Sanitary Survey - Review

Swansea Bay – 2023

Document No. – *J0591/22/08/08*

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Document QA and Approval

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Author	Joshua Baker	Senior Consultant	18 October 2023
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Initial Consultation

Consultee	**Date of consultation**
Swansea Council	March 2023
Natural Resources Wales	May 2022

Consultation on draft report

Consultee	Date of consultation
Natural Resources Wales	February 2023
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Swansea Port Health Authority	March 2023
Welsh Water	March 2023

A sanitary survey relevant to the bivalve mollusc beds in Swansea Bay was undertaken in 2011 in accordance with Regulation (EC) 854/2004 (which was replaced by retained EU Law Regulation (EU) 2017/625, with sanitary survey requirements now specified in retained EU Law Regulation (EU) 2019/627). This provided appropriate hygiene classification zoning and monitoring plan based on the best available information with detailed supporting evidence. In line with regulatory and EU guidance the Food Standards Agency undertake targeted sanitary survey reviews to ensure public health protection measures continue to be appropriate. This report provides a review of information and recommendations for a revised sampling plan if required. Carcinus Ltd. (Carcinus) undertook this work on behalf of the FSA. Carcinus Ltd accepts no liability for any costs, losses or liabilities arising from the reliance upon or use of the contents of this report other than by its client.

Dissemination

Food Standards Agency, City and County of Swansea. The report is publicly available via the Carcinus Ltd. website.

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

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1 Introduction

1.1 Background

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

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

1.2 Swansea Bay Review

This report reviews information and makes recommendations for a revised sampling plan for existing mussel (*Mytilus* spp.) classification zones in Swansea Bay (Figure 1.1). This review explores any changes to the main bacteriological 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 the Natural Resources Wales (NRW) responsible for the production area was undertaken in Spring 2022. This supporting local intelligence is valuable to assist with the review and was incorporated in the assessment process.

Following production of a draft report, a wider **external second round of consultation** with responsible LAs, Industry and other Local Action Group (LAG) members was undertaken in Spring 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 2011 and sampling plan as necessary and the report should be 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.

A Shoreline Survey was undertaken in February 2023, and the desktop assessment has been updated with additional relevant information.

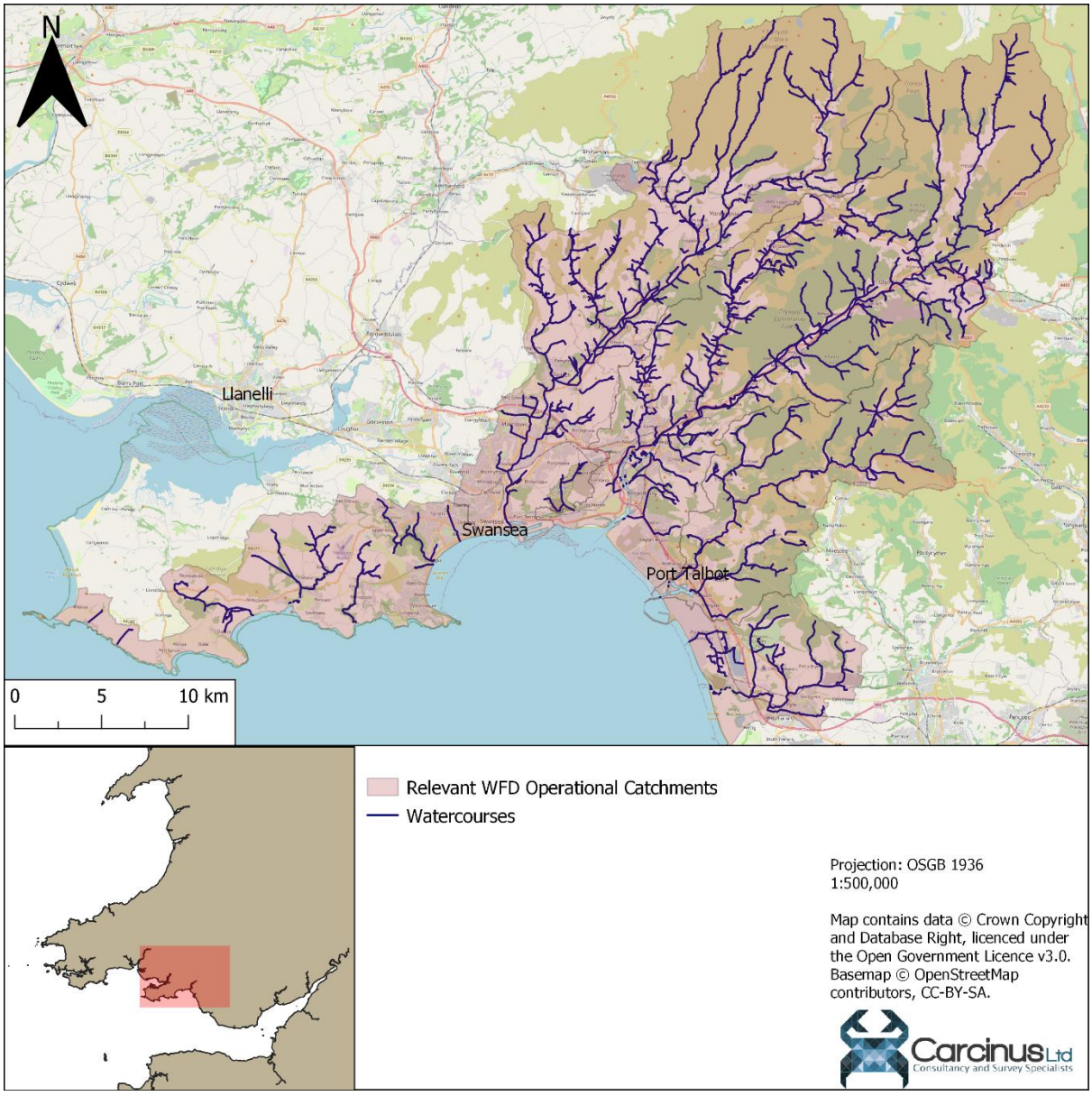


Figure 1.1 Location of Swansea Bay.

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 August 2022, with supplementary information from the Shoreline Survey conducted in February 2023.
- 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 August 2022 have been used within this study. Any subsequent samples have not been included.

2 Shellfisheries

2.1 Description of Shellfishery

The Swansea Bay Bivalve Mollusc Production Area (BMPA) is situated within the embayment of the same name, located on the southern coast of West Wales. The only identified Classification Zone (CZ) for bivalve molluscs is situated within the Queen's Dock, in the middle of the embayment. There are no other BMPAs in the near vicinity, the closest is the Burry Inlet, on the other side of the Gower Peninsula, although there is no hydraulic connectivity between this BMPA and the Swansea Bay production area. 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 the report can be drawn on should reclassification of historic zones be required in the future.

The shellfish beds within the Swansea Bay BMPA are under the jurisdiction of the Local Enforcement Authority (LEA), Swansea Council, for food hygiene purposes. The Swansea Bay (Thomas Shellfish Limited) Mussel Fishery Order 2012 came into force on 18 September 2012 and grants right of several fishery within an area off the coast of the Mumbles, on the western side of the embayment, for 20 years (HM Government, 2012). No other several or regulating orders apply to the waters of the BMPA, nor any byelaws governing harvesting of shellfish in the area.

At the time of the original sanitary survey in 2011, there were active CZs for both mussels and native oysters (*Ostrea edulis*) within Swansea Bay, with the main harvesting areas off The Mumbles and in the southern section of the embayment (Cefas, 2011). The original sanitary survey did give a recommendation for two CZs and Representative Monitoring Points (RMPs) for native oyster, although oyster zones were declassified in 2012. Similarly, the 2011 report provided a recommendation to create four mussel CZs in the main embayment, none of which are currently classified. A CZ for the area covered by the Mussel Fishery Order 2012 was classified in 2013 and 2014, but was declassified in the following year. At present there are no active classification zones within this area.

The only designated CZ within the Swansea Bay BMPA is the mussel zone within the Queens' Dock. This was classified following the original sanitary survey in 2011, and has held a B or

[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/.

long term-B (LT-B) classification for most of the last 10 years. In April 2022, commercial harvesting was prohibited from this CZ due to a number of results significantly above the maximum permitted regulatory limit (46,000 *E.coli/*100g) and as a consequence, there is presently no output from this fishery.

2.2 Classification History

The original sanitary survey provided a recommendation for the creation of seven Classification Zones, five for mussels and two for native oyster. Only one of these zones is still designated, *Queens Dock* which covers the whole of the Queens' Dock within the Port of Swansea. Historic classification information provided by the Food Standards Agency suggests that none of the other zones recommended in the original sanitary survey were ever awarded full classifications. In addition, a CZ covering the several order bed off the Mumbles was classified in 2013, but declassified in 2015. The location of the *Queen's Dock* CZ within the BMPA is shown in Figure 2.1.

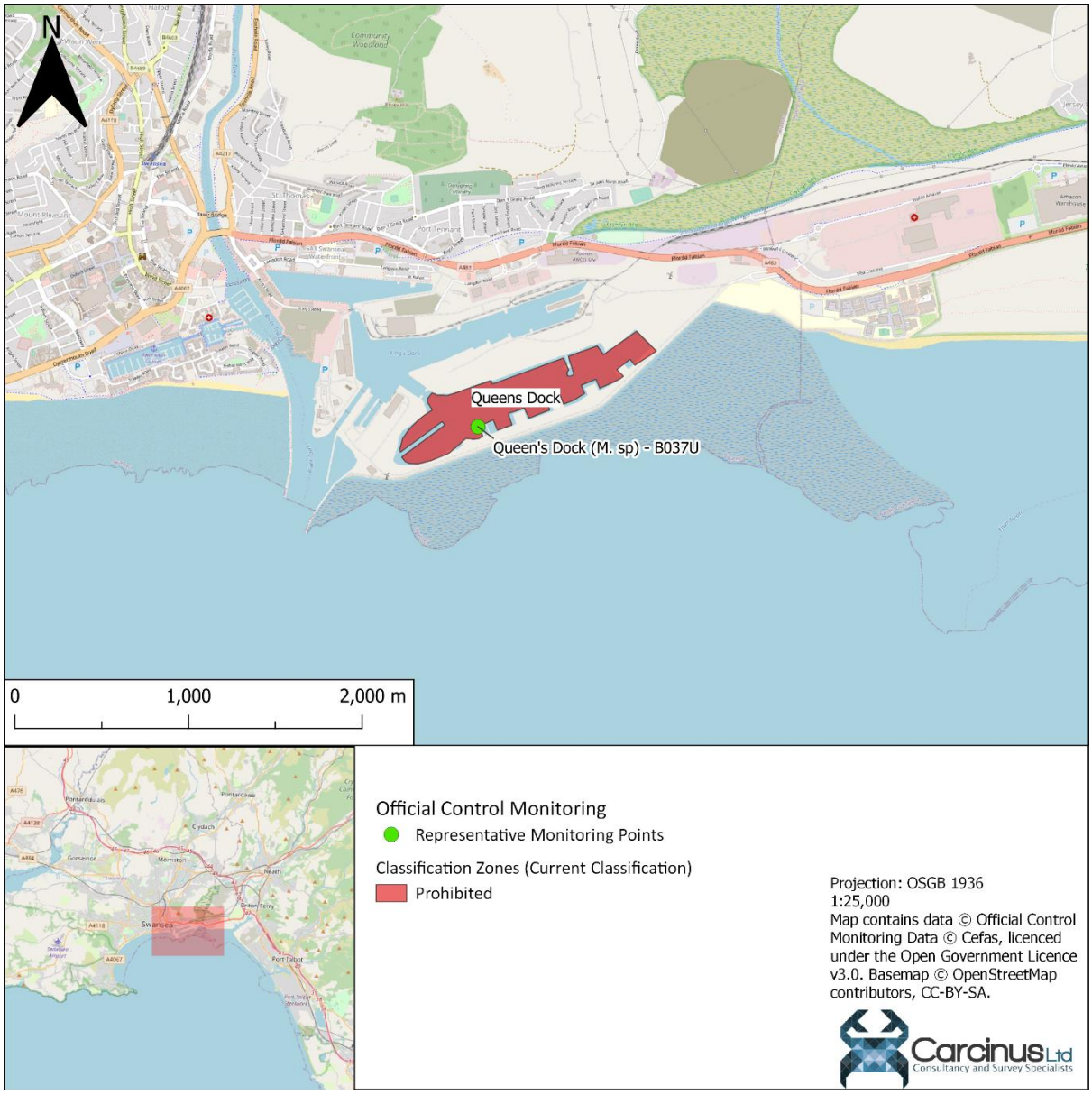


Figure 2.1 Current Classification Zones and associated Representative Monitoring Points in the Swansea Bay BMPA.

3 Pollution sources

3.1 Human Population

The 2011 sanitary survey presents population data based on mid-2005 population estimates for river catchment areas within England and Wales (Cefas, 2011). Repeat data was not readily available to the authors of this review, and so population changes between the 2001 and 2011 censuses of the United Kingdom were considered 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

[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.

census Super Output Areas (lower layer) wholly or partially contained within the Swansea Bay catchment between the 2001 and 2011 census are shown in Figure 3.1.

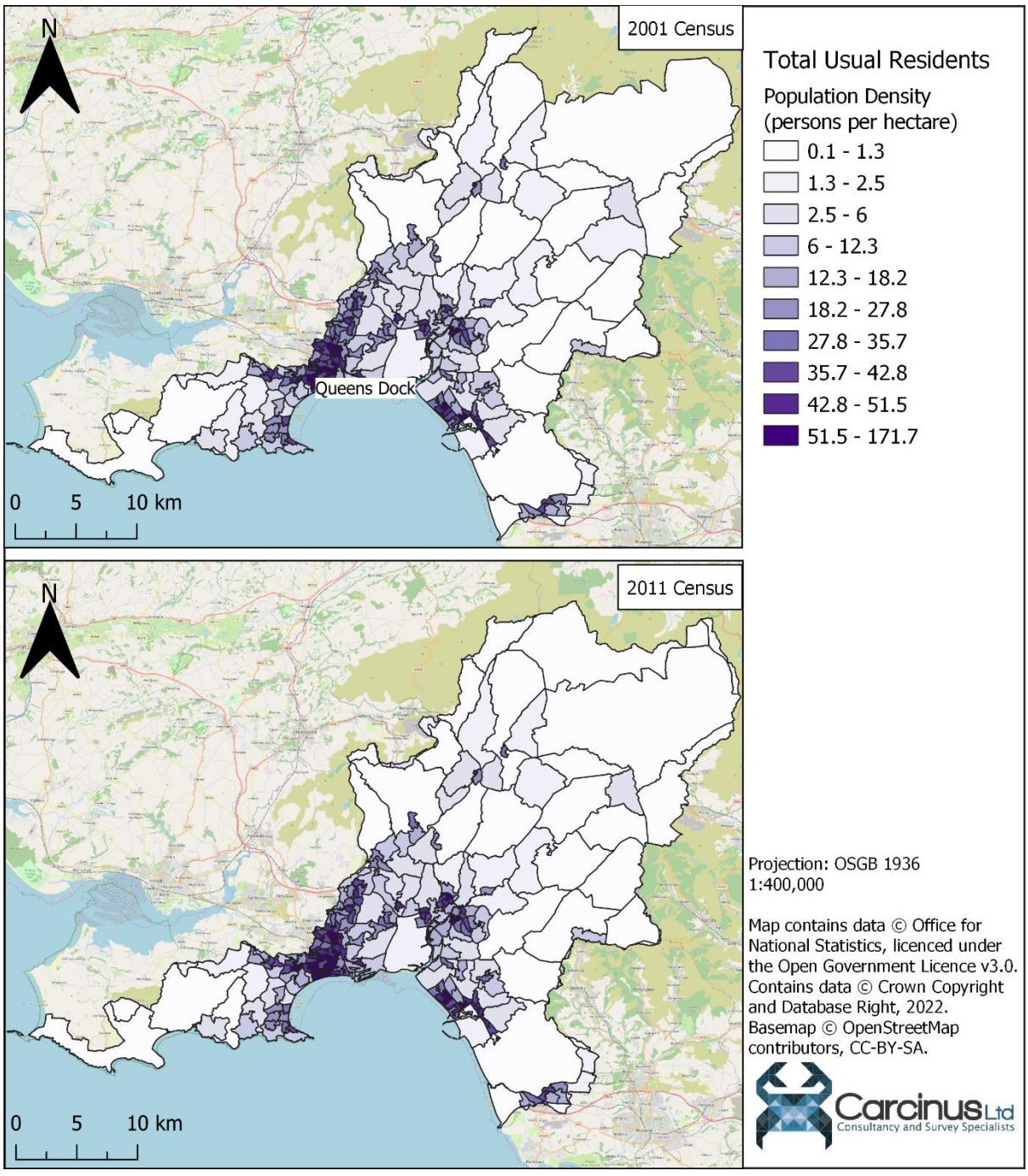


Figure 3.1 Human population density in 2001 and 2011 Census Super Output Areas (lower layer) that intersect the Swansea Bay catchment.

The data presented in Figure 3.1 suggests that the distribution of the main population centres within the catchment has not changed significantly, with the majority of the catchment having population densities of <1 person per hectare. The main population centres remain Swansea and its surrounding suburbs, as well as the towns of Port Talbot on the eastern side of the bay and the towns backing the Mumbles on the western side of the bay. All these conurbations have areas with population densities above 30 persons per

hectare. Across the entire catchment, the estimated average population density at the 2011 census was 24.59 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 Swansea Bay catchment was 365,534 at the time of the 2001 Census. By the 2011 census, this had increased to 384,258, an increase of 5.12%. 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 Swansea Bay catchment increase to 41,349 people.

The potential for urban runoff remains greatest from the city of Swansea as it is located directly adjacent to the shores, and is the closest conurbation to the only active (but currently Prohibited) CZ in the BMPA. Impacts from sewage discharges would depend on the specific nature and locations of such discharges, changes to which are discussed in the next section.

During the shoreline survey, it was noted that areas within the proximity of the BMPA were undergoing development/building works. Development, both residential and commercial, can lead to increased contamination of waterways, either through direct run-off or the development itself applying increased pressure on the wastewater treatment network (WWTN). We understand that some redevelopment of the land surrounding the Port of Swansea has taken place, and a recent plan to construct approximately 200 more homes in coming years has been proposed (Nation Cymru, 2022). Any new housing developments may lead to a small increase in population size and therefore an increase in the demand placed on WWTN. Without upgrades to assets on the WWTN, an increase in faecal loading to coastal waters is possible which could negatively impact the BMPA. Most new housing developments have to incorporate a waste strategy into their planning submission, so no additional consideration needs to be given to these developments. Without information to the contrary, the authors of this review assume that any new housing development would be connected to the existing sewerage network, and therefore minimal additional bacteriological contamination is expected.

The original sanitary survey cites tourism statistics from 2008 and 2009, with just over 710,000 and just under 870,000 annual visitors to the city respectively. Directly comparable data were not available, although data from The Scarborough Tourism Economic Activity Model (STEAM) show that Swansea Bay received over 4.3 million visitors in 2013 (a rise of 200,000 on the year before) (Turner, 2014). In 2019, this had increased to 4.79 million (Swansea Council, 2021). 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 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 Swansea Bay catchment were 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.

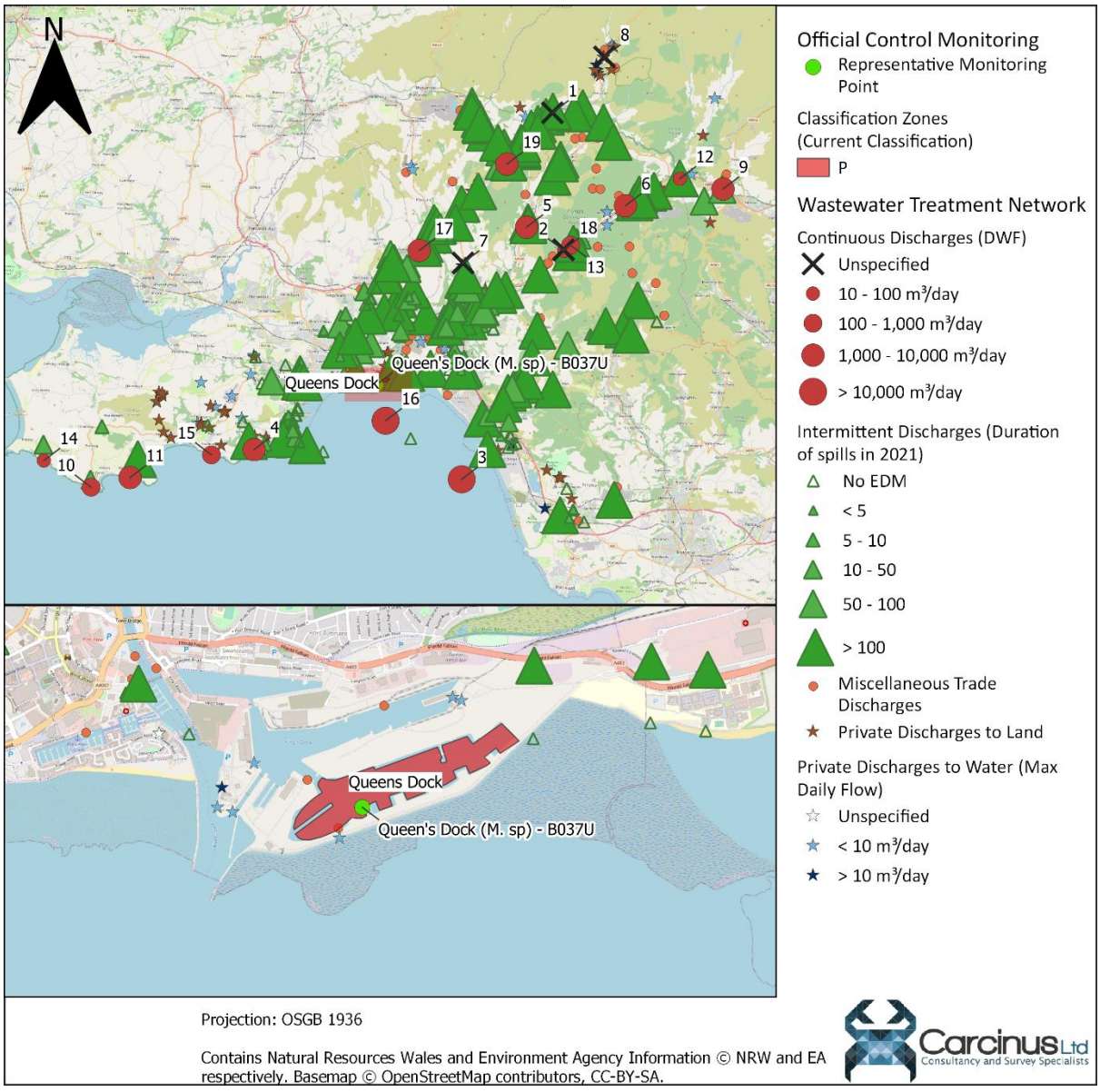


Figure 3.2 Locations of all consented discharges within the Swansea Bay catchment. Numbers refer to continuous discharges, details of which can be found in Table 3.1.

Table 3.1 Details of continuous discharges within the Swansea Bay catchment. Discharges of relevance to the BMPA that have seen reductions in the consented discharge volume are highlighted in green.

ID	Site Name	Permit ref	Outlet NGR	Treatment	DWF (m^3/day)
1	ABERCRAVE STW ABERCRAVE SWANSEA	BM0028101	SN 80820 12400	ZZ: Unspecified	Unspecified
2	ABERGARWED STW	BA2001201	SN 81690 02107	ZZ: Unspecified	34
3	AFAN WWTW	BP0284701	SS 74050 85070	01: BIOLOGICAL FILTRATION	50716
4	BISHOPSTON STS BRANDY COVE LANE	BP0054601	SS 58560 87287	22: UV DISINFECTION	1406
5	CRYNANT STW CRYNANT NEATH	BA2001101	SN 78890 03870	01: BIOLOGICAL FILTRATION	4520
6	CWMGWRCH STW CWMGWRCH NEATH	BA1005701	SN 86270 05470	01: BIOLOGICAL FILTRATION	1250
7	FFOREST GOCH STW BRYNCOCH NEATH	BA2026901	SN 74150 01200	ZZ: Unspecified	Unspecified
8	HEOL CALLWEN STW	BP0250901	SN 84705 16565	ZZ: Unspecified	Unspecified
9	Hirwaun Wastewater Treatment Works	BA1002401	SN 93553 06717	02: HIGH RATE BIOLOGICAL	1119
10	OVERTON STW PORT EYNON	BP0054801	SS 46390 84480	01: BIOLOGICAL FILTRATION	700
11	OXWICH S T W	BP0054901	SS 49300 85200	01: BIOLOGICAL FILTRATION	1136
12	PONTNEDDFECHAN STW SWANSEA	BA2014001	SN 90332 07482	26: BIODISC	77
13	RESOLVEN STW STORM TANKS NEATH	BA2001301	SN 82178 02521	01: BIOLOGICAL FILTRATION	832
14	RHOSSILI WWTW PITTON SOUTH GOWER	BP0054501	SS 42865 86469	01: BIOLOGICAL FILTRATION	68
15	SOUTHGATE STW HEAL LANE SOUTHGATE	BP0054701	SS 55370 86890	01: BIOLOGICAL FILTRATION	682

ID	Site Name	Permit ref	Outlet NGR	Treatment	DWF (m^3/day)
16	Swansea Waste Water Treatment Works	BP0236601	SS 68370 89437	22: UV DISINFECTION	56592
17	TREBANOS Wastewater Treament Works	BC0016601	SN 70879 02128	01: BIOLOGICAL FILTRATION	6290
18	YNYSGARWED STW YNYSGARWED NEATH	BA1014501	SN 81650 02180	ZZ: Unspecified	Unspecified
19	YSTRADGYNLAIS WWTW OFF WIND ROAD	BF0169101	SN 77423 08569	08: CHEMICAL - PHOSPHATE STRIPPING	4234

The original sanitary survey identified that the most significant continuous discharges in terms of their contribution to the bacteriological contamination within the BMPA were Afan WWTW Port Talbot and Swansea STW, which had consented discharge volumes of 104,112 and 112,320 m^3/day respectively, employing secondary treatment and UV disinfection respectively. The treatment methodologies employed by these discharges has not changed, nor has the consented discharge volume (Dry Weather Flow, DWF)[3]. Even though the only classified zone is within the Queens Dock and there are no longer any zones in the wider bay, these still represent the most significant continuous discharges in the area. There are no continuous discharges within the Queen's Dock itself, meaning that any contamination will originate via the intake pump used to fill the Dock when the water level gets too low. At the time of drafting this report, no response had been received from Natural Resources Wales and so the authors are not aware of when these upgrades occurred, nor what other improvements may have been made to other continuous discharges in the catchment. The Shoreline Survey confirmed that there are no continuous discharges within Queen's Dock itself.

In addition to the continuous discharges, the original sanitary survey identified a total of 183 intermittent discharges within the Swansea Bay catchment. 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. The original sanitary survey did not present any EDM data and so no comparison is possible. There are no intermittent discharges within the

[3] The 2011 Sanitary Survey gives Max Daily Volumes of discharge from consented sewage treatment works, rather than Dry Weather Flows. Maximum Daily Volumes were removed from permits in 2010.

Queen's Dock itself, meaning that the contamination from any spills would enter the dock through existing connections to the wider bay, primarily the intake pump used to 'top up' the Dock.

A recent investigation by Natural Resources Wales identified Cwmbwrla CSO as a water company asset that could be linked to deteriorations in bacteriological water quality within Queen's Dock. This outfall usually discharges to Burlais Brook, more than 3 km from Queen's Dock, but a downstream sewer collapse meant that it was instead discharging much more frequently than under normal operations. The NRW investigation concluded that the spilling from this discharge into a culverted watercourse for a prolonged period contaminated the groundwater, which contributed to high results within the Queens Dock even after the asset was repaired in October 2021. In addition, there is concern that other CSO in the vicinity of the Lower Tawe that are deemed to be operating as 'normal' could be contributing to base load bacteria levels and therefore may also be somewhat responsible for unexplained and/or elevated results over the years. In addition to the already mentioned Cwmbwrla, this includes Copper Quarter Group, and Swansea Barrage CSO. NRW have highlighted Cwmbwrla CSO for improvement as part of Dwr Cymru's PR24 investment programme together with further investigations (source apportionment modelling) to determine the relative contribution of some of the other assets in the vicinity and what if any further improvements may be required in the future.

During the Shoreline Survey, an outfall previously identified (no EDM data) outside of the Dock and over the seawall was observed to be flowing on the day and therefore a water sample was taken. This returned an *E. coli* concentration of 4,900 CFU/100ml, and an intestinal *Enterococci* result of 1,210 CFU/100ml. Both values are considered reasonably high and could be deemed a cause for concern. A second outfall not identified in the desktop assessment was noted approx. 300m from this intermittent discharge. The sulphurous smell and visible water staining at the location could be indicative of a potential source of contamination. However, low *E. coli* and intestinal *Enterococci* results were recorded from water samples taken here. Given the location of the outfall in comparison to the CZ (other side of the sea wall, discharging to Swansea Bay), it is unlikely to be a significant source of bacteriological contamination as there is no evidence to suggest these outfalls have any hydraulic connectivity to the Dock. DCWW modelling found that the discharges in this location had a 0 or < 1 % impact on Swansea Bay Shellfish Waters.

An additional outfall was also identified in Swansea marina/Tawe basin during the Shoreline Survey but not observed to be flowing on the day, nor could previous flow evidence be seen (water staining on the wall). A survey path was taken up the River Tawe during the Shoreline Survey, and a small number of outfalls were identified (not flowing) but could not be sampled due to inaccessibility. Surface road drainage was also identified and flowing on the day. A strong sulphurous smell and surface foam was visible, indicating a potential contamination source. However, this was approx. 50 m from the River banks, and any runoff into the river is likely to experience significant dilution before reaching the CZ.

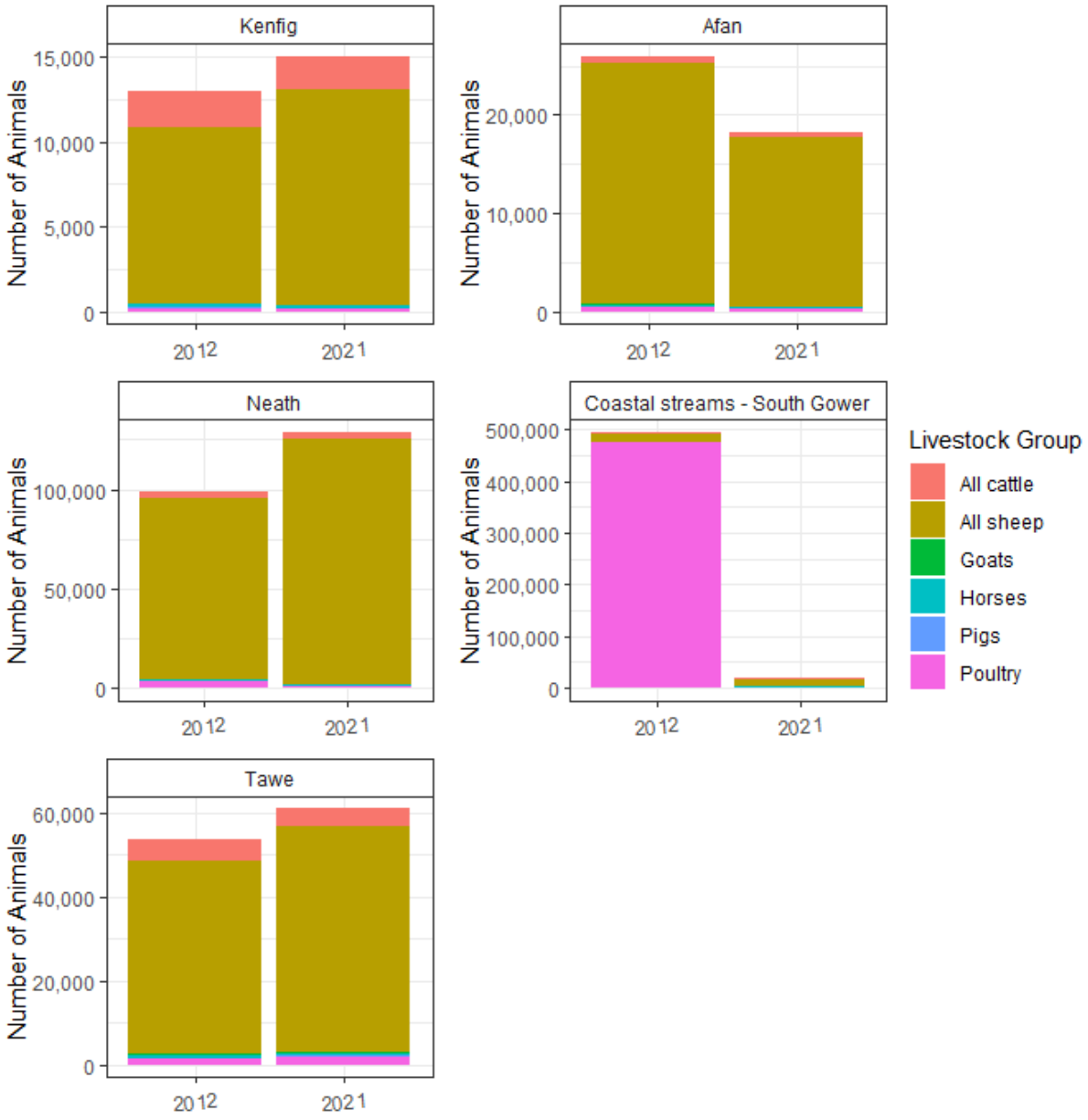
In addition to the water company owned discharges, there are a number of privately owned discharges that spill into the dock network (Figure 3.2). Limited information can be provided about these discharges due to data protection legislation, although the consented spill volumes are relatively small (<10 m^3/day). During the Shoreline survey, water samples were taken as close as possible to the two miscellaneous trade discharges identified in Queen's Dock (Figure 3.2). Both samples reported an *E. coli* concentration of 0 CFU/100ml, and an intestinal Enterococci result of either 0 or 1 CFU/100ml. Therefore, these trade discharges are unlikely to be a source of contamination to the CZ. The two major continuous discharges that are pumped into Swansea Bay have seen an approximate 50% reduction in total spill volume since the original sanitary survey, meaning that the contamination that they cause should have significantly reduced. No comparison of EDM data is possible, although there are still no intermittent discharges within the Queen's Dock. These changes will be taken into account in any updated sampling plan.

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, broken down into the sub-catchments within the wider catchment.

The data show that at the time of the original sanitary survey, the dominant species in terms of population size in four of the five catchments was sheep, although in the catchment with the highest overall population (Coastal Streams – South Gower) this was poultry. By 2021, three of the four catchments showed an increase in livestock populations, though the species breakdown remained broadly similar. However, in the Coastal Streams – South Gower catchment, the poultry population fell from nearly 475,000 birds to approximately 2,000 birds. Across all groups of animals, population size will vary throughout the year, with the highest numbers during Spring and the lowest numbers when animals are sent to market in Autumn and Winter.



Livestock population data based on estimates from the Welsh Agricultural Survey, 2012 and 2021.
Data © Stats Wales, made available under the Open Government Licence v3.0

Figure 3.3 Changes in livestock population for sub-catchments of the Swansea Bay catchment between 2012 and 2021. Data based on estimates from the Welsh Agricultural Survey.

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 Swansea Bay catchment. It shows that there is a marked difference in the land cover between the northern and southern sections of the catchment, with the northern areas much more rural and dominated by grazing and arable farmland, and the southern areas dominated by urban areas and associated land cover types. As of 2018, there are no significant areas of pasture or arable farmland adjacent to the shoreline of Swansea Bay, which is no different to the situation found in 2012. It can be concluded from this that there is minimal risk associated with direct agricultural runoff within this BMPA, and this pollution source does not require

additional consideration within any updated sampling plan. Agricultural runoff into rivers upstream such as the Neath, Afan, Clythe and Tawe, may however represent a potentially significant source of contamination, although any pollution will undergo a large degree of dilution before reaching the classified shellfish waters, particularly as there is limited hydraulic connectivity between these rivers and the Queen's Dock.

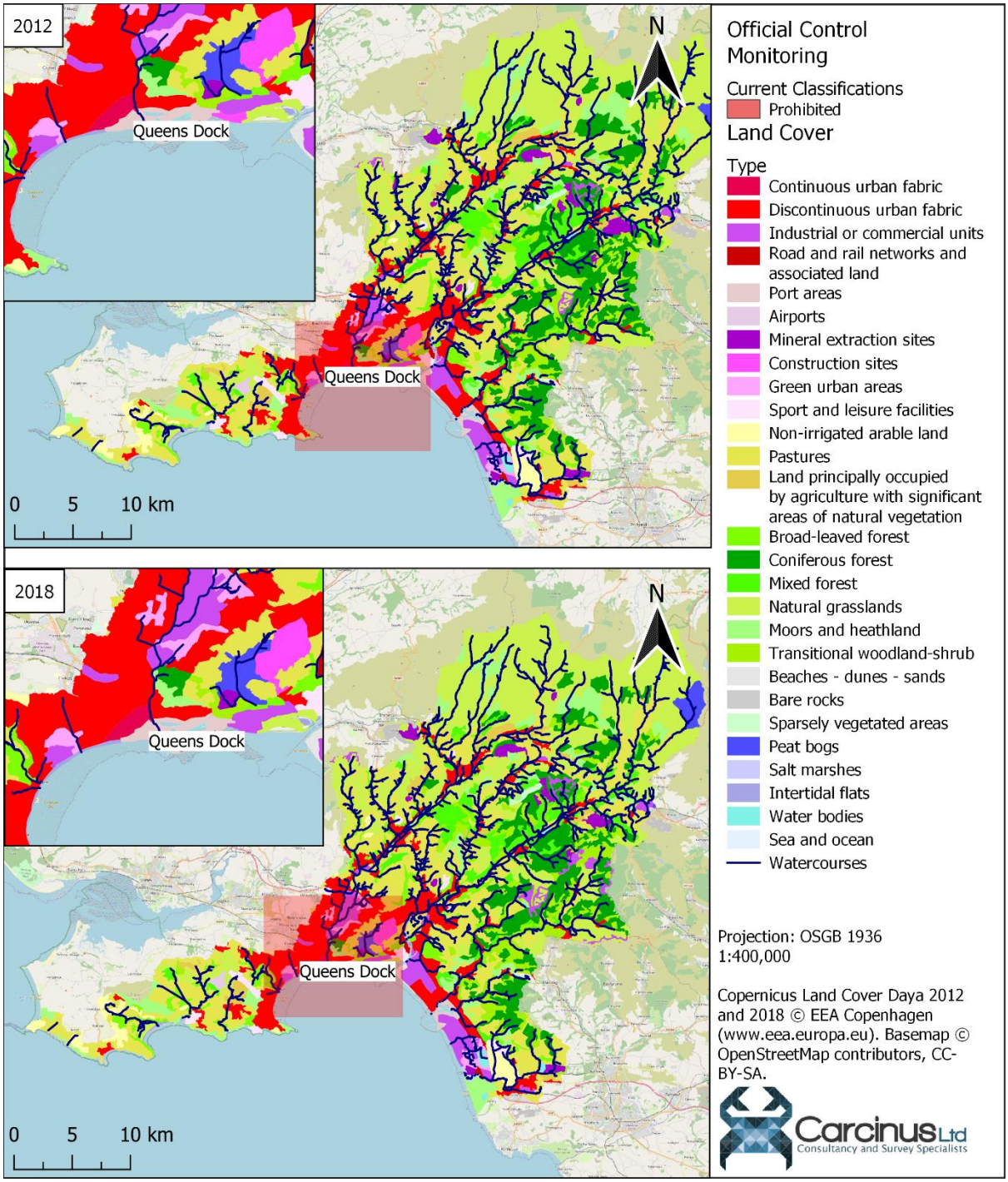


Figure 3.4 Land cover change in the Swansea Bay catchment between 2012 and 2018.

The total livestock population within the Swansea Bay catchment was estimated to have fallen significantly between 2012 and 2021, though much of this drop was driven by a massive reduction in poultry populations. Land cover maps suggest that there is very limited

agricultural land adjacent to the shoreline (and this did not change between 2012 and 2018), and as such the risk of direct agricultural runoff remains low. There remains some risk of runoff in the upper reaches of the catchment contaminating rivers, although this will experience a significant degree of dilution before reaching the CZs within the BMPA. The Shoreline Survey confirmed little to no agricultural land adjacent to the shoreline, and therefore the risk of direct agricultural runoff remains low. No update to the sampling plan is needed on the basis of this finding.

3.4 Wildlife

The waters of Swansea Bay contain a large variety of habitats suitable for 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 2011/2012, the average count of overwintering birds in Swansea Bay was 8,647 (Austin *et al.*, 2014). In the five winters to 2019/2020 (the most recent for which data are available, the average count was 8,125 (Frost *et al.*, 2021). Despite an overall decrease of 6%, the Bay still supports nationally significant aggregations of Great Crested Grebe, Sanderling and Mediterranean Gull.

The original sanitary survey noted that the greatest aggregation of waterbirds is in the intertidal flats around The Mumbles, most likely due to the significant shellfish beds in that area at the time of the original sanitary survey. The only currently classified area for shellfish harvesting in Swansea Bay is within the Port of Swansea. It is unlikely that significant populations of waterbirds will use this area due to the highly disturbing nature (level of human activity, noise and vibration etc.) of an operational port and as such the risk of contamination from waterbirds is considered to be small. Furthermore, as is described in the original sanitary survey, contamination from waterbirds is often temporally very variable, and it is nearly impossible to define RMPs that reliably capture this source of contamination. The Shoreline Survey confirmed no notably large aggregations of birds present in the CZ or surrounding docks. In addition, when passing over the seawall no evidence (no guano on the seawall) of birds was identified. No update to the sampling plan is needed based on these findings, and it remains unlikely that birds are a significant source of pollution to the CZ.

The original sanitary survey does not comment on the potential pollution caused by any other wildlife species. There is no significant grey seal haul-out site within Swansea Bay, the closest is at Skomer Island (Bull *et al.*, 2017), more than 50 km from the BMPA. Seals are occasionally spotted within the area (i.e Suffield, 2022) but do not visit the area regularly. 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, and this was also confirmed in the Shoreline Survey.

3.5 Boats and Marinas

The discharge of sewage from boats in the vicinity of the Swansea Bay 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.

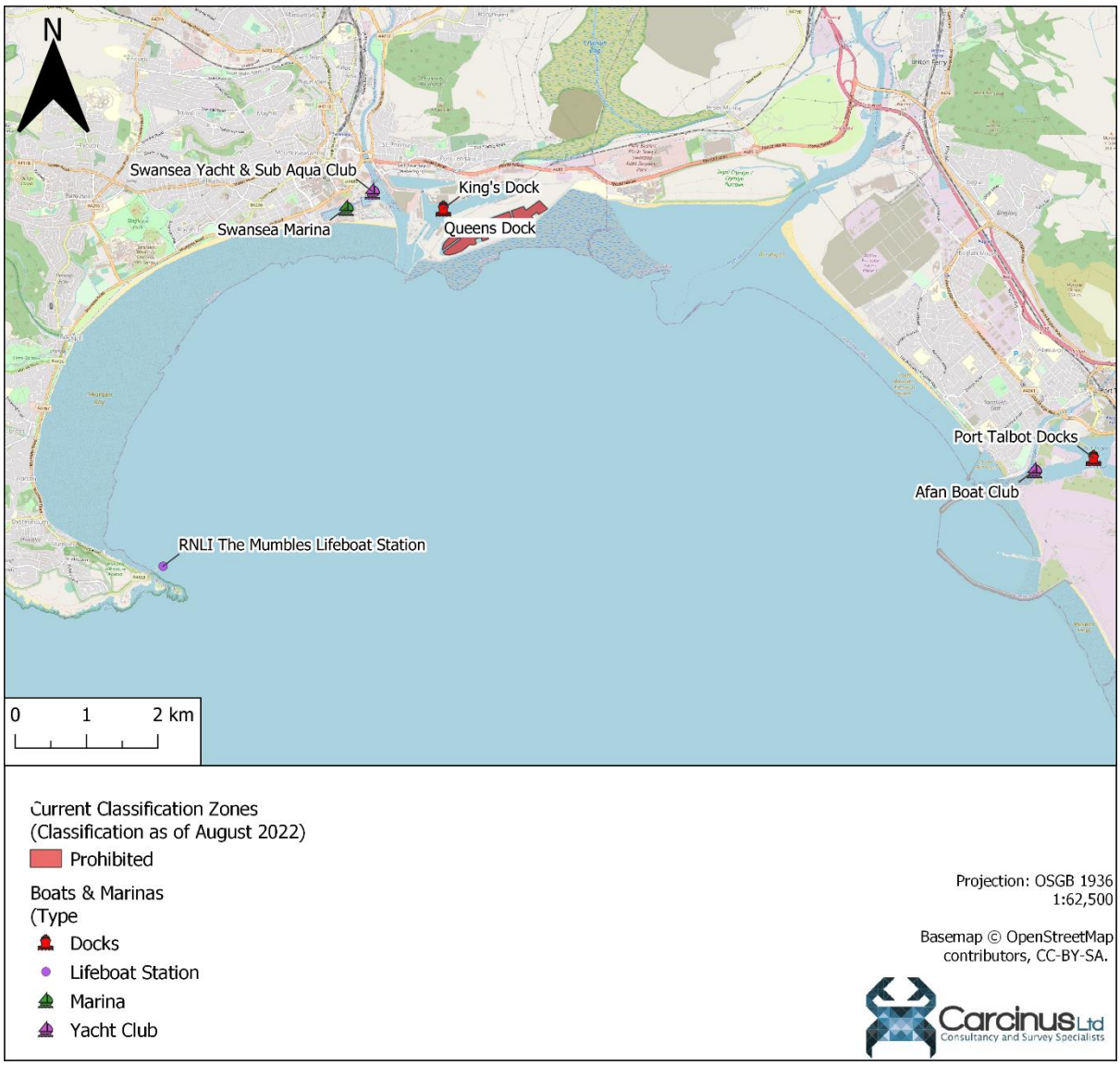


Figure 3.5 Location of boats, marinas and other boating activities in the vicinity of the Swansea Bay BMPA.

The original sanitary survey describes that the Port of Swansea contains three main docks; King's and Queen's Dock, as well as a the Prince of Wales Dock that is now used as a recreational yacht haven rather than an operational port. The Port handles over 520,000 tonnes of cargo per year and can accept vessels up to 30,000 dwt (deadweight tonnage), 200 m long with draughts of up to 9.9 m (Associated British Ports, 2022). No changes to the legislation governing the discharge of sewage from merchant vessels has occurred. Therefore, despite the fact that all these activities are still ongoing, 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[4]. The port was confirmed as being very active with multiple large commercial/merchant vessels observed during the Shoreline Survey. The prohibition of overboard discharges remains valid and therefore it continues to be unlikely that this is a significant source of contamination.

There is an active fishing fleet operating out of Swansea Bay, with three vessels over 10 m and 26 vessels under 10 m listing Swansea or Port Talbot as their home port as of August 2022 (gov.uk, 2022). In addition, there is a degree of pleasure craft activity throughout the bay. The original sanitary survey identified that the total berthing capacity around Swansea was around 1,000 boats. The Welsh Government has recently assumed control of the Prince of Wales Dock following its closure from the rest of the Port. This is in part due to the recently submitted planning applications to approximately 200 more houses/flats in the area surrounding the dock (Nation Cymru, 2022). The total number of berths within the area (and therefore the level of berthing activity, is similar to that described in the original sanitary survey. There are still no pump out facilities within the Marina, meaning that 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. It is generally considered unsociable to make overboard discharges when moored in a marina setting.

Given that the only Classified area for shellfish harvesting within the BMPA is within the docks of the Port of Swansea, there is considered to be no recreational boating traffic in the area and so direct contamination is considered to be very unlikely. No additional consideration therefore needs to be given to this source of pollution in any updated sampling plan. The Shoreline Survey confirmed that no recreational boating activity occurs in the Dock area. No update to the sampling plan is necessary based on these findings during the Shoreline Survey.

3.6 Other Sources of Contamination

The *Queen's Dock* CZ is flanked by a significant area of urban fabric, being located adjacent to the City of Swansea. Contamination from utility misconnections is therefore possible, and should be taken into account in any updated sampling plan. The CZ is located within an operational port, and so access by dog walkers etc. will be minimal and no significant impact from this source is expected. No dog walkers were seen around the docks, and few were seen on the path running parallel to the River Tawe on the Shoreline Survey. Therefore, contamination from this source remains unlikely to have a significant effect, and no update to the sampling plan is necessary.

4 Hydrodynamics/Water Circulation

The only CZ in the BMPA is situated within the Queen's Dock, part of the Port of Swansea (Figure 2.1). As a consequence of this, the hydrodynamic conditions of the waters will be

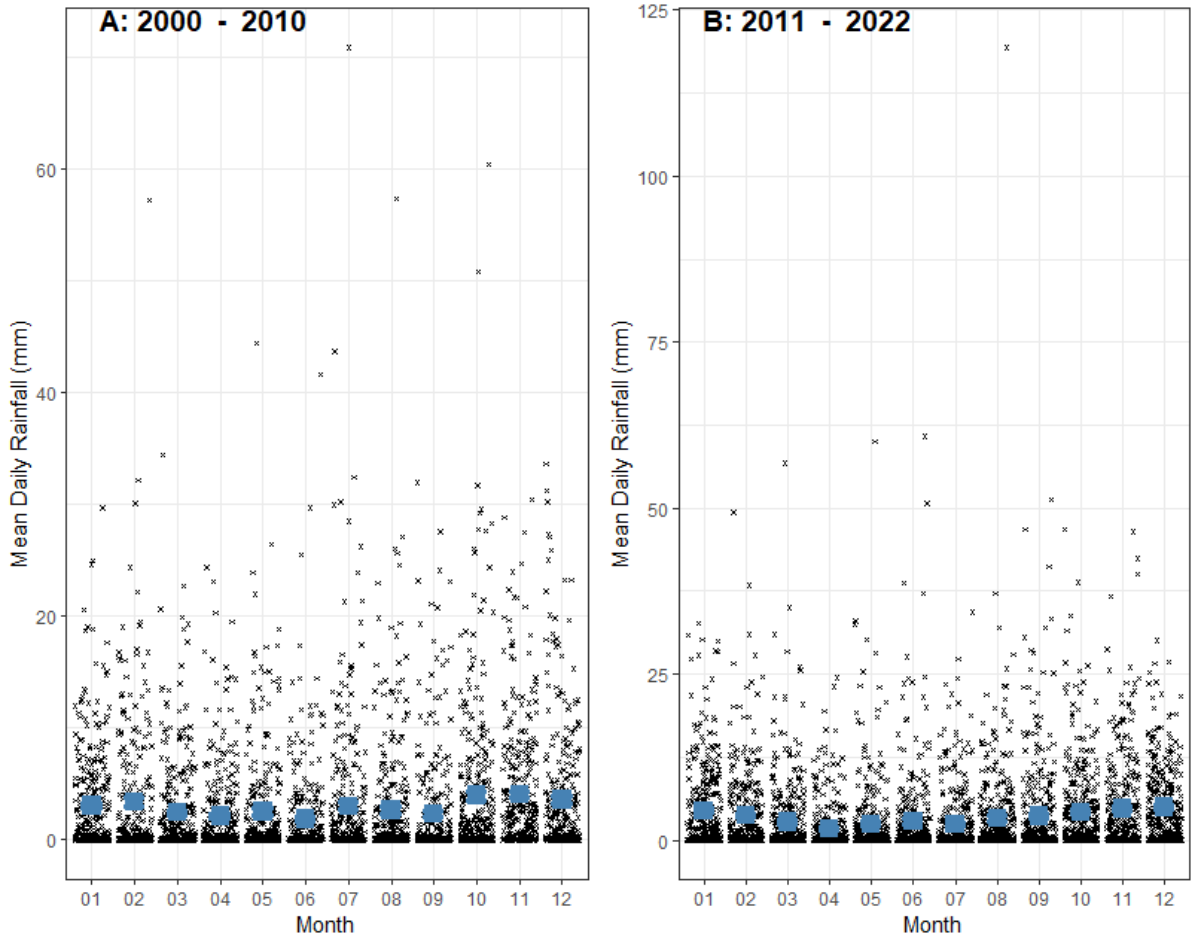
[4] The Merchant Shipping (Prevention of Pollution by Sewage and Garbage from Ships) Regulations 2008.

relatively stable with a consistent water level, much different to the wider embayment which sees a significant movement of water with the tide and possesses a large intertidal area.

During secondary consultation, NRW stated that there are some surface water inputs into the Prince of Wales Dock area. No inputs were identified within the Queen's Dock area (where all shellfish production takes place). All water exchange into and out of the CZ will occur via the pumps that are used to 'top up' the dock system after the water level following use of the locks. This restricts the impact of any contamination sources in the wider embayment, as only limited water will move into the dock complex. Any contamination is therefore likely to enter the Queens' Dock via the connection to the rest of the dock system. However, any contamination within the dock system will not be 'flushed' as there is the docks are never in free flow with the wider bay. Any reduction in contamination levels will therefore occur via bacteriological die off. This situation is unchanged from the original sanitary survey.

5 Rainfall

Rainfall data for the Victoria Park monitoring station (NGR: SS 64238 92222) 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). It should be noted that from 2000 – 2016, the station was referred to as Victoria Park TBR (tipping bucket raingauge) but from 2016 present it has been referred to as Victoria Park WRG (weather raingauge). This does not affect the interpretation of the monitoring data from this point. 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 mean daily rainfall totals per month at this monitoring station, and the results are summarised in.



Archive Daily Rainfall from the Victoria Park TBR monitoring station (#497135) at NGR: SS6423892222
Data provided by the Natural Resources Wales, licenced under the Open Government Licence v3.0

Figure 5.1 Mean daily rainfall per month for the Victoria Park monitoring station (NGR: SS 64238 92222) 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 Victoria Park monitoring station.

Period	Mean Annual Rainfall (mm)	Percentage Dry Days	Percentage Days Exceeding 10 mm	Percentage Days Exceeding 20 mm
2000 - 2010	1037.545	43.654	32.797	20.483
2011 - 2022	1220.467	39.561	35.82	21.94

The data suggest that the area received increased rainfall in the years following the original sanitary survey, with both the mean annual rainfall and percentage of days with heavy rainfall (>10 mm/day) increasing. However, 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 (though there are none in the Queens Dock itself). 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 only available for the sampling at one RMP within the Swansea Bay BMPA since the original sanitary survey was published. This is the Queen's Dock (B037U), which has been sampled since September 2009. Sampling at this RMP is ongoing, although no monitoring data is available for any of the RMPs recommended in the original sanitary survey, as they are not currently active and samples were last collected more than 5 years ago. 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 it 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 August 2022.

RMP (Species)	NGR	No. Samples collected	Geometric Mean	Min Value	Max Value	% > 230	% > 4,600	% > 46,000
Queen's Dock (M. sp) - B037U	SS67659210	146	2741.16	18	92000	39.04	4.79	2.74

Monitoring results from this RMP have been mixed, with the majority of results within the criteria of a Class B status (90% results <4,600 *E. coli* and no results >46,000 *E. coli*/100 g). However, nearly 3% of results have been at or above prohibited levels (>46,000 MPN/100 g). Figure 6.1 presents a boxplot of the *E. coli* monitoring results from this RMP. No comparison is possible as there is only one RMP for which monitoring history is available.

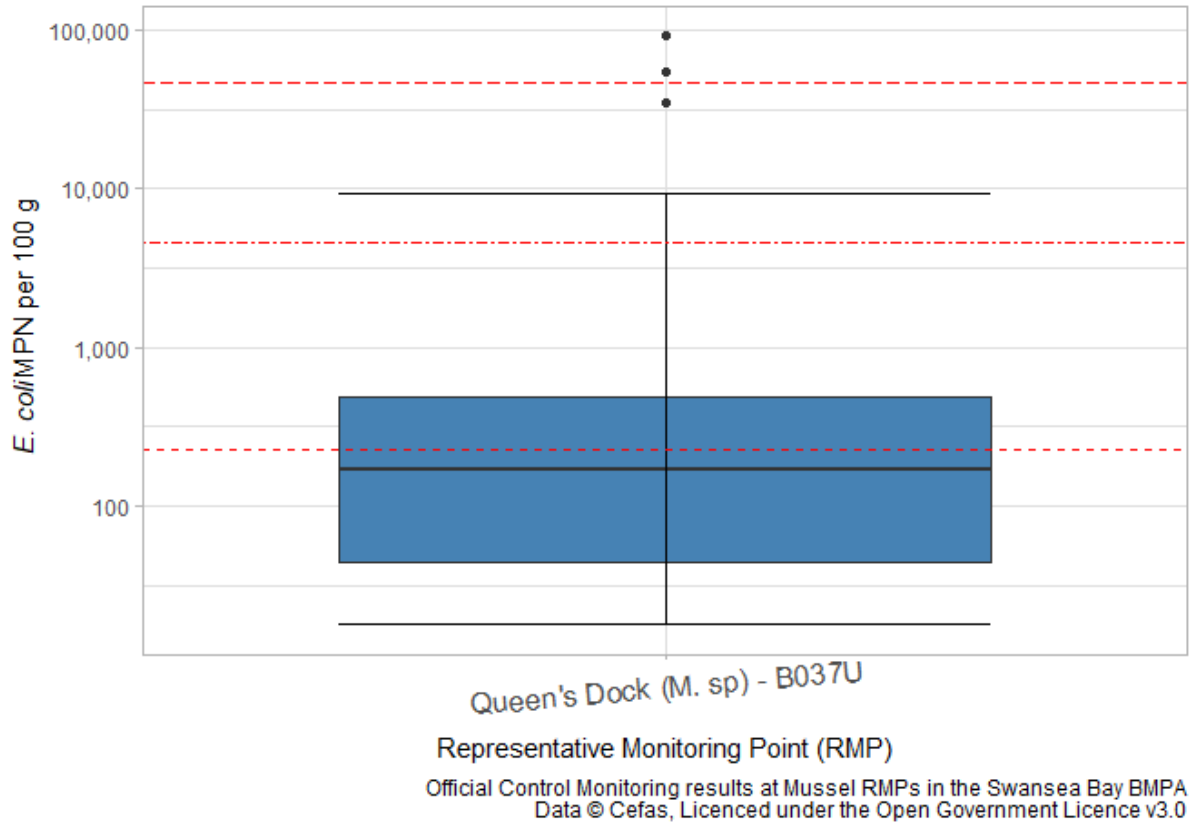


Figure 6.1 Boxplots of the E. coli levels at mussel RMPs sampled within the Swansea Bay BMPA since the original sanitary survey. Central line indicates median value, box indicates the lower-upper quartile range and whisker indicates the minimum/maximum values, excluding outliers (points >1.5 x the interquartile 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 the single RMP sampled within the Swansea Bay BMPA is shown in Figure 6.2. The loess model suggests that for much of the time period since the original sanitary survey, the concentrations of *E. coli* in shellfish samples have been within the Class B limit, with the trend line falling on or around the 230 MPN/100 g threshold. However, from late 2019 / early 2020, the loess model trends upwards, and includes four results above the maximum permitted threshold for classification (46,000 MPN/100 g) threshold. This repeated occurrence of high results ultimately led to the prohibition of the *Queen's Dock* CZ in April 2022.

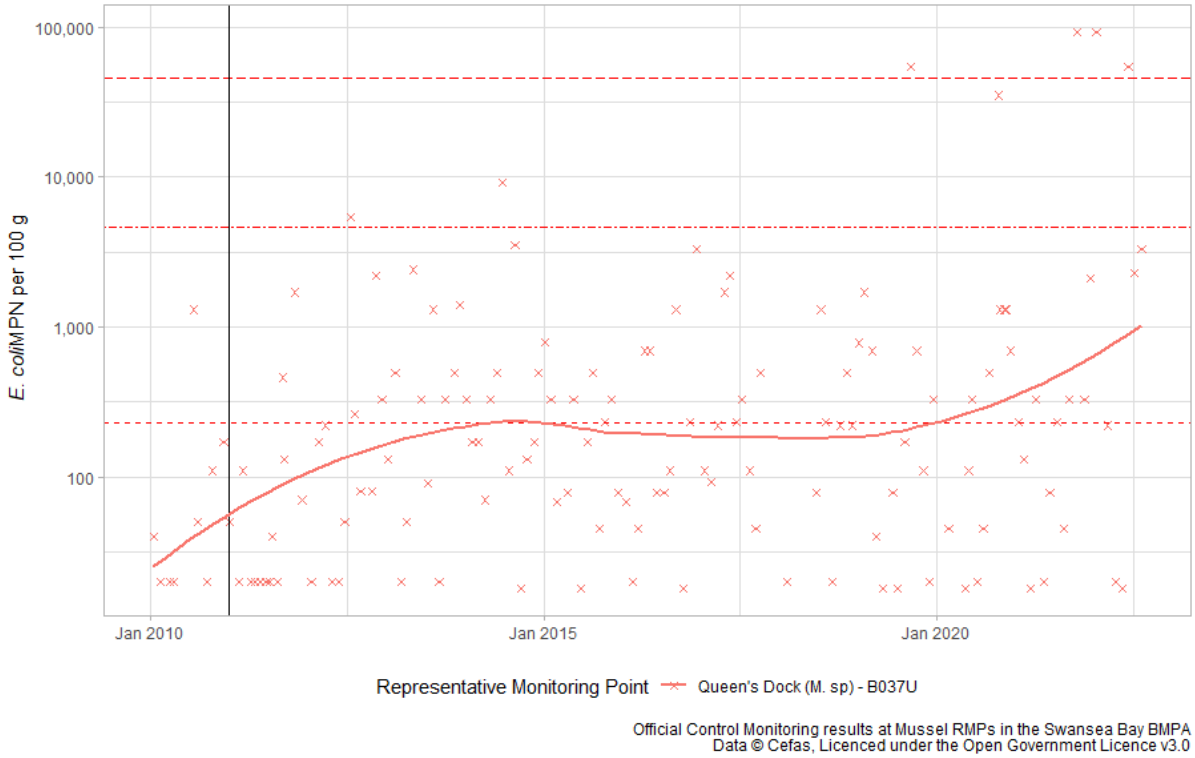


Figure 6.2 Timeseries of E. coli levels at mussel RMPs sampled in the Swansea Bay BMPA since the original sanitary survey. The scatter plot is overlaid with a loess model fitted to the data. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g.

6.3 Seasonal patterns of results

The seasonal patterns of *E. coli* levels at the mussel RMP within the Swansea Bay 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 results from Summer and Autumn months were on average slightly higher than those from Winter and Spring. This is likely due to the increased levels of rainfall, and therefore surface runoff, during these months, but is also biased by the timing of the recent extremely high results that have led to the prohibition of this bed.

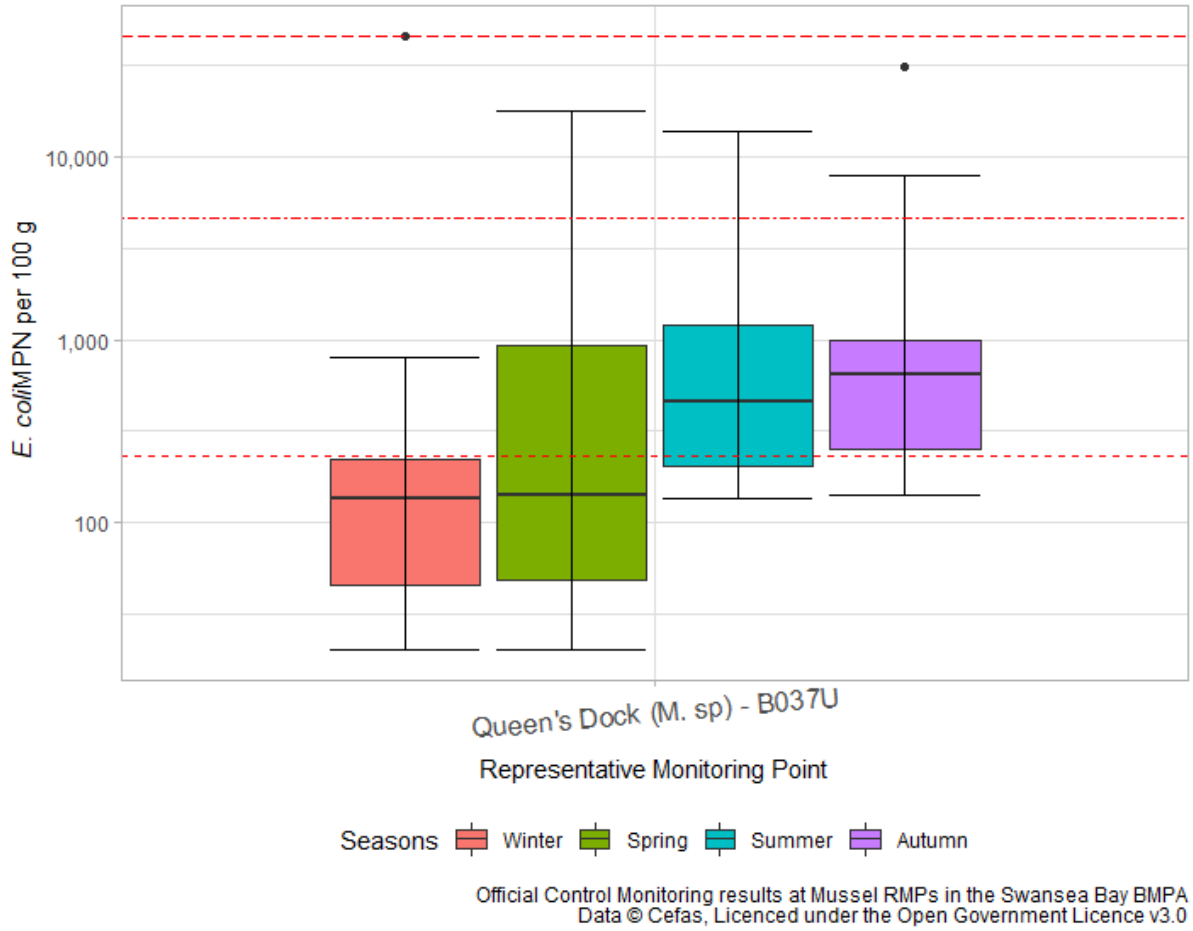


Figure 6.3 Boxplots of E. coli levels per season at mussel RMPs sampled within the Swansea Bay BMPA since the original sanitary survey. Central line indicates median value, box indicates the lower-upper quartile range and whisker indicates the minimum/maximum values, excluding outliers (points >1.5 x the interquartile range). Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g respectively.

7 Conclusion and overall assessment

The Swansea Bay BMPA is situated on the southern coast of Wales. At the time of the original sanitary survey, there were classification zones across a large proportion of the embayment, particularly on the western side near the Mumbles. However, at present there is only one designated classification zone. The *Queen's Dock* CZ is within the Port of Swansea and covers the area of the eponymous dock. Until 2022, this CZ had a LT-B or B classification, although at present it is classed as Prohibited, due to a number of recent results significantly above the permitted classification limit.

The original sanitary survey cites population data in the form of 2005 estimates. 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 5.12% between 2001 and 2011, and the and the UK government estimate that the population will have increased a further 6.79% between 2011 and 2022. The area remains a popular tourist destination, and the peak tourist season is June – September. 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.

The two major continuous discharges that are pumped into Swansea Bay have seen no changes in consented Dry Weather Flow volume since the original sanitary survey, meaning that the contamination that they cause should have remained similar. No comparison of EDM data is possible, although there are still no intermittent discharges within the Queen's Dock that would pose a direct risk to the bacteriological health of the shellfishery. There are some small private discharges within the Queen's Dock, although the consented discharge volume of these outfalls is small (<10 m^3/day).

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. Livestock population data for the Local Authority Districts within which the catchment falls was accessed for 2012 and 2017. The livestock population of each district was adjusted to the percentage of the catchment that falls within it. These data suggest that livestock populations fell across the catchment, but as there are no areas of pasture immediately adjacent to the classified waters of the BMPA, any impacts will be due to run-off contaminating upstream watercourses which then gradually move downstream.

Swansea Bay 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 show a slight decrease on the average count in the five winters preceding the original sanitary survey production date. 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. In addition, the number of waterbirds using the waters of the Port of Swansea are likely to be relatively low due to general disturbance. Occasional visits to the waters of the BMPA by seals occur, although any contamination will be minimal and highly spatially and temporally variable, and so does not require additional consideration in any updated sampling plan.

The Port of Swansea is capable of receiving vessels of up to 200 m length, and handles 300,000 tonnes of cargo each year. Also present are two main marinas with berths for several hundred pleasure craft(Swansea marina provides 550 berths and the Prince of Wales Dock is expected to provide more than 400 more). 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 Classification Zone is located within a working dock and so the number of recreational vessels is likely to be very low, as will the corresponding risk of contamination.

Official Control monitoring data is only available for a single RMP within the BMPA, which has been sampled since 2009 and is still in use. No monitoring data is available for any of the other RMPs recommended in the original sanitary survey – the beds they were related to are declassified and no samples have been collected in the last 5 years. The monitoring data from the Queen's Dock (B037U) RMP has in the most part been solidly Class B, although due to a number of results significantly above the maximum permitted regulatory limit (46,000 MPN/100 g) has led to the zone being declassified. 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. However, as the recent decline in water quality in the Dock cannot be reliably explained by any identified contamination source, a shoreline survey of the dock was conducted.

There have been several results breaching the classification thresholds which indicate water quality in the area might be changing. This will be further investigated by completing a shoreline survey.

8 Recommendations

The Swansea Bay BMPA currently has only one active RMP that is used to classify a single Classification Zone. Recommendations for this CZ are given, with justification, below, and are summarised in Table 8.1.

8.1 Mussels

Queen's Dock

This CZ covers an area of 0.33 km², the entire area of the Queen's Dock within the Port of Swansea. The current sampling plan for this CZ states that samples should be taken within 10 m of NGR SS 6765 9210 (off Jetty No. 5). This was identified in the original sanitary survey to be representative of microbiological contamination entering the dock via King's Lock and Scherzer Passage. During the Shoreline Survey, the LEA officer and FBO representative stated that samples are currently collected from SS 6764 9220, approximately 100 m from the position stated in the sampling plan.

Given the limited scope for hydrodynamic input affecting the zone, the contamination is likely to occur on a gradient, with a high point nearest the water inlet points. The current actual sampling point is located at the nearest point of the mussel lines to the Dock entrance, and so is representative of the contamination entering Queen's Dock from the wider dock system.

8.2 General Information

8.2.1 Location Reference

Production Area	**Swansea Bay**
Cefas Main Site Reference	M037
Ordnance survey 1:25,000	OS Explorer 165
Admiralty Chart	Admiralty Chart 1161

8.2.2 Shellfishery

Species	Culture Method	Seasonality of Harvest
Mussels (*Mytilus* spp.)	Aquaculture (long lines)	Year Round

8.2.3 Local Enforcement Authority(s)

Name	**Swansea Council** **Food and Health and Safety,** **Guildhall** **Swansea** **SA1 4PE**
Website	www.swansea.gov.uk
Telephone number	01792 635600
E-mail address	foodandsafety@swansea.gov.uk

*Table 8.1 Proposed sampling plan for the Swansea Bay 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
Queen's Dock (Mussels)	B037U	Queen's Dock	**SS 6764 9220**	**51°36.727'N, 03°54.770'W**	Mussels	Hand	Hand	Mussels (*Mytilus* spp.)	10 m	Monthly

9 References

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Appendices

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Appendix I. 2021 EDM Return

Site Name	Permit Reference	NGR	Count of Spills in 2021	Total Duration (hours) of spills in 2021
CSO 108 REAR 16 MARGAM ST CYMMER	BP0028607	SS8593696149	Unspecified	Unspecified
CSO 122 18 DUKE STREET AFAN	BP0046201	SS7765188374	Unspecified	Unspecified
QUARRY ROAD CLYDACH (POINT 125) S	BP0245001	SN6881801215	Unspecified	Unspecified
HEOL Y NT/SYBIL STREET CLYDACH (P	BP0245201	SN6909901391	Unspecified	Unspecified
CSO 104 BETHEL ROAD LLANSAMLET	BW4104101	SS6932197373	0	0
SWO. FELINFACH RD. YSTRADOWEN.	BW1400101	SN7538011930	36	452.25
BRYNDULAIS (SWO 2A)	BW2902901	SN8143008900	53	1025
SWO. 50 YARDS BELOW SHELL GARA KNEL	BW4100201	SS4720089000	12	7.75
SWANSEA STW FABIAN WAY SWANSEA ,	BP0236601	SS6877693029	18	205.75
ELMGROVE ROAD CSO	BW4108401	SS6086489570	4	5
SWO.M'HOLE 14 ABERCRAVE ST.DAVIDS C	BW0600801	SN8308512749	19	117
CSO 16, OUTFALL G, ADJACENT TO JUNCTION OF MUMBLES RD & MAYALS ROAD, SWANSEA	BP0237408	SS6179390395	0	0
CSO 69 TRWYDDFA ROAD SWANSEA	BP0242801	SS6566096030	5	4.5
(BONYMAEN RD NR DARTFORD RD) SWANSE	BP0244401	SS6732795168	21	46.5
Cynonville CSO	Unpermitted-52106	SS8195595065	12	64.5
Newton Lady Housty CSO	Unpermitted-51947	SS6059988103	10	4.75
Newton Rd CSO	Unpermitted-71079	SS6093588104	34	56
Heol Eithryn Combined Sewer Overflow, Clydach, Swansea.	ZP3126GM	SN6873801849	19	84.5
SWO. NEAR NORTON AVENUE (POINT	BP0237405	SS6120988725	66	102.25
72 Bethel Rd CSO, Lower Cwmtwrch	Unpermitted-71408	SN7721609821	87	973
No6 Heol Dyfan CSO, Morriston	Unpermitted-70961	SS6677099088	26	31.5
CSO 73 CROWN ST MORRISTON SWANSEA	BP0243801	SS6726097750	23	36
DUFFRYN STORMWATER OVERFLOW CHAMBER	BP0028608	SS8374195771	6	3

Site Name	Permit Reference	NGR	Count of Spills in 2021	Total Duration (hours) of spills in 2021
Cwmgrach STW Overflow	Unpermitted-52579	SN8647005490	2	2
RAILWAY TERRACE, CWYMLLYNFELL	Unpermitted-71398	SN7482612903	89	245
CHAINBRIDGE CSO GLYN-NEATH	BP0341101	SN8695005728	74	695.5
CL'ACH BR.RE'VEN SWO 3A RESO	BW2900601	SN8301902946	32	22
CLYNE SPS CLYNE NEATH NEATH PORT T	BP0219301	SN7988700339	27	150.75
YS.MARCH CRYNT SWO 2C	BW2900701	SN7900704239	181	1161.75
FELIN FRAN CSO WALTERS RD LLANSAMLE	BP0311401	SS6932098494	33	237
INCO CSO CLYDACH SWANSEA	BW2302601	SN6899601209	128	1030
CSO 80 PENTRPOETH RD MORRISTON	BP0244001	SS6729098510	7	1.75
SWO.M'HOLE148 GOUGH ARM YSTRADGYN	BW0600101	SN7859009550	33	135.5
CSO NO 110 TONMAWR	BW2901001	SS7969796155	77	473.25
CSO NO 116 100M U/S CONF PELEN	BP0304301	SS7935394114	20	9.25
SWANSEA (BONYMAEN RD) PT 101A , ,	BP0244501	SS6726595194	36	53.25
CSO 9 CIMLA COMMON, CIMILA, NEATH	BP0240601	SS7640796252	0	0
CSO 60 GORS AVENUE SWANSEA	BP0241601	SS6512094590	3	0.75
LANGLAND SPS LANGLAND SWANSEA	BP0305901	SS6052687371	4	2
NEWTON ROAD CSO	Unpermitted-52469	SS6071588083	84	187
Ynys Y Mond Rd CSO, Glais	Unpermitted-52472	SN7026700793	15	27
SKEWEN SPS PARK AVENUE LONLAS NEATH	BW2902601	SS7142497210	106	309.25
CSO 64A PENLANFACH BRYNHYFRYD	BP0242501	SS6498795911	1	0.75
SWO. YNYSTAWE (POINT 86 NEW MA	BW4104701	SN6831100292	168	1231.25
BRYNHYFRYD CSO LLANGYFELACH ROAD	BP0280601	SS6548995848	31	35.25
Pwll y Glaw CSO, Front of No 2	Unpermitted-72330	SS7929493251	9	4.75
CSO 103 SAMLET ROAD LLANSAMLET	BW4103101	SS6827897564	33	221.25

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Site Name	Permit Reference	NGR	Count of Spills in 2021	Total Duration (hours) of spills in 2021
CSO 34 REAR OF 38 CAENT TERRACE, NEATH	BP0316501	SS7275797529	5	6
CSO NO 31 OPP NEW ROAD SKEWEN	BP0303801	SS7307397386	5	1.5
SWO.HEATHFIELD AVENUE GLYNNEAT	BP0038901	SN8796306446	170	582.75
CSO NO 117 PLAYGROUND, REAR OF 3 MORGAN TERRACE, EFAIL FACH	BP0317501	SS7915494525	0	0
GUNSIGHT OVERFLOW (SWO 11)-NEATH VALLEY	BW2902401	SS7472397529	21	23.25
REAR OF CAL COTTAGE ABERCRAVE	BB3893ZH	SN8034212106	94	938.75
REAR OF LONLAS STATION ROAD ABERCRAVE	CB3192FQ	SN8255612735	25	45.5
CADOXTON ROAD CSO, NEATH	BP0353601	SS7513598244	3	3
STATION RD GWYNFRYNLEN CSO	CB3193CJ	SN8246512355	76	572.25
RHIGOS - OUTSIDE NO. 4C HEOL-Y-GRAIG	AN0096601	SN9214605810	46	91.25
PENLAN CRESENT (POINT 52A) SWANSEA	BP0242701	SS6502396658	54	55.25
CSO at rear of Ynys Y Wern, Cwmafan	BP0305601	SS7749691524	75	214.25
CSO NO 125 CWMAFAN RFC CWMAFAN	BW0200301	SS7848892118	21	116.25
48 Eaton St CSO, Swansea	Unpermitted-74695	SS6543495405	0	0
PENTRE CHWYTH SW0. (POINT 100	BW4101901	SS6642094722	25	59
SWO.M'HOLE12 CWMTAWE FM PENRHOS	BW0600601	SN7974011570	17	122
LONGFORD ROAD CSO LONGFORD ROAD	BW2901101	SS7364398137	12	47.75
Rear of Margam Rd Depot	CB3298FZ	SS7810087770	0	0
LIMESLADE PUMPING STATION SWANSEA	BW4100901	SS6253887189	2	0.5
SWO. YNYSMEUDW WAREHOUSE (SOC	BW2302501	SN7404205605	65	408.75
CSO 32 NR ST JOESEPHS CHURCH	BW2903601	SS7554496522	15	7.75
CSO ADJ 97 CRAIG RD GELLINUDD	BP0288501	SN7358404197	65	374
CWMTWRCH SWO YSTRADGYNLAIS YSTRADGY	BW0601101	SN7577010920	116	1468.25

Site Name	Permit Reference	NGR	Count of Spills in 2021	Total Duration (hours) of spills in 2021
OUTFALL K (CSO 264) JUN OF MUMBLES	BP0237411	SS6396192343	0	0
OUTFALL E (CSO 14) JUN OF MUMBLES R	BP0237406	SS6149289321	0	0
SWN YR AFON CSO, Ystradgynlais	CB3194CP	SN7923611242	60	250
Dwr Y Felin Rd CSO, Neath	Unpermitted-51900	SS7482097834	79	165.5
CSO NO 134 GOYTRE BRYN AFAN	BP0304201	SS8084791783	86	248.25
PONTARDAWE LEIS CENTRE CSO SWANSEA	BW4108701	SN7196903318	62	266.25
O/S 17 GLANTAWE ROW YSTRADGYNLAIS	CB3193ZY	SN7860609656	59	275.75
OUTFALL B (CSO 301) JUN OF MUMBLES	BP0237402	SS6165088180	20	11.25
CSO 103 UNDER R'DBR PONTRHYDYFEN	BW2900801	SS7932194160	49	221.75
SWO.CRAIG Y DUKE TREBANOS SOC	BW2303101	SN7128502622	85	520.25
Swan Rd CSO, Baglan	Unpermitted-71427	SS7423193324	80	120.75
CSO 33 CIMLA ROAD CIMLA NEATH	BW2903701	SS7592997083	7	21.5
RHYDDINGS TERRACE UPLANDS SWANSEA	TB3593HM	SS6358792626	5	1.25
O/S 54 YNYS STREET	BP0322001	SS7713890268	14	25.25
TREBANOS STW (SETTLED STORM) TREBA	BC0016601	SN7118702324	182	3231.25
CSO NO 34 REAR OF FURZELAND DRIVE S	BW4102301	SS6199092925	30	145
ABBEY SPS BRITISH STEEL SITE	BW0202801	SS7695188259	2	0.5
SWO.M'HOLE 154A GEORGE IV PH UPPER	BW1400201	SN7547411466	32	134.25
BRITON FERRY SPS INNER DOCK NEATH	BP0283201	SS7345093830	5	8.75
NT Y CAFN SWO DULAIS VALLEY	BW2904001	SN8082807633	125	1377.75
CSO 72 SLATE ST MORRISTON SWANSEA	BP0243701	SS6726097750	1	0.25
CSO AT BEDFORD ROAD CEFN CRIBWR ,	BP0269201	SS8543983544	93	437.75
CSO 129 GLYNCORRWG CSO GLYNCORRWG	BP0317601	SS8717598430	26	113.75
BLAENGWNFI STORMWATER OVERFLOW CHAM	BP0028604	SS8861996835	0	0

Site Name	Permit Reference	NGR	Count of Spills in 2021	Total Duration (hours) of spills in 2021
CSO 123 MARGAM PS NR BROMBILL ST	BP0046202	SS7771088238	0	0
OUTFALL D1 (CSO 10) JUN OF MUMBLES	BP0237404	SS6143988693	20	9
FABIAN WAY SPS FABIAN WAY SWANSEA	BP0271501	SS7172093326	48	781.25
GIANTS GRAVE SPS PILL TERRACE	BP0283301	SS7354594778	12	7.75
HIRWAUN STW STORM TANKS HIRWAUN	BA1002401	SN9349006687	24	63
MELINCRYDDAN PS MILLAND ROAD IND ES	BP0255901	SS7457096852	78	572.75
PENRHIWTYN SPS NEATH	BP0256001	SS7402496350	5	3
QUAY ROAD PS TOWN CENTRE NEATH ,	BP0256201	SS7499897735	41	69
BISHOPSTON G CHURCH LANE PS	Unpermitted-52459	SS5773089380	0	0
CSO 104 NEWBRIDGE ROAD PUMPING STATION	BB4025501	SS7560889609	50	305.5
ABBEY PS.	BP0224802	SS7677898823	67	246.5
London Close CSO, Cwmafan	Unpermitted-52043	SS7792291780	98	681
Rhossili WwTW	Unpermitted-73571	SS4282887660	12	28.75
CRYNT STW CRYNT NEATH	BP0269101	SN7902704013	244	5245.25
GEORGES ROW SPS GEORGES ROW NEATH	BP0283101	SS7350694216	4	5.25
BAGLAN SPS BRITON FERRY NEATH	BP0287801	SS7402093168	173	1651
BAGLAN SPS BRITON FERRY NEATH	BP0287901	SS7402093168	2	0.75
PENIEL GREEN CSO PENIEL GREEN ROAD	BP0309801	SS6925697484	24	120.25
OFFICE ROW CAR PARK YSTALYFERA CSO	BW2303401	SN7648908110	18	34.5
DRUMAU FARM BIRCHGROVE RD P.S. SSO	BW4100401	SS7038099200	97	1080.25
JAMES STREET CSO	WQD005714	SN7198404189	72	254
FAIRWOOD RD/LYNDEN TREE P H SWANSEA	BP0245401	SS6111589866	5	1.5
COLBREN PS 1 EMERG , ,	BO5088001	SN8463411676	83	530
MYNYDD NEWYDD ROAD (POINT 50) SWAN	BP0243601	SS6375796137	6	4

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Site Name	Permit Reference	NGR	Count of Spills in 2021	Total Duration (hours) of spills in 2021
AFAN WWTW PHOENIX WHARF HARBOUR RD	BP0287601	SS7598487331	152	1409.75
CSO NO 109 CYMMER CSO AFAN	BP0307901	SS8609396248	115	887.5
PONTNEDDFECHAN STW SWANSEA	BP0322901	SN9032607521	171	1525
COMMERCIAL RD PS RESOLVEN NEATH ,	BW2900502	SN8264903053	26	30
CSO IN FOOTPATH ADJ BETHEL RD	WQD001597	SN8839306579	37	173.25
BALDWINS CRESCENT SPS	BE0010501	SS6954493056	55	619.5
TEMPORARY INCREASED DIS. FROM	BE0010502	SS6991393002	32	188.75
STORM KING NEAR GLAIS PS CSO	BP0246001	SN6997600794	23	87.5
CSO 136, Afan St. Velindre, Afan	BP0304101	SS7681690398	6	2
DILWYN ARMS PONTARDAWE CROSS NPT	BP0343601	SN7216403946	105	556.25
OLD ROAD CSO OLD ROAD SKEWEN NEATH	BP0353701	SS7325097330	77	293.25
HEOL ILLTYD CSO BRYNCOCH NPT	BP0362001	SS7488198639	1	0.25
SSO.OUTLET OF GLAIS P.S.	BW4102801	SN6997600794	23	87.5
CASWELL BAY CAR PARK SPS CASWELL	BE0022301	SS5936087710	4	9.5
DYFFRYN CELLWEN	BP0135001	SN8538410231	104	1130.25
OUTFALL 'M' THE TAWE BARRAGE SWANS	BP0237413	SS6618492911	25	234.5
DYNEVOR PS CSO EO LLANDARCY NPT	BP0255601	SS7281596442	139	1406.5
LLANTWIT PS LLANTWIT CHURCH NEATH	BP0255801	SS7615897995	10	22.25
MYNYDDGARNLLWYD CSO SWANSEA	BP0280701	SS6538697402	12	6
CHURCH ROAD CSO CHURCH ROAD NEATH	BP0353501	SS7572698720	7	22.5
CSO 4 OPPOSITE LAMB & FLAG COTTAGES	BW0600701	SN8085812502	130	1239.25
SWO. GODRE'R GRAIG SOC 20. GODRE'R	BW2302801	SN7528506540	26	227.5
PONTARDAWE 2 TO R TAWE CSO SWANSEA	BC0016801	SN7244303860	14	67.5
CSO27 FARMERS ROAD PUMPING STATION	BO5092301	SS7415599946	46	203.25

Site Name	Permit Reference	NGR	Count of Spills in 2021	Total Duration (hours) of spills in 2021
ABERGREGAN PUMPING STATION AFAN	BP0028601	SS8479996503	84	1589.25
MARLAS STORM TANKS N CORNELLY BRIDG	BP0169901	SS8139482391	22	181
CSO NO 33 GLAN YR AFON ROAD SKETTY	BP0212901	SS6206593079	13	50.25
NEATH ABBEY PS SKEWEN NEATH PORT T	BP0224301	SS7379397203	42	185.75
MUMBLES SPS KB ROCK MUMBLES SWANS	BP0236603	SS6250087610	70	655.75
OUTFALL J (CSO 24) JUN OF MUMBLES R	BP0237410	SS6337492136	15	9.75
SWO. NEAR H.M. PRISON (POINT 6	BP0237412	SS6505092360	18	46.75
CSO 119 CWM ROAD HAFOD SWANSEA	BP0242101	SS6577994224	31	24.5
FARFIELD PS PRINCE OF WALES DRIVE	BP0255701	SS7547997902	102	473.75
PENTREFFYNNON PS NEATH ABBEY IND ES	BP0256101	SS7318196934	32	113
CSO SKETTY PARK DRIVE SWANSEA ,	BP0268801	SS6201492680	3	1
BISHOPSTON STW BRANDY COVE LANE	BP0271801	SS5817487937	19	161
OVERTON STW PORT EYNON	BP0274701	SS4633985046	4	30.5
CWMBWRLA CSO CWMBWRLA RBOUT SWANSEA	BP0280801	SS6494994706	130	1445.25
WYCHTREE STREET CSO MORRISTON	BP0280901	SS6708397267	61	420.75
KILLAY SPS OFF GOWER RD KILLAY	BP0289501	SS5985692400	12	58.25
CSO 81 CWM BATH ROAD MORRISTON	BP0244101	SS6684998088	0	0
CSO 101 THE WAUN 200M U/S FOOTBRIDE	BM0003204	SS7881992414	64	191
CSO NO 102 100M D/S FOOTBRIDGE	BM0003201	SS7781991839	44	92
Heol Dulais CSO, Birchgrove	CB3192ZR	SS7002898394	8	11
CSO NO 126 MOORS ST CULVERT AFAN	BP0240201	SS7593289717	14	25.75
SWANSEA - BIRCHGROVE ROAD/ ST. JOHNS CHURCH (POINT 109) CSO	BP0244801	SS7050798602	8	6.25
CSO No 115, Scott's Yard, Cwmafan	BW0200101	SS7715490706	97	764.5

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Site Name	Permit Reference	NGR	Count of Spills in 2021	Total Duration (hours) of spills in 2021
CSO 107 BELOW ALDER TERRACE AFAN	BP0028605	SS8667395860	56	101.5
CSO NO 21 DERWEN FAWR ROAD SKETTY S	BP0212801	SS6197792354	29	116.5
SWO. QUEENS DOCK (POINT 95)	BP0237414	SS6530593130	6	3.75
CSO AT LON Y CARIADON NORTH CORNELL	BP0303101	SS8207882144	1	0.25
Combined Sewer Overflow at Sketty Green	AB3694FF	SS6227092310	21	109
HAZEL GROVE PUMPING STATION PYLE	BP0303301	SS8237082808	2	4.25
SWO NO 11 NR GLANYRAFON CWMLLY	BW1404001	SN7480412483	63	186
Plas Y Coed CSO, Glyn neath	BB3893NJ	SN8729606315	41	109.75
MASON'S ARMS SWO YSTRADG	BW0600401	SN7847710171	21	121
CSO NO 10 30M U/S ROADBRIDGE	BW2901401	SS7437599821	76	204.25
MOSTERY ROAD CSO (CSO 35) NEATH	BP0336901	SS7375397487	14	20.5
CSO 13 RUGBY CLUB	BW0600301	SN7856209759	16	100.75
CSO NO 38 O/S PUBLIC HEALTH OFFICE	BP0303901	SS7551697897	7	2
CAL CSO. TOWPATH OFF HEBRON ROAD, CLYDACH	BP0353201	SN6890001170	50	156.25
GLANOWEN ROAD CSO Swansea	Unpermitted-73328	SS6498094197	7	2.25
CSO 17 UNDER OLD RD BRDGE ABRDULAIS	BP0316401	SS7721799416	12	45
PARK STREET CSO PARK STREET TON	BP0353901	SS7771299255	13	5.25
PT 28 BRYNMOR\WESTBURY , ,	BP0212501	SS6437992692	1	0.25
MOSES ROW CSO RESOLVEN NEATH	BW2900301	SN8221802012	59	432.5
THE LLANDARCY 36" OUTFALL, PEN-YR-HEOL, NEATH	BP0064319	SS7290096380	16	33
OUTFALL A (CSO 201) JUN OF MUMBLES	BP0237401	SS6193887849	0	0
The Nook CSO Oxwich	Unpermitted-72835	SS4987786577	31	619.5
OFF LLIPUT LANE POINT 130 CSO SWAN	BP0237407	SS6162289854	0	0
CSO 69A HEOL NT GELLI SWANSEA	BP0242901	SS6568096230	3	1

Site Name	Permit Reference	NGR	Count of Spills in 2021	Total Duration (hours) of spills in 2021
CSO OFF HEOL LAS LLANSAMLET	BP0244701	SS7013598648	3	0.75
GNOLL PARK ROAD CSO, NEATH	BP0353801	SS7569197628	63	62.5
Trallwyn Community Centre, Llansamlet CSO106	BW4101701	SS6934197291	0	0
SWO.NEAR CHEMICAL RD. MORRISTON (PO	BW4105001	SS6721898549	0	0
CSO 48 NEATH RIVER BRIDGE ADJ CALOR	BP0316601	SS7733399190	53	166.75
REAR GODFREY AVENUE GLYNNEATH NPT	BP0319301	SN8736205909	50	183.5
CSO 12 B4599 ROAD BRIDGE	BP0320001	SN7859310079	49	202
RESOLVEN STW STORM TANKS NEATH	BP0341401	SN8238802631	64	391.5
GEORGE IV CSO 23 UPPER CWMTWRCH	BP0341601	SN7543111577	57	688.25
GLANDYFFRYN CLOSE CSO, PORT TALBOT	BP0359301	SS7756489311	10	13.5
CSO 10 REAR OF WAUN GYRLAIS PENRHOS	BW0600501	SN7975411056	30	108.25
YSTRADGYNLAIS WWTW OFF WIND ROAD	BW0600901	SN7755208709	137	2546.5
CSO 21 BRIDGE STREET	BW2303501	SN7675710164	35	178.25
CSO 8 BRYNCOCH SWO 7B BRYNCOCH	BW2901501	SS7446799303	11	53.75
REAR NO 1 DYFFRYN V'W BRYN COCH	BW2901601	SN7432700277	53	247.75
CSO 49 LLANGATWG SCHOOL ABERDULIAS	BW2902801	SS7665199191	28	148.5
SSO. HALFWAY CRYMLYN ROAD P.S. PENT	BW4101101	SS6949296111	16	24.75
SSO YNYSFORGAN ROUNDABOUT	BW4104901	SS6768899322	0	0
CSO 70 A4067 NTHBND LANDORE SWANSEA	BW4105401	SS6611895736	90	322
NEAR DELFFORDD PONTARDAWE	CB3191HQ	SN7321503039	0	0
BRYNDULAIS CSO, SEVEN SISTERS	WQD005680	SN8137508627	41	169.5

Appendix II. Swansea Bay Sanitary Survey Report 2011

Cefas

EC Regulation 854/2004

CLASSIFICATION OF BIVALVE MOLLUSC PRODUCTION AREAS IN ENGLAND AND WALES

SANITARY SURVEY REPORT

Swansea Bay

(Wales)

2011

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Appendix III.Shoreline Survey

Swansea Bay Shoreline Survey

Report Context

This report is designed to be read in conjunction with the desk-based assessment, to which this forms an appendix. It details the findings of the shoreline survey but does not repeat details of contamination sources detailed in the main report unless there is specific need to (i.e., where there are differences between the situation described in the desk-based assessment and those observed during the shoreline survey). The desk-based assessment is based on data sources (including Official Control monitoring) up to and including August 2022. The description of the shellfishery presented within this report is based on the information contained in the desk-based assessment and information gathered during the Shoreline Survey.

This shoreline survey of the Swansea Bay area was recommended in the desk-based assessment due to an unexplained deterioration in shellfish flesh hygiene standards from samples taken at the Representative Monitoring Point (RMP) in this area, resulting in the shellfishery being prohibited. As such the shoreline survey focussed on the shellfishery itself at Queens Dock, and any potential contamination sources (identified and unidentified) upstream of the Classification Zone (CZ) in the River Tawe. The Swansea Bay Bivalve Mollusc Production Area (BMPA) is situated within the embayment of the same name, and the only currently designated CZ for bivalve molluscs is Queen's Dock in the middle of the embayment. This CZ has been designated as Prohibited since April 2022.

General Information

Date (time):

21st February 2023 (09:30-15:00 UTC)

Bivalve Molluscs Production Area (BMPA) surveyed:

Swansea Bay (Cefas Site Reference: M037, Figure 1)

Weather:

Overhead:	Clear
Beaufort:	2
Precipitation in 48hrs preceding survey:	Light
Precipitation during survey:	None observed

Tidal predictions:

21st February 2023 (https://www.tidetimes.org.uk/swansea-tide-times-20230221)

LW	HW	LW	HW
00:55	07:06	13:19	19:29

0.50 m	10.07 m	0.22 m	9.88 m

Objectives

The shoreline survey is a physical survey of potential sources of contamination. During the survey samples of freshwater or anthropogenic inputs to the area are collected for bacteriological (*E. coli*) testing to evaluate potential differences in levels of contamination entering the shellfish harvesting area; confirm the location of previously identified sources of potential contamination; and to identify other potential sources of contamination that were not apparent in the desk based assessment. A full list of recorded observations is presented in Table 1 and the locations of these observations are mapped in Figure 1. Photographs taken during the shoreline survey are referenced in Table 1 and presented in Figure 5 to Figure 21.

The shoreline survey was conducted over one day with both surveyors working together to survey the same area of shoreline, maximising safety whilst on site. Water samples SCPH23006 - SCPH23011 and the two Shellfish flesh samples (OC001 and OC002) were collected by boat from within Queen's Dock and the adjacent King's Dock. Water samples SCPH23012 and SCPH23013 were collected on foot via access over the seawall and down onto the beach when the tide was out. This formed part one of the survey and can be seen from waypoint 364 to 371 on Figure 1.

Representatives from the FSA were present during part one of the survey, alongside a representative from Swansea council who collected the shellfish flesh samples. The sampling was timed to coincide with the regular monthly Official Control monitoring sampling from this BMPA. If safe to do so, samples of all surface water inputs were taken and subsequently analysed for *Escherichia. coli* and intestinal *Enterococci* (IE) concentrations at the Public Health Wales Microbiology Laboratory in Carmarthen following established testing protocols. Shellfish flesh samples collected during part one of the survey were collected and analysed following established Official Control monitoring procedures. Water sample *E. coli* and intestinal *Enterococci* results can be seen in Figure 2 and Figure 3 respectively. Figure 4 shows the Shellfish flesh sample *E. coli* results.

The second part of the survey (part two) consisted of surveyors walking around the harbour and part-way up the River Tawe (~4 km one-way route). The route walked can be seen in Figure 1. Surveyors were able to reach all areas as planned. Outfalls and potential contamination risks were identified throughout the survey.

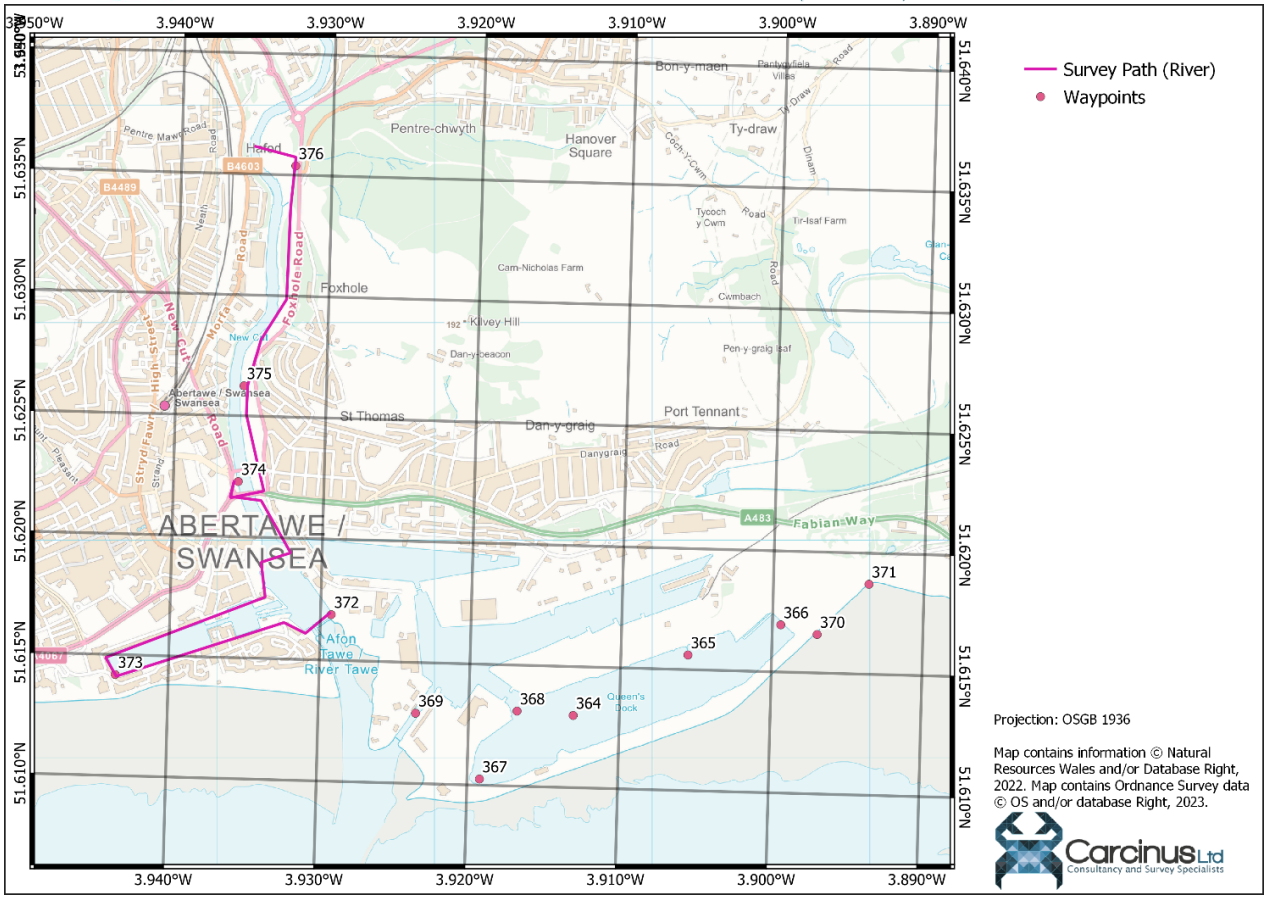

Figure 1 Locations of shoreline observations with survey split into two sections – 1: By boat and around the dock, 2: By foot around the harbour and up the River Tawe. See Table 1 for details of waypoints and observations at each made during the survey.

Description of Shellfishery

A full shellfish stock assessment is beyond the scope of a shoreline survey, and this report only presents observations made during the survey. Further information can be found in the desktop study. The Swansea BMPA is situated within the embayment of the same name, on the South coast of West Wales. The only identified CZ for bivalve molluscs is in the centre of the embayment, Queen's Dock (although at the time of the shoreline survey in February 2023 it was designated as Prohibited). The next closest BMPA is Burry Inlet, but no hydraulic connectivity exists between these two production areas. For this shoreline survey, only the Queen's Dock CZ, listed as being in the Swansea BMPA at the time of the sanitary survey review in August 2022 is considered.

The shellfish beds with the Swansea BMPA are under the jurisdiction of the Local Enforcement Authority (LEA), Swansea Council. The Swansea Bay Mussel Fishery Order came into effect in 2012, and no other regulating order nor byelaw governs harvesting of shellfish in the area. The Queen's Dock mussel zone has held a B or long term-B (LT-B) classification for the most part of the previous 10 years. In April 2022, commercial harvesting was ceased and the CZ designated as prohibited due to a number of *E. coli* concentration results far exceeding the maximum permitted regulatory limit of

46,000 *E. coli*/100g. Consequently, at the time of the shoreline survey (February 2023) there was no output of shellfish from this fishery.

Sources of contamination

Sewage discharges

Continuous Discharges

A total of 19 continuous discharges were identified during the desktop assessment as being within the area of the BMPA and therefore shoreline survey. Those said to be the most significant with regards to their contamination output within the BMPA were Afan WWTW Port Talbot (approx. 9 km from CZ boundary, discharging into Swansea Bay) and Swansea STW (approx. 2.6 km from CZ boundary, discharging into Swansea Bay). The Shoreline Survey confirmed that there continues to be no continuous discharges within the Queen's Dock itself, meaning that any contamination is likely to originate via the intake pump used to fill the Dock when the water level becomes too low. Details of all continuous discharges can be found in the main report.

Intermittent Discharges

The desktop assessment describes a total of 183 intermittent discharges within the study area . No intermittent discharges were identified within the Queen's Dock itself, meaning that any contamination is likely to enter the dock via the pump filling system. Two miscellaneous trade discharges were identified in the desktop study in the Queen's Dock itself, and water samples were taken as close as possible to these (SCPH23009 and SCPH23010). Both water samples reported an *E. coli* concentration of 0 CFU/100 ml, and an intestinal Enterococci result of 1 CFU/100ml and 0 CFU/100ml respectively therefore are unlikely to be a source of contamination to the CZ.

In addition, an intermittent discharge identified outside of the Dock and over the seawall in the desktop study was confirmed and observed to be flowing on the day of survey (waypoint 370). This returned an *E. coli* concentration of 4,900 CFU/100ml, and an intestinal *Enterococci* result of 1,210 CFU/100ml. Both values are considered reasonably high and could be deemed a cause for concern. However, given the location of the outfall in comparison to the CZ (the other side of the sea wall, discharging to Swansea Bay), it is unlikely to be a significant source of bacteriological contamination as there is no evidence to suggest this outfall has any connectivity to the Dock. Dwr Cymru Welsh Water (DCWW) modelling found that the discharges in this location had a 0 or < 1 % impact on Swansea Bay Shellfish Waters.

Further up the beach (~300 m from waypoint 370), a second outfall was sampled (waypoint 371). This outfall was not identified in the desk-based assessment. It should be noted that this outfall had a sulphurous smell and visible water staining inside/around the pipe (Figure 13; Figure 14). Whilst this may be indicative of potential contamination, low *E. coli* and intestinal *Enterococci* results were recorded. It should also be noted that given the location of these two outfalls on the beach, discharging into Swansea Bay, there is no evidence of connectivity to the CZ at Queen's Dock. Therefore a combination of location in comparison to the CZ and low water sample contamination results indicate these outfalls are unlikely to be a significant source of bacteriological contamination.

During part two of the survey, the tidal barrage outfall identified in the desktop study was confirmed at Swansea Marina Lock in the Tawe Basin (waypoint 372). A closed outfall not identified in the desktop assessment was also noted in Swansea Marina (waypoint 373), and no evidence of previous flow could be seen (no water staining on the wall). Further up-river, the Parc Tawe outfall was

confirmed as previously identified. Although it was not flowing on the day of survey (waypoint 374), some evidence of staining below the outfall suggests recent previous flow.

A small number of outfalls were visible upstream, but were difficult to assess further due to inaccessibility. A work plant was also noted in the River (Figure 19) but limited information could be seen on the works being carried out, and whether this may have any effect on water quality and contamination in the river itself. Surface road drainage was identified during the shoreline survey and observed to be flowing on the day (waypoint 376). A strong sulphurous smell and surface foam was visible (Figure 21) which could be indicative of potential contamination. This road drainage was set back about 50 m away from the watercourse, and any runoff into the river is likely to experience significant dilution before passing close to the CZ.

Freshwater inputs

Watercourses draining to the Swansea Bay BMPA are described in full within the main report. The main freshwater watercourse draining within the vicinity of the shellfishery is the River Tawe. However, given that the Classification Zone is within a dock, all water exchange into and out of the CZ will occur via the pumps used to control the dock system water level following use of the locks. Limited water can move into and out of the dock complex. That being said, any contamination that already exists within this water before its movement into the CZ will not be flushed as no free flow occurs within the wider bay. Bacteriological die off is likely the only reduction method for potential contamination, as discussed in the desktop study.

Boats and Shipping

The discharge of sewage from boats in the vicinity of the Swansea Bay BMPA was identified as a potential source of contamination in the desktop study. The Port of Swansea contains three main docks; King's and Queen's Docks, as well as the Prince of Wales Dock (now used as a recreational yacht haven). During the shoreline survey, the port was very active with multiple large commercial/merchant vessels observed. Following confirmation of the nature of vessels, this is considered to be an unlikely significant source of contamination to the BMPA given merchant shipping vessels are prohibited from making overboard discharges withing 3 nautical miles of land[1].

The desktop study also identified pleasure craft activity throughout the bay, which was observed during the shoreline survey. Vessels with onboard toilet facilities could be likely to make overboard discharges. However, this remains an unlikely source of bacteriological contamination to the BMPA as the designated area for shellfish harvesting is within the Dock itself. No recreational boating activity is likely to occur in the Dock area.

Livestock

Little to no agricultural land could be seen adjacent to the shoreline, and therefore the risk of direct agricultural runoff as mentioned in the desktop study remains low.

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

Wildlife

Some seabirds were noted during the shoreline survey, but with the nature of the survey being onboard a boat in a working dock it was difficult to capture evidence of this through photos as they were easily disturbed. There were no notably large numbers of birds observed during the shoreline survey, only a few gulls in and around the water. The desktop study suggested birds are unlikely to be a direct source of contamination to this Shellfish bed given the levels of human activity and noise from the surrounding Docks.

The commercial fisherman guiding the boat during part one of the survey has observed that when the mussels are harvested often large aggregations of birds are present. When passing over the seawall to take water samples at waypoints 370 and 371, no notable evidence of seabirds (i.e. no Guano on the seawall itself) was identified. It remains unlikely that birds represent a significant source of pollution.

The survey area and surrounding docks have limited public access, however the River Tawe survey path may be used by dog walkers. Dogs were sighted infrequently on the day of survey, and little to no evidence of dog fouling was present therefore it is unlikely that this will be a source of contamination.

Tables & Figures

All maps presented in this section are presented referenced to the Ordnance Survey of Great Britain, 1936 (OSGB 1936, eastings and northings). However, the coordinate grid overlaid on them is presented in World Geodetic System of 1984 format (latitude and longitude) to aid comparison with the coordinates presented in each of the tables. The differences between these two projections are the reason for the x and y grids being not absolutely horizontal or vertical.

Table 1: Details of shoreline observations. Those highlighted in yellow were not identified in the desktop assessment.

Name	Date/Time (GMT)	Latitude	Longitude	Notes	Sample No.	Figure
364	21/02/2023 10:10	51.61298	-3.91306	RMP, Seabirds, anthropogenics at banks which are cleared once a year with a digger.	SCPH23006/ OC001	Figure 5; Figure 6
365	21/02/2023 10:22	51.6156	-3.90555	Mid-point of dock	SCPH23007/ OC002	Figure 7
366	21/02/2023 10:31	51.61695	-3.89945	Dock Eastern End, anthropogenics noted at the banks.	SCPH23008	Figure 8
367	21/02/2023 10:46	51.61025	-3.91918	Dock Western End.	SCPH23009	Figure 9
368	21/02/2023 10:51	51.6131	-3.9168	Pipe near dock entrance, not observed to be flowing during survey. Pipe partially submerged so no evidence could be obtained of previous flow (i.e. water staining on the wall).	SCPH23010	Figure 10
369	21/02/2023 11:08	51.6129	-3.92353	Lock gate.	SCPH23011	Figure 11
370	21/02/2023 11:52	51.61659	-3.89702	Outfall 1 seaward, flowing during survey.	SCPH23012	Figure 12
371	21/02/2023 11:59	51.61872	-3.89366	Outfall 2 seaward, flowing during survey. Water staining observed and anthropogenics near pipe entrance.	SCPH23013	Figure 13; Figure 14
372	21/02/2023 13:10	51.61688	-3.92929	Pumping station closed, tidal barrage outfall.		Figure 15
373	21/02/2023 13:29	51.61417	-3.94353	Outfall closed.		Figure 16
374	21/02/2023 13:55	51.62228	-3.9357	Parc Tawe outfall, not observed to be flowing during survey but staining suggests previous flow.		Figure 17
375	21/02/2023 14:08	51.62624	-3.93548	Outfalls near houses (no flow), work plant in river, periodic bubbling observed on surface of water as surveyors walked upstream.		Figure 18; Figure 19 ; Figure 20
376	21/02/2023 14:39	51.63538	-3.93243	Surface road drainage, strong smell and flowing observed during survey. Surface foam identified.		Figure 21

Sample Results

Table 2: Water sample E. coli and Intestinal Enterococci results.

Sample No.	Date/Time (GMT)	Latitude	Longitude	E. coli (CFU/100 ml)	Intestinal *Entercocci* (CFU/100ml)
SCPH23006	21/02/2023 10:10	51.61298	-3.91306	3	2
SCPH23007	21/02/2023 10:22	51.6156	-3.90555	4	1
SCPH23008	21/02/2023 10:31	51.61695	-3.89945	0	2
SCPH23009	21/02/2023 10:46	51.61025	-3.91918	0	1
SCPH23010	21/02/2023 10:51	51.6131	-3.9168	0	0
SCPH23011	21/02/2023 11:08	51.6129	-3.92353	100	3
SCPH23012	21/02/2023 11:52	51.61659	-3.89702	4900	1210
SCPH23013	21/02/2023 11:59	51.61872	-3.89366	1	19

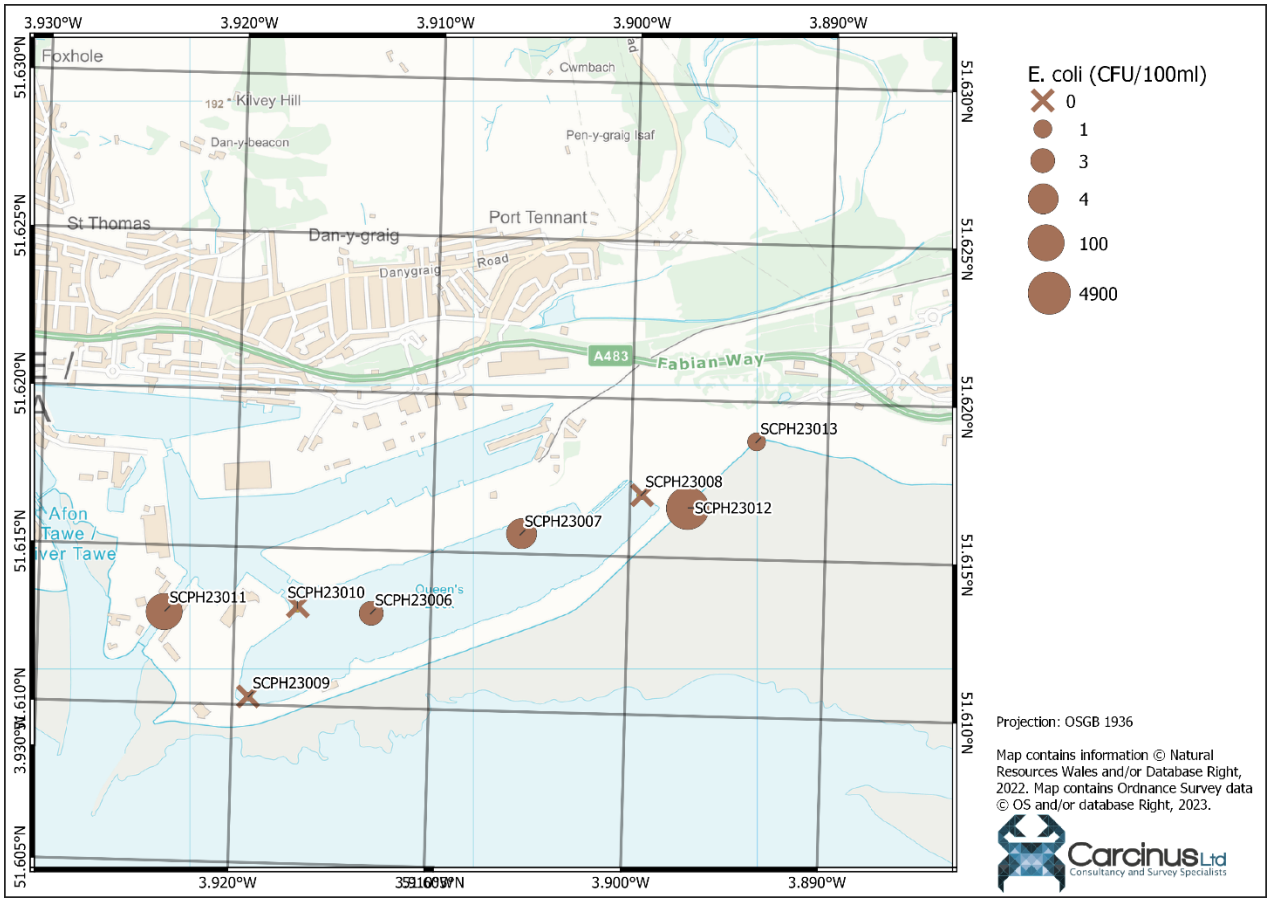

Figure 2 E. coli results for water samples taken at Swansea Bay.

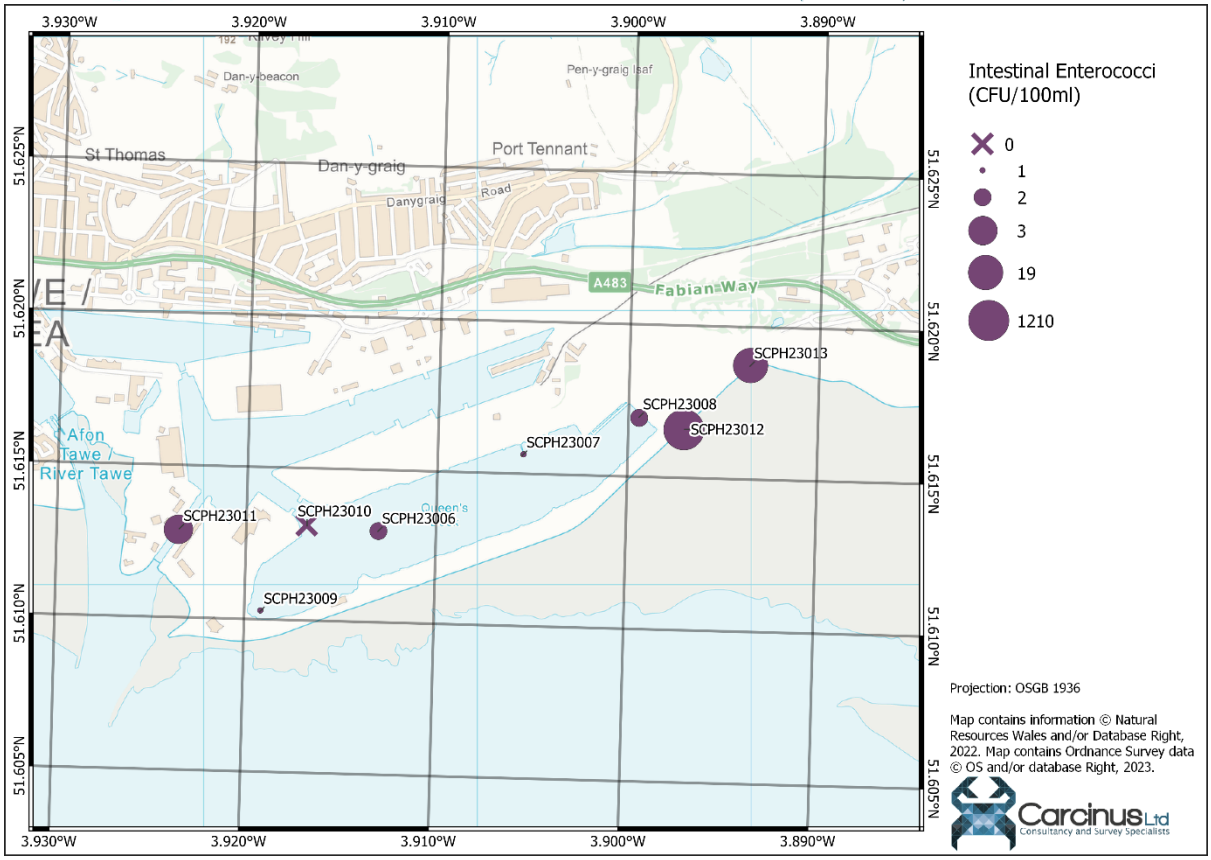

Figure 3 Intestinal Enterococci results for water samples in Swansea Bay.

Table 3: Shellfish flesh sample E. coli (MPN/100g) results.

Sample No.	Date/Time (GMT)	Latitude	Longitude	E. coli (MPN/100g)
OC001	21/02/2023 10:10	51.61298	-3.91306	78
OC002	21/02/2023 10:22	51.6156	-3.90555	<18

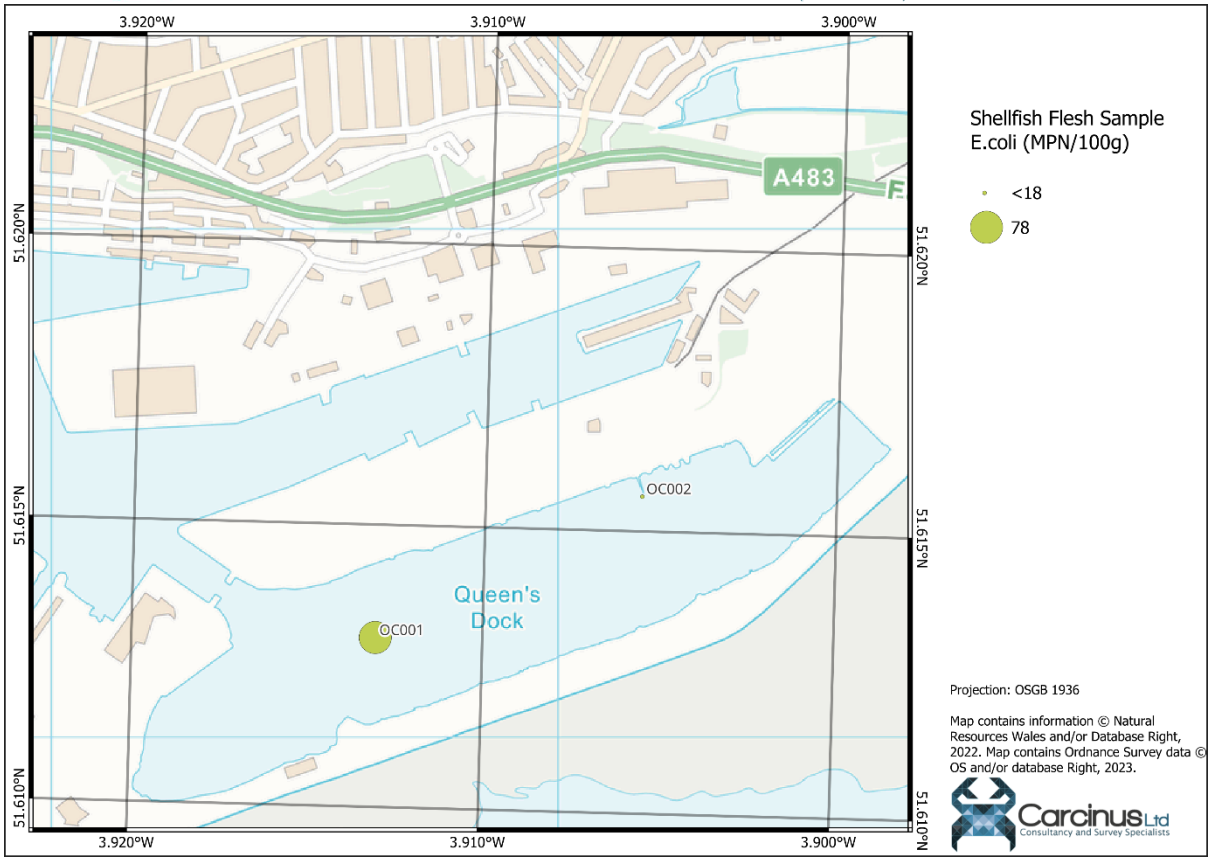

Figure 4 Shellfish flesh sample E. coli results (MPN/100g)

Shellfish Flesh Samples

The results of the shellfish flesh samples taken during the shoreline survey can be seen in Table 3. The current RMP (OC001) returned an *E. coli* concentration of 78 MPN/100g. The secondary sampling location (OC002) returned an *E. coli* concentration of <18 MPN/100g. This sample was taken at the far end of the dock and further from the entrance (Figure 4). The Queen's Dock CZ was previously classified as Class B or long term-B until April 2022. Whilst the *E. coli* concentration at the secondary location is less than the current RMP, both samples still fall within the standards of a Class B shellfish bed set by the FSA (less than or equal to 4600 *E. coli*/100g, no sample exceeding 46000 *E. coli*/100g[2]). Whilst the shellfish flesh samples collected represent only a snapshot of contamination levels, the fact that the sample collected nearer the Dock entrance contained a higher concentration of *E. coli* suggests that the recommendations in the desk-based report, to take shellfish flesh samples as close to the Dock entrance as possible, remain valid.

Images

The following section contains images captured during the shoreline survey – these were collected whilst maximising safety.

[2] https://www.food.gov.uk/business-guidance/shellfish-classification#permitted-levels-of-e-coli

Figure 5 RMP for mussel farm in Queens Dock. Location of water sample SCPH23007 and Shellfish flesh sample OC001.

Figure 6 Anthropogenic litter seen from onboard the boat whilst collecting water and shellfish samples at RMP, Queens Dock.

Figure 7 Mid point of Dock, location of water sample SCPH23007 and shellfish sample OC002.

Figure 8 Dock Eastern End, location of water sample SCPH23008. Anthropogenic material was visible from the boat.

Figure 9 Western end of Dock, location of water sample SCPH23009.

Figure 10 A pipe identified during the shoreline survey. Not observed to be flowing during the survey. No clear evidence of previous water flow. Location of water sample SCPH23010.

Figure 11 Lock gate. Location of water sample SCPH23011.

Figure 12 Outfall 1 seaward. Observed to be flowing during survey. Location of water sample SCPH23012.

Figure 13 Outfall 2 seaward. Identified during shoreline survey. Flow observed on survey day. Anthropogenic material in surrounding area and water staining visible from flow of water. Location of water sample SCPH23013.

Figure 14 Outfall 2 seaward photo taken up inside the pipe.

Figure 15 Tidal barrage outfall. Pumping station from desktop study confirmed. Closed on day of survey.

Figure 16 Outfall identified during shoreline survey walking route around harbour and up River Tawe. No flow observed during survey.

Figure 17 Parc Tawe outfall confirmed. No flow observed during survey.

Figure 18 Outfalls observed along river bank near houses. Periodic bubbling was also seen in the centre of the river on the surface of the water in random locations as surveyors walked upstream.

Figure 19 Work plant identified in the river during shoreline survey. Active on day of survey. Unclear what work was being done.

Figure 20 Second photo of the periodic bubbling on the surface of the water further upstream.

Figure 21 Surface road drainage identified during the shoreline survey path route up the River Tawe. Observed to be flowing on the day of survey with a strong smell and surface foam.

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About Carcinus Ltd

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

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