that several of these had the potential to negatively impact the bacteriological health of the shellfishery. However, as discussed elsewhere in this report (see Section 2.1) the Milford Haven shellfishery has reduced significantly since the original sanitary survey was published, and at present the only active Classification Zone is within Angle Bay.

As such, there are only three continuous discharges with the potential to impact this zone – Angle Bay Waste Water Treatment Works (WWTW) (No. 5), Milford Haven WWTW (No. 7) and Rhoscrowther Sewage Treatment Works (STW) (No. 9). There have been no changes to the treatment methodologies employed at these works, all three still employ biological filtration. The Rhoscrowther STW has seen a slight reduction in the discharge volume, but the other two remain the same. No upgrades to any of these discharges have occured. Impacts from Angle Bay WWTW and to a lesser extent Milford Haven WWTW are expected to be the greatest given the treatment methodology and consented discharge volume from these sources.

In addition to the continuous discharges, the original sanitary survey identified number of intermittent discharges with the potential to impact the BMPA. Intermittent discharges comprise Combined Storm Overflows (CSOs), Storm Tank Overflows (STOs) and Pumping Station Emergency Overflows (PSs). During Asset Management Plan (AMP) 6 and AMP7, Event Duration Monitoring (EDM) was installed at several of the discharges within the

catchment, and summary data for 2020 was published by the Environment Agency in March 2021, and for 2021 in March 2022 (Environment Agency, 2022). Details of the EDM return for 2021 are presented in Appendix I. There is only one intermittent discharge in the vicinity of the Angle Bay shellfish bed (Angle Bay WWTW, 1 km from the CZ), and EDM data suggests that the Milford Haven SWO spilled less frequently in 2021 than in 2012. There is no EDM data is available for the Angle Bay WWTW in either 2021 or 2012, although in 2020 it spilled 102 times for a total of 844 hrs, meaning it is of potential significance to the bacteriological health of the CZ and should be taken into account in any updated sampling plan.

In addition to the water company owned discharges, the authors of the original sanitary survey identified a large number of private discharges within the catchment, although most were small and discharged to watercourses throughout the catchment. Many such discharges remain, although those in the direct vicinity of the BMPA continue to be small and so do not require additional consideration within the sampling plan as the water company owned discharges will be of much greater significance.

No upgrades to treatment methodologies at the main continuous discharges in the vicinity of the BMPA have occurred. Spills from the intermittent discharge closest to the shellfish bed were fairly common in 2020, although no comparison with the situation at the time of the original sanitary survey was possible. These factors will be taken into account in the updated sampling plan presented in Section 8.

3.3 Agricultural Sources

Direct comparison with the agricultural statistics presented in the original sanitary survey was not possible, as no updated data for the catchments assessed were freely available.

A request was made to the Farming Statistics Office of the Welsh Government for livestock populations within the catchment area presented in Figure 1.1. This data was made available under the Open Government Licence v3.0. Figure 3.3 presents the changes in livestock populations within the catchment between 2012 and 2021. No more fine-scale geographical breakdown of the data was possible because many of the subdivisions within the catchment had very few responses to the survey, leading to potential issues with data quality and possible disclosive results. We have been advised that the catchment level data is accurate however.

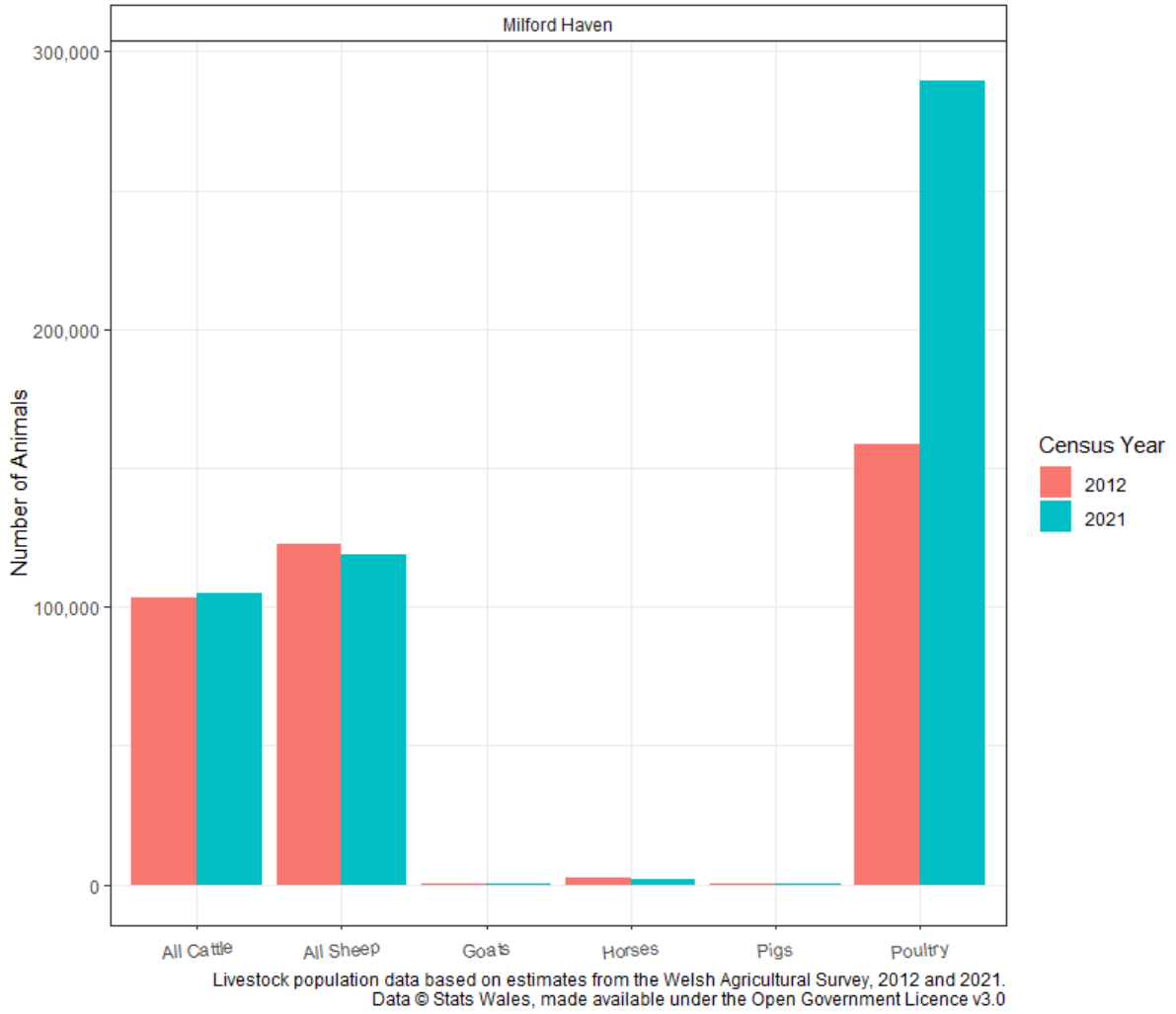


Figure 3.3 Changes in population for different livestock groups between 2012 and 2021. Data based on estimates from the Welsh Agricultural Survey.

These data show that generally populations of livestock groups have remained similar, with cattle increasing slightly from approximately 103,000 animals to 105,000 animals, and sheep populations decreasing slightly from approximately 123,000 animals to 119,000 animals. Goat, horse and pig populations have remained very small, several orders of magnitude smaller than cattle, sheep and poultry. Poultry populations have increased by more than 80%, with the population at approximately 290,000 animals in 2021. During secondary consultation, the LEA confirmed that there were no registered poultry keepers within 5 miles of the site, meaning that this increase in population across the catchment is unlikely to significantly affect the bacteriological contamination of the BMPA. Across all groups of animals, population size will vary throughout the year, with the highest numbers in during Spring and the lowest numbers when animals are sent to market in Autumn and Winter.

The principal route of contamination of coastal waters by livestock is surface run-off carrying faecal matter. Figure 3.4 shows the change in land cover in the vicinity of Milford Haven. It suggests that whilst there are several areas of pasture immediately adjacent to the

shoreline, the geographical extent of these areas has not changed significantly since the original sanitary survey, meaning it would not require additional consideration in any updated sampling plan. Areas of arable farmland adjacent to coastal waterbodies or estuaries can also represent a risk should slurry that has been added to fields as fertiliser wash off into the water. During initial consultations, NRW indicated that the Eastern and Western Cleddau catchments are negatively impacted by phosphate issues. They indicated that pollution events from both run-off and overflowing/leaking slurry lagoons are not uncommon. However, evidence of issues associated with arable land are far less common in the area.

Increases in the livestock populations across the Milford Haven catchment were principally driven by an 80% rise in Poultry populations. However, as the areas of pasture immediately adjacent to the BMPA have remained similar since the production of the original sanitary survey, the overall risk is considered to have remained similar and no modifications to the sampling plan therefore required to capture this source of contamination.

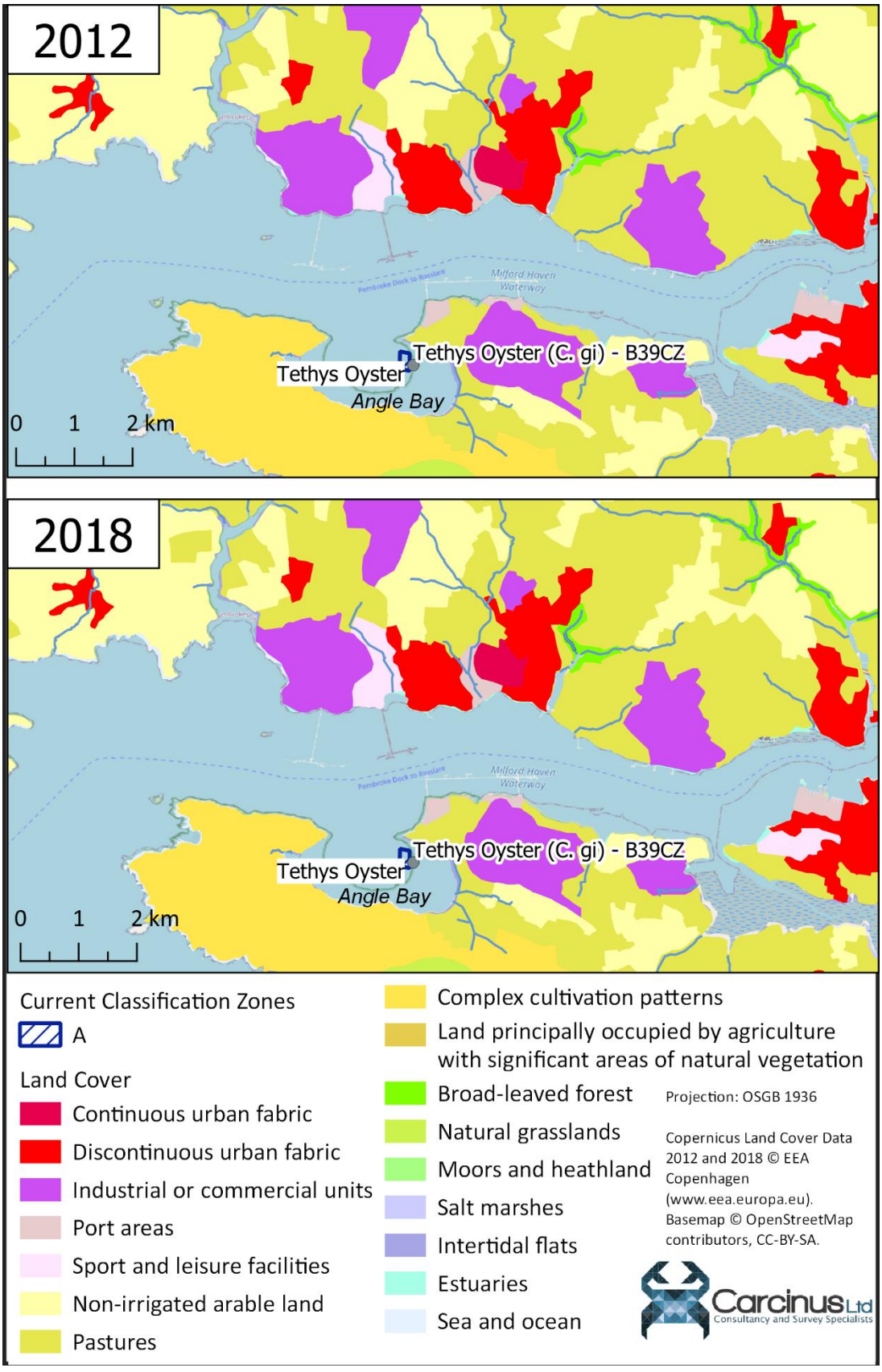


Figure 3.4 Land cover change in the vicinity of Milford Haven between 2012 and 2018.

3.4 Wildlife

The Milford Haven estuary complex contains a large variety of intertidal and subtidal habitats that support a significant diversity of flora and fauna. The group of animals most likely to contribute notable levels of faecal contamination to the shellfishery is overwintering waterbirds (both wildfowl and waders), as they tend to forage (and therefore defecate) directly on intertidal shellfish beds.

In the five winters to 2012/2013, the average count of overwintering birds in the Cleddau Estuary (in which the Milford Haven BMPA sits) was 24,759 (Austin *et al.*, 2014). In the five winters to 2019/2020 (the most recent for which data are available), the average count was 27,727, including nationally significant populations of Brent Goose, Wigeon, Dunlin and Greenshank (Frost *et al.*, 2021). This is an increase of almost 12%, and contamination from birds will therefore continue to represent both a continual diffuse source as well as a periodic acute one. The 'hotspot' areas of contamination will vary from year to year as the avian species forage for food on the shifting shellfish beds, and as such it is impossible to define RMP positions that would reliably account for the pollution that bird species cause. Nevertheless, the effects are likely greatest in winter months when migratory species will be present.

The original sanitary survey identifies that whilst Pembrokeshire is home to approximately 5,000 grey seals, no colonies are located within Milford Haven itself. The population of grey seals at Skomer Island, the closest known colony approximately 10 km from the BMPA, is growing (Bull *et al.*, 2017), and so it is likely that the number of seals occasionally foraging within the estuary has increased slightly. However, this species forages over a wide area and so any faecal contamination will be highly spatially and temporally variable and would have a very minor influence on the bacteriological health of the BMPA, requiring no additional consideration in any updated sampling plan.

No other wildlife species of significance are noted.

3.5 Boats and Marinas

The discharge of sewage from boats in the vicinity of the Milford Haven BMPA is a potentially significant source of contamination. Boating activities in the area have been derived through analysis of satellite imagery and various internet sources and compared to that described in the original sanitary survey. Their geographical positions are presented in Figure 3.5.

Figure 3.5 Locations of moorings, marinas and other boating activities in the vicinity of the Milford Haven BMPA.

The original sanitary survey describes that Milford Haven is a significant deepwater port, serving the hydrocarbon industry as well as being home to a ferry port linking Wales to Ireland. Furthermore, Associated British Ports, Neath Port Talbot Council Pembrokeshire County Council and the Port of Milford Haven have launched a freeport bid consortium to explore the case for a freeport in the area (ABPorts.co.uk, 2022). This would potentially increase the number of vessels moving into and out of the waters of the BMPA. No change to the legislation governing the discharge of sewage from merchant vessels has occurred. Therefore, despite the fact that all these activities are still ongoing (and potentially expanding), contamination from merchant shipping is not considered to be a significant risk to the bacteriological health of the BMPA as merchant shipping vessels are prohibited from making overboard discharges within 3 nautical miles of land[3].

There is an active fishing fleet operating out of Milford Haven, with 39 vessels <10 m and 16 vessels >10 m having Milford Haven as their home port, and a further 343 vessels (most of which are <10 m) listing Milford Haven as their administrative port as of May 2022 (gov.uk,

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

2022). In addition, there is significant pleasure craft activity throughout the estuary and because these vessels are not covered by the sewage disposal regulations for commercial shipping, the greatest potential for bacteriological contamination is likely to come from this source. Vessels of a sufficient size to contain onboard toilets are likely to make occasional overboard discharges, particularly when moving through the main navigational channels or when moored offshore. The marinas at Neyland and Milford Haven are still present, provide berths for several hundred vessels. Neither of these contain pump out facilities, although at the time of writing (June 2022), Milford Marina are planning to install these in the near future (milfordmarina.com, 2022). The only active classification zones within the BMPA are within Angle Bay, and given that the Bay is relatively shallow (<1 m), boating activity (and therefore the risk of contamination) is expected to be minimal. Any contamination is likely to be greatest in summer months.

3.6 Other Sources of Contamination

The only active Classification Zone is situated in Angle Bay. There are no conurbations around this embayment, and the urban fabric (cities, towns and villages and associated land) within the catchment remains relatively sparse, with the only significant conurbations that of Pembroke on the southern side of the estuary, Milford Haven on the northern side and Haverfordwest further inland. Contamination of the shellfishery from utility misconnections is therefore considered to be relatively unlikely, and would form part of the diffuse contamination affecting the zone rather than a point source impact. There are some advertised walks around Angle Bay, and dog walking is likely to occur over those areas of coastline not covered by the oil refineries etc., although again this is unlikely to form a significant point source impact.

The original sanitary survey notes that small operational spills from the hydrocarbon industry in the area may occur from time to time, and this may impact the shellfishery. Industrial operations of this type are ongoing, and so the risk remains. However, it is beyond the scope of this review to consider chemical contamination of shellfish.

4 Hydrodynamics/Water Circulation

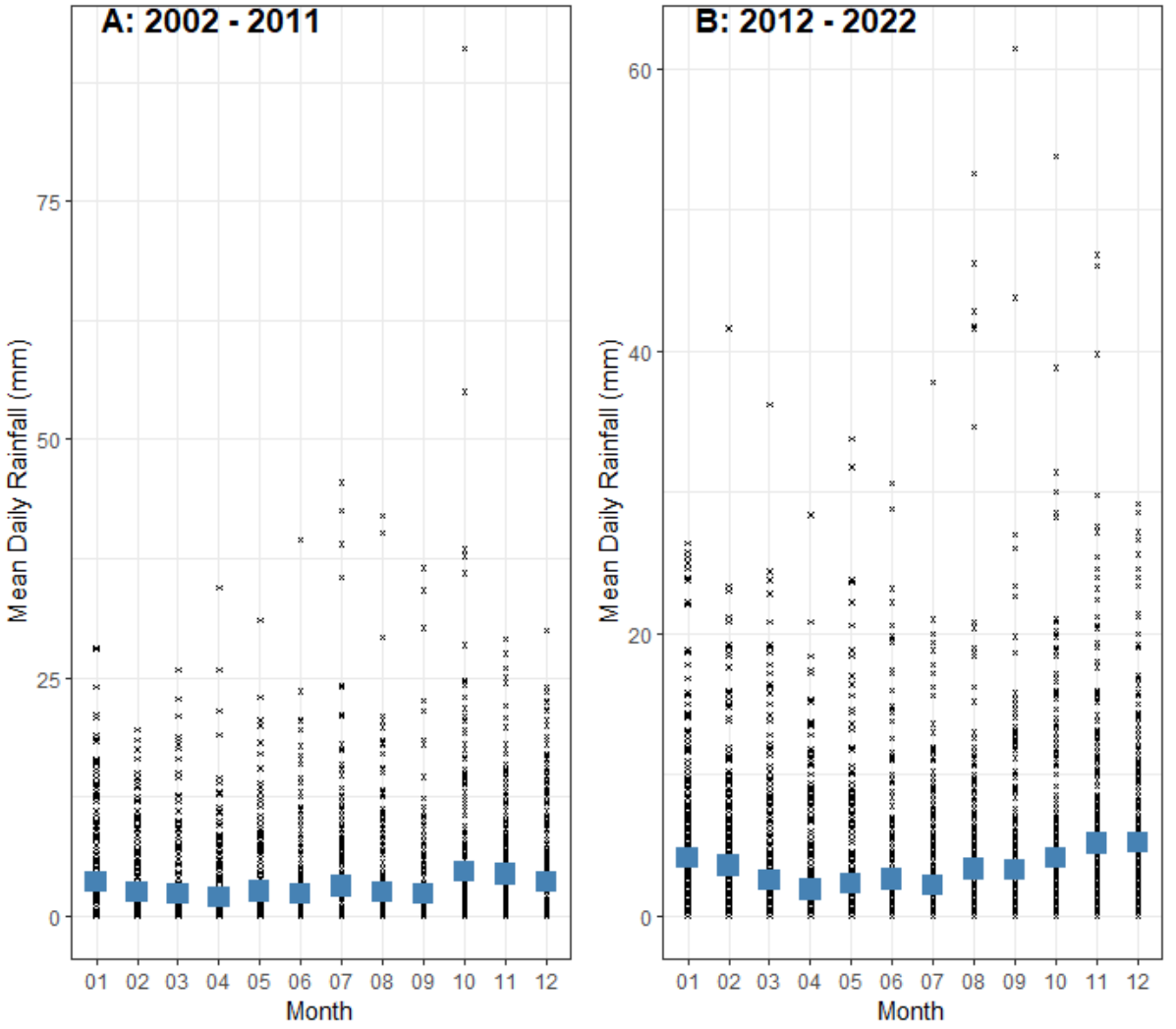
The only Classification Zone currently classified is situated within Angle Bay, on the southern side of the estuary complex, approximately 6 km from the mouth of the estuary. The bay is very shallow, with much of it drying at low water. This is in contrast to the main section of the estuary, which has a central channel up to 30 m depth surrounded by subtidal areas. The original sanitary survey notes that the intertidal embayments along the estuary, of which Angle Bay is a classic example, will have less dilution potential but a large proportion of the water within them will be exchanged each tidal cycle.

Contamination of the CZ in Angle Bay will occur through contamination carried in a south westerly direction on a flooding tide, (contaminants from the main estuary) and north easterly on an ebbing tide (contaminants from the shoreline of Angle Bay). There is no evidence that this pattern of tidal circulation has changed since the original sanitary survey,

and so the recommendations made in that report to account for the hydrodynamics of the area remain valid.

5 Rainfall

Rainfall data for the Bolton Hill monitoring station (NGR: SM 91886 11214) were requested from Natural Resources Wales for the period 2000 – Present. These data were then subdivided into 2002 – 2011 (pre sanitary survey) and 2012 – 2022 (post sanitary survey) and processed in R (R Core Team, 2021). These data were used to determine whether any changes in rainfall patterns had occurred since the original sanitary survey was published. Figure 5.1 shows the average daily rainfall totals per month at the Bolton Hill monitoring station, and the results are summarised in Table 5.1.



Archive Daily Rainfall from the Bolton Hill monitoring station (NGR: SM 91886 11214)

Figure 5.1 Mean daily rainfall per month for the Bolton Hill monitoring station (NGR: SM91886 11214) for the periods (A) 2002 – 2011 and (B) 2012 – 2022.

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

Period	Mean Annual Rainfall (mm)	Percentage Dry Days	Percentage Days Exceeding 10 mm	Percentage Days Exceeding 20 mm
2002 - 2011	1082.11	43.39	33.95	21.48
2012 - 2022	1144.24	36.28	36.57	22.54

The data suggest that the area has received increased rainfall in the years following the original sanitary survey, with both the mean annual rainfall and the percentage of days with more than 20 mm of rain increasing, and the percentage of dry days falling. Two sample t-tests indicated that there was no significant difference ($p > 0.05$) in the mean daily rainfall per month between the 2002 – 2011 and 2012 – 2022 periods.

Rainfall leads to increased faecal loading through two factors, elevated levels of surface runoff and spill events from intermittent discharges. Rainfall levels during both periods were greatest in winter months (November – February), and so the 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 RMP recommendations made in the original sanitary survey to capture the influence of runoff and spill events remain valid.

6 Microbial Monitoring Results

6.1 Summary Statistics and geographical variation

Data is available for the sampling at one RMP within the Milford Haven BMPA since the original sanitary survey was published. This is Tethys Oyster (B39CZ), which has been sampled since October 2019, following a pRMP assessment (Carcinus, 2019). Sampling at this RMP is ongoing, no monitoring data is available for any of the RMPs recommended in the original sanitary survey, as the beds for which they were recommended are not active and no sample has been collected in the last five years. The Cefas datahub[1] only presents data for RMPS where a sample has been taken in the last five years, and so it is possible that other data exists, but is not considered here. The position of the RMP relative to the CZ it represents is presented in Figure 2.1, and summary statistics are presented in Table 6.1.

Table 6.1 Summary statistics of Official Control Monitoring (E. coli MPN/100 g) at bivalve RMPs sampled since the original sanitary survey. Data was cut off at May 2022.

RMP (Species)	*NGR*	*No. Samples collected*	*Mean* E. coli *(MPN/100 g)*	*Min Value (MPN/100 g)*	*Max Value (MPN/100 g)*	*% > 230 MPN/100 g*	*% > 4,600 MPN/100 g*	*%> 46,000 MPN/100 g*
Tethys Oyster (C. gi) – B39CZ	SM89000275	31	116.6452	18	330	12.90323	0	0

Monitoring results from this RMP have been generally very good, with less than 15% of results exceeding 230 MPN/100 g and the maximum result ever returned being 330 MPN/100 g. Figure 6.1 presents a boxplot of *E. coli* monitoring results from this RMP. No comparison is possible as there is only one RMP for which monitoring history is available.

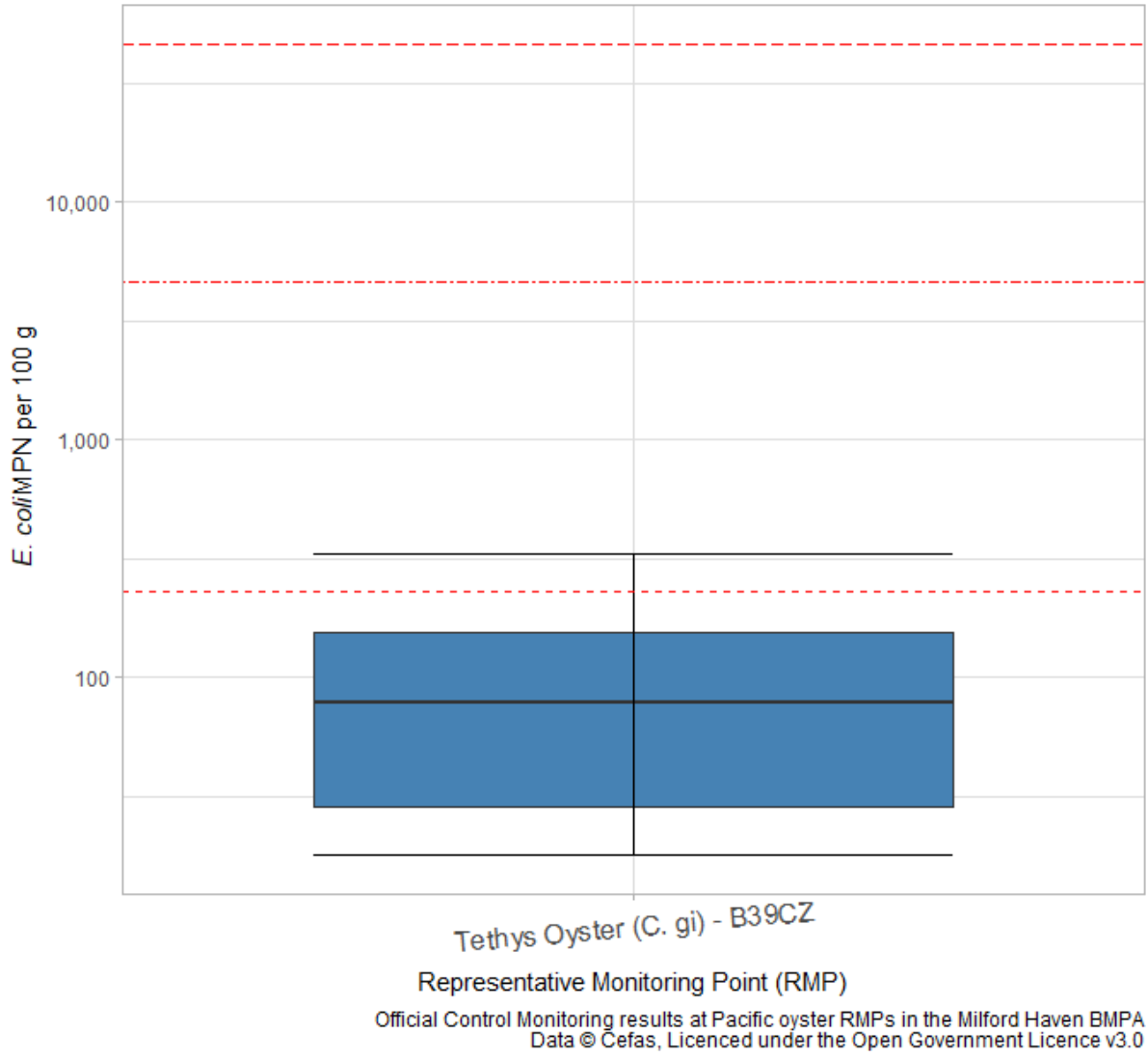


Figure 6.1 Boxplots of E. coli levels at Pacific oyster RMPs sampled within the Milford Haven BMPA since the original sanitary survey. Central line indicates median value, box indicates lower-upper quartile range and whisker indicates minimum/maximum values, excluding outliers (points >1.5 x the interquartile range). Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g.

6.2 Overall temporal pattern in results

The overall temporal pattern in shellfish flesh monitoring results for RMPs sampled within the Milford Haven BMPA is shown in Figure 6.2.The loess model fitted to the data suggests that water quality is generally good in the vicinity of the RMP, with the trend line indicating declining levels of *E. coli* within samples. Only four results have ever been above the 230 MPN/100 g threshold, and many have been at or near the limit of detection (18 MPN/100 g). Since 2022 there has been a slight increase in the loess trend line, although the raw data are well within previous maximum values and so no additional consideration needs to be given to this. Where elevated results have been recorded, they are generally associated with

Autumn / Winter months (October – March), possibly due to higher rainfall in these periods (Figure 5.1).

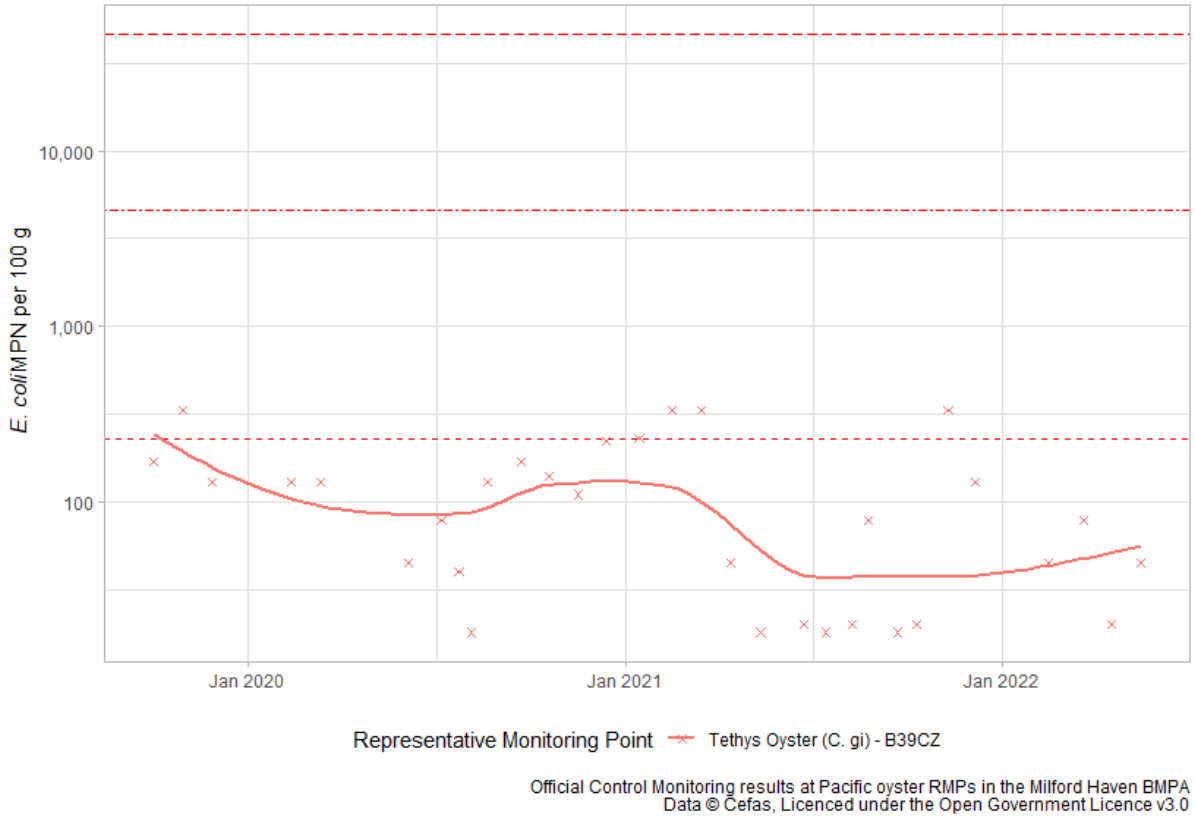


Figure 6.2 Timeseries of E. coli levels at Pacific oyster RMPs sampled in the Milford Haven BMPA since the original sanitary survey. The scatter plot is overlaid with a loess model fitted to the data. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g.

6.3 Seasonal patterns of results

The seasonal patterns of *E. coli* levels in RMPs within the Milford Haven BMPA were investigated and are shown in Figure 6.3. The data for each year were averaged into the four seasons, with winter comprising data from January to March, spring from April to June, summer from July to September and autumn from October to December. As there was only one RMP for which data were available, a one-way Analysis of Variance (ANOVA) test was used to look for significance in the Official Control monitoring data between the four seasons. Significance was taken at the 0.05 level and all statistical analysis was performed in R (R Core Team, 2021).

No significant differences ($p > 0.05$) were found in the data, although slightly higher results have been recorded in winter and autumn months than in spring and summer months. This is likely due to the increased levels of rainfall, and therefore surface runoff, during these months.

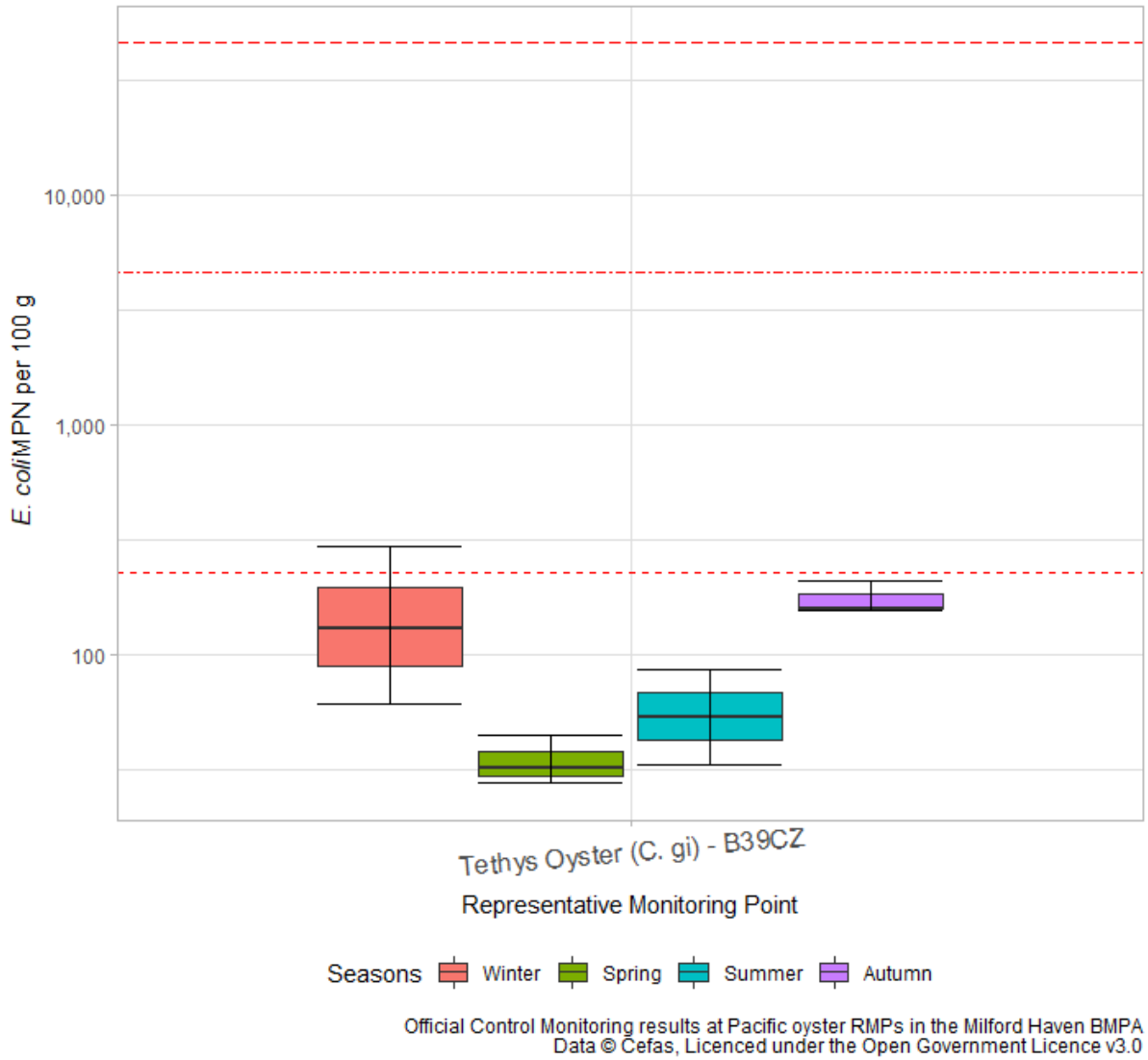


Figure 6.3 Boxplots of E. coli levels per season at Pacific oyster RMPs sampled in the Milford Haven BMPA since the original sanitary survey. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g.

7 Conclusion and overall assessment

The Milford Haven BMPA is situated in the Cleddau estuary complex in Pembrokeshire, West Wales. At the time of the previous sanitary survey of 2012, the shellfishery involved several different species and Classification Zones were positioned throughout the estuary. However, none of the Classification Zones recommended in that report were ever awarded a full classification. At present, the only Classification Zone within the BMPA is located within Angle Bay, and has been classified since 2019, following a pRMP assessment. The Classification Zones are an aquaculture site for native and Pacific oysters. There are no several or regulating orders that apply to the fishery, nor any byelaws. The current harvesting output is <1 tonne per month.

The original sanitary survey presents the result of the 2001 census to provide an indication of the human population across the catchment. As the results of the March 2021 census are not yet available, the changes between the 2001 and 2011 censuses were compared to give an indication of population trends. The total resident population in Census Super Output Areas (lower layer) was estimated to have increased by 8.55% between 2001 and 2011, and the UK government estimate that the population will have increased a further 6.79% between 2011 and 2022. The main population centres did not change significantly. The area remains a popular tourist destination, and the peak tourist season is June – September (with well over 50% of visitors coming during this period). The main population centres within the catchment have not changed significantly, and as a result the recommendations made in the original sanitary to account for the impact of human population centres remain valid.

No upgrades to any of the three main continuous discharges in the vicinity of the BMPA have occurred since the original sanitary survey was published, although the consented discharge volume at the Rhoscrowther STW has decreased slightly. There are very few intermittent discharges in the vicinity of the Angle Bay shellfish bed, although EDM data from 2020 suggests that these should be taken into account in any update sampling plan as they spill relatively frequently.

A direct comparison of the livestock statistics presented in the original sanitary survey was not possible as data to the same spatial scale was not available. The overwhelming majority of the catchment is in the Pembrokeshire local authority area, and so the livestock populations of that district were adjusted to the percentage of the district within the catchment. These data suggest that livestock numbers across the catchment increased by almost 50% between 2012 and 2017 (no more recent data are available), though much of this increase was driven by a large increase in fowl numbers. Whilst there are several areas of pasture immediately adjacent to the shoreline around the BMPA, although land cover maps suggest that the geographical extent of these areas has not changed significantly. Overall, the risk from this source of contamination is not considered to have changed significantly, as there is no evidence that significant growth in poultry farming immediately adjacent to the BMPA has occurred, and as such requires no further consideration in any updated sampling plan.

The BMPA is situated within the Cleddau estuary complex, which contains a variety of intertidal and subtidal habitats that support a significant diversity of wildlife. One group of animals that is most likely to contribute contamination to the BMPA are overwintering waterbirds and waders. The winter counts conducted by the Wetland Bird Survey show that the average count of waterbirds and waders (including gulls) in the five winters to 2019/20 was almost 12% higher than in the five winters to 2012/2013. Hotspots of contamination are likely to occur, particularly in the winter months, although the precise locations of contamination are likely to be very spatially and temporally variable and so impossible to reliably capture with a single RMP. The Pembrokeshire coast is also home to a large population of grey seals, and the population of the nearest colony is known to be growing.

However, these animals have very large foraging ranges and so the impact of any faecal contamination is likely to be very minimal.

There is a significant volume of shipping activity in Milford Haven, with commercial ports, ferry terminals, a small but significant fleet of fishing vessels and two large marinas for recreational craft. Commercial vessels are prohibited from making overboard discharges within 3 nautical miles of land and so would not pose a risk to the bacteriological health of the shellfishery. However, recreational vessels of a sufficient size to contain onboard toilets are liable to make overboard discharges from time to time, particularly when moving through the main navigational channels or when moored offshore. However, the only active CZ in the BMPA is located in a very shallow embayment that is dry for a significant portion of the tidal cycle, and so the overall impact of contamination from boats is likely to be minimal.

Official Control monitoring data is available for a single RMP within the BMPA, which has been sampled since 2019 and is still in use. No monitoring data is available for any of the RMPs recommended in the original sanitary survey, although the beds they were recommended for are not currently classified. The monitoring data from Tethys Oyster (B39CZ) suggests that water quality in the area is generally good, with the maximum result ever recorded only being 330 MPN/100 g. No statistical comparison with other RMPs is possible, although comparison of data from this RMP between seasons suggests that results from Winter and Autumn months are slightly higher (although not statistically significantly so).

Based on the information available, whilst there have evidently been large changes to the nature of the shellfishery in the BMPA, there do not appear to have been any significant changes to the main sources of contamination since the original sanitary survey was published. The authors of this review have not identified any knowledge gaps that would justify a full shoreline survey.

Having reviewed and compared the desk-based study with the findings of the original sanitary surveys in 2012, the FSA are also content that a shoreline assessment is not required.

8 Recommendations

The Milford Haven BMPA currently only has one active RMP that is used to classify two Classification Zones (same area for two species). Recommendations for the CZs in the BMPA are given below, with justification, and summarised in Table 8.1.

8.1 Pacific oyster

8.1.1.1 Tethys Oyster

This CZ covers an area of 0.05 km² in the eastern side of Angle Bay, and was classified following a pRMP assessment conducted in 2019 (Carcinus, 2019). That report identified that the main contamination sources affecting this zone were located a significant distance from the zone itself in the wider estuary, with some minor impact likely from the STW discharge on the western side of the Bay. It recommended placing an RMP in the centre of

the zone (with a slight bias to the low water mark), at NGR SM 8883 0282. This location is approximately 185 m north west of the current RMP position at NGR SM 8900 0275. During secondary consultation, the LEA stated that the original location was inaccessible at all but the lowest states of tide. It is recommended that the eastern boundary of the CZ be moved eastwards so that the existing RMP location is within the CZ boundaries (Figure 8.1) .

8.2 Native oyster

8.2.1.1 Tethys oyster

This CZ covers the same area as the Pacific oyster CZ of the same name. A Cefas report, commissioned by the FSA, into the suitability of using indicator species to classify UK shellfish production areas (Cefas, 2014), recommended that Pacific oyster (*C. gigas*) can be used to reliably represent native oyster (*O. edulis*). Therefore, it is considered appropriate to continue to use the Tethys Oyster (B39CZ) Pacific oyster RMP (in its new position) to represent the native oyster CZ.

8.3 General Information

8.3.1 Location Reference

Production Area	**Milford Haven**
Cefas Main Site Reference	M039
Ordnance survey 1:25,000	OS Explorer 36
Admiralty Chart	3274 and 3275

8.3.2 Shellfishery

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

8.3.3 Local Enforcement Authority(s)

Name	**Pembrokeshire County Council** Unit 23, Thornton Industrial Estate, Milford Haven, SA73 2RR
Website	https://www.pembrokeshire.gov.uk
Telephone number	01437 764551
E-mail address	porthealth@pembrokeshire.gov.uk

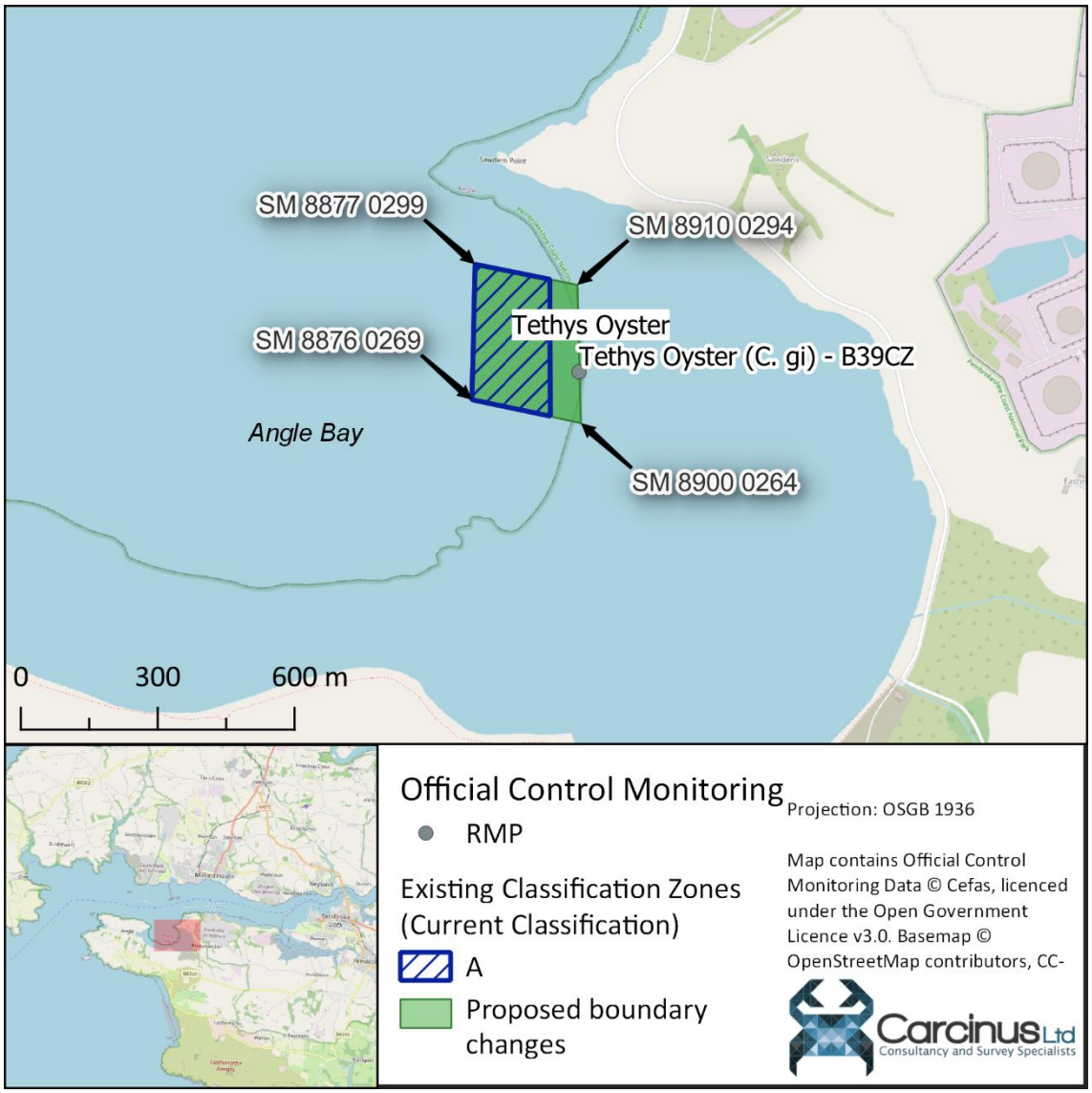


Figure 8.1 Proposed changes to the boundaries of the Tethys Oyster Classification Zone.

*Table 8.1 Proposed sampling plan for the Milford Haven 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
Tethys Oyster (Pacific and native oyster)	B39CZ	Tethys Oyster	SM 8900 0275	51°41.026'N 05°3.223'W	Pacific oyster; native oyster	Hand	Hand	*C. gigas*	25 m	Monthly

9 References

ABPorts.co.uk (2022) *South-West Wales launches a freeport bid consortium*. Available at: https://www.abports.co.uk/news-and-media/latest-news/2022/south-west-wales-launches-a-freeport-bid-consortium/ (Accessed: 7 December 2022).

Austin, G.E. *et al.* (2014) *Waterbirds in the UK 2011/12: The Wetland Bird Survey.* Thetford: BTO/RSPB/JNCC.

Bull, J.C. *et al.* (2017) *Temporal trends and phenology in grey seal (Halichoerus grypus) pup counts at Skomer, Wales*. Bangor: Natural Resources Wales, pp. 1–24. Available at: www.naturalresourceswales.gov.uk (Accessed: 7 June 2022).

Carcinus (2019) *Provisional Representative Monitoring Point (pRMP) Assessment - Tethys Oyster Farm Site*. Carcinus.

Cefas (2012) *Sanitary Survey of Milford Haven*. Weymouth: Cefas.

Destination Research (2019) *Economic Impact of Tourism: Visit Pembrokeshire-2019*.

Environment Agency (2022) *Event Duration Monitoring - Storm Overflows - Annual Returns*. Available at: https://data.gov.uk/dataset/19f6064d-7356-466f-844e-d20ea10ae9fd/event-duration-monitoring-storm-overflows-annual-returns (Accessed: 21 June 2022).

European Commission (2021) *Community Guide to the Principles of Good Practice for the Microbiological Classification and Monitoring of Bivialve Mollusc Production and Relaying Areas with regard to Implementing Regulation 2019/627*. Issue 4. Available at: https://www.aesan.gob.es/en/CRLMB/docs/docs/procedimientos/Micro_Control_Guide_DEC_2021.pdf (Accessed: 24 October 2022).

Frost, T.M. *et al.* (2021) *Waterbirds in the UK 2019/20: The Wetland Bird Survey.* Thetford: BTO/RSPB/JNCC.

gov.uk (2022) *UK fishing vessel lists*. Available at: https://www.gov.uk/government/collections/uk-vessel-lists (Accessed: 7 June 2022).

mhpa.co.uk (2022) *Retail, Leisure and Tourism*. Available at: https://www.mhpa.co.uk/leisure-and-tourism/ (Accessed: 27 May 2022).

milfordmarina.com (2022) *Frequently Asked Questions for Liveaboards at Milford Marina*. Available at: https://www.milfordmarina.com/berthing/liveaboard-berthing/frequently-asked-questions-for-liveaboards-at-milford-marina# (Accessed: 7 June 2022).

Natural Resources Wales (2022) *Consented Discharges to Controlled Waters with Conditions*. Available at:

https://lle.gov.wales/catalogue/item/ConsentedDischargesToControlledWatersWithConditions/?lang=en (Accessed: 12 September 2022).

ons.gov.uk (2022) *National population projections - Office for National Statistics*. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2020basedinterim (Accessed: 27 May 2022).

R Core Team (2021) 'R: A language and environment for statistical computing'. Vienna, Austria: R Foundation for Statistical Computing. Available at: https://www.R-project.org/ (Accessed: 8 June 2022).

10 Appendices

Appendix I. 2021 EDM Return

Site Name	Permit Reference	NGR	Counted Spills in 2021	Total Duration (hours) of spills in 2021
CLYNDERWEN WWTW INLET CSO	BP0324401	SN1235318390		
M.HAVEN/CASTLE PILL SWO PEMBS	BP0065501	SM9133106116	0	0
CSO serving Wolfsdale SPS, Wolfsdale, Pembrokeshire, SA62 6JH	XB3990HH	SM9311821238	63	814
LANGDON STW STORM LANGDON PEMBS	BG0012002	SN1008207451	163	2036.25
MILFORD HAVEN STW	BG0033102	SM8995006210	23	279.25
MILFORD HAVEN STW	BG0033103	SM8995006210	40	132.75
PONT-YR-HAFOD SEWAGE PUMPING STATION	BP0353301	SM9066126063	94	1802.5
COMBINED SEWER OVERFLOW NO 6	BP0295801	SM9480615321	61	89.5
CSO AT 3/4 ST NICHOLAS CRES PBROKE	BP0065801	SM9840101896	14	9.25
EMERGENCY DISCHARGE FROM LLANGWM SPS	BN0266801	SM9901209341	53	982
Houghton SPS	CB3193FB	SM9819907262	0	0
HOOK STW	BN0000402	SM9848011032	44	287
M'TON BRDGE P'BROKE SWO	BP0209501	SM9809301328	0	0
COSHESTON STW . .	BG0046402	SN0014703497	251	2922
MILL BRIDGE CSO	BP0281401	SM9834301663	43	73.25
ANGLE VILLAGE PS . .	BP0111901	SM8657202949	105	1589.75
WOLFSCASTLE STW . .	BG0011602	SM9579626647	25	126
LETTERSTON WEST WORKS . .	BH0071102	SM9290029200	152	1331
PUNCHESTON WORKS INLET . .	BG0017602	SN0098929834	175	2784.75
CRUNDALE SPS CRUNDALE HAVERFORDWEST	BP0287301	SM9657217563	0	0
HOLYLAND ROAD CSO TWOPENNY HAY CLSE	BP0117501	SM9916901348	32	399.75
ST ISHMAELS WORKS INLET . .	BG0011502	SM8323606828	110	1980.25
Pembroke Dock Sycamore St	AB3597FE	SM9649402639	11	6.25
LWR PENR(E).SWO.PEMBR PEMB	BP0066101	SM9643302117	34	193
(B)MEYRICK ST SWO PEMBROKE DO	BP0209401	SM9675203668	37	333.25
PROMEDE NEYLAND SWO	BP0208601	SM9600305032	33	29.5
LLANDDEWI VELFREY STW RBERTH PEMB	BG0013202	SN1423016872	62	1099.5
PENR(W).SWO.PEMB.DOCK	BP0066001	SM9624702154	13	8.75

LAMPHEY WWTW LAMPHEY NEAR PEMBROKE	BP0339101	SN0191100793	3	6
Rosemarket	AB3499CN	SM9537107953	86	429.5
WOLFSCASTLE P.S. . .	BP0111801	SM9579426430	38	418.5
PICTON PS & PICTON FIELDS CSO	BP0282301	SM9563315418	89	298.75
Keeston Works Inlet CSO	BP0087902	SM9082018697	116	1076.5
CAREW WWTW CAREW PEMBROKESHIRE	BP0215001	SN0518003555	179	2966.5
PEMBROKE DOCK STW (EMERGENCY) FORT	BP0250802	SM9560303765	32	94.75
BURTON FERRY WWTW NEYLAND PEMBS	BP0272401	SM9804204970	44	586
CLARBESTON ROAD PS	BG0014503	SN0198420715	150	3011.5
PEMBROKE RIVER PS CATSHOLE QUARRIES	BN0084703	SM9795101836	0	0
RBERTH WEST STW	BP0219601	SN1028614257	47	227.5
NEYLAND PROMEDE CSO , ,	BP0223901	SM9637804820	4	3
BROADMOOR SEAGE PUMPING STATION	BP0296701	SN1000606189	20	85
TIERS CROSS WWTW INLET CSO PEMBRK	BP0315301	SM9033410786	263	4666.75
DALE WWTW DALE MILFORD HAVEN PEMBS	BP0345801	SM8109805719	24	15
Gaddarn Reach SPS	AB3595HZ	SM9679605676	0	0
Nelson Quay SPS CSO	AB3794CH	SM9042805779	0	0
Honeyborough SPS CSO	AB3794FZ	SM9621106436	0	0
MAENCLOCHOG STW	BG0000402	SN0757926915	167	2356.5
CLARBESTON STW HAVERFORDWEST PEMBS	BG0014502	SN0112620958	193	1178.75
HERBRANDSTON WWTW HERBRANDSTON	BG0016702	SM8693107230	0	0
SPITTAL WWTW SPITTAL PEMBS	BG0016902	SM9743522631	323	2709.75
MARLOES WORKS INLET . .	BG0022702	SM7975508378	29	381.5
CASTLEMORRIS WASTEWATER TREATMENT	BG0034602	SM9022931645	58	243.75
CSO 7 UNION HILL HAVERFORDWEST	BH0069801	SM9564215270	73	94.25
NORTHGATE/FRED REES CSO HVRFORDWEST	BH0070601	SM9524115935	32	56
WATERSTON WORKS INLET . .	BH0073902	SM9474404829	283	819
FRESHWATER OUTFALL PUMPING STATION	BP0060302	SS0148797753	0	0
M'FORD HAVEN RATH SWO MILFORD HAVEN	BP0065701	SM9083205566	82	182.5
NEYLAND P.S. . .	BP0111601	SM9588105166	21	82.5
IRON DUKE CLYNDERWEN SPS	BP0112001	SN1185619312	47	887.75
RBERTH BRIDGE SWO RBERTH PEMBS	BP0117701	SN1073114121	67	220

BEGELLY CS0 BEGELLY KILGETTY	BP0208701	SN1143306934	17	82
NEW QUAY CSO NEW QUAY HAVERFORDWEST	BP0282701	SM9552515575	41	61
COMBINED SEWER OVERFLOW NO 10	BP0295901	SM9456215688	0	0
ANGLE WWTW PEMBROKE PEMBROKESHIRE	BP0312801	SM8689803127	46	695.75
WATER ST P'BROKE DK SWO	BP0116201	SM9688003780	26	23.25
MILFORD HAVEN SWO	BP0065601	SM9008305476	68	125.75
MERLINS BRIDGE STW/INLET SPS	BJ0087402	SM9563014640	115	847.25
CSO WOODBINE CLOSE PEMBROKE	BP0117301	SM9871101703	4	1
STEYNTON SPS	BP0322501	SM9127306885	59	509.25
MATHRY SPS NR FISHGUARD PEMBROKSHRE	BP0317201	SM8823331583	13	91.25
PRIORY	BP0322201	SM9022207245	7	11.5
LETTERSTON EAST WWTW INLET CSO	BP0324501	SM9540229572	89	1537
LLANGWM WWTW LLANGWM PEMBROKESH	BP0324601	SM9960808745	43	900
HUNDLETON WWTW INLET STORM OVERFLOW	BP0328401	SM9629301333	110	515
CAREW/MILTON WWTWS PEMBROKESHIRE	BP0345601	SN0407903248	172	3710.75
NEYLAND WWTW NEYLAND PEMBROKESH	BP0347501	SM9578205330	32	38.75
Combined Sewer Overflow at Beach Hill	WQD007456	SM9128205723	68	115.75
SCLEDDAU WORKS INLET . .	ZB3590HM	SM9461333945	171	3394.75

Cefas

EC Regulation 854/2004

CLASSIFICATION OF BIVALVE MOLLUSC PRODUCTION AREAS IN ENGLAND AND WALES

SANITARY SURVEY REPORT

Milford Haven

2012

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.

Contact Us

Carcinus Ltd

Wessex House

Upper Market Street

Eastleigh

Hampshire

SO50 9FD

Tel. 023 8129 0095

Email. enquiries@carcinus.co.uk

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

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".*