Sanitary Survey - Review

Dee – 2022

Document No. – *J0591/22/01/13*

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Document QA and Approval

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Initial Consultation

Consultee	Date of consultation
Wirral Council	10 November 2021
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Consultation on draft report

Consultee	Date of consultation
Wirral Council	08 March 2022
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A sanitary survey relevant to the bivalve mollusc beds in Dee was undertaken in 2013 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, Flintshire County Council, Wirral Council. The report is publicly available via the Carcinus Ltd. website.

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Carcinus Ltd., 2022. Review of the Dee 2013 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, 2017). 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 Dee Review

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

An **initial consultation** with Local Enforcement Authorities (LEAs) and the Environment Agency (EA) responsible for the production area was undertaken November and December 2021. 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 LEAs and Local Action Group (LAG) members was undertaken in March and April 2022. 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 2013 and sampling plan as necessary and the report should read in conjunction with the previous survey, which is presented in Appendix III.

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.

1.3 Assumptions and limitations

This desktop assessment is subject to certain limitations and has been made based on several assumptions, namely:

- Accuracy of local intelligence provided by the Local Authorities and Environment Agency
- The findings of this report are based on information and data sources up to and including December 2021
- 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 November 2021 have been used within this study. Any subsequent samples have not been included.

[1] Cefas shellfish bacteriological monitoring data hub. Available at: https://www.cefas.co.uk/data-and-publications/shellfish-classification-and-microbiological-monitoring/england-and-wales/.

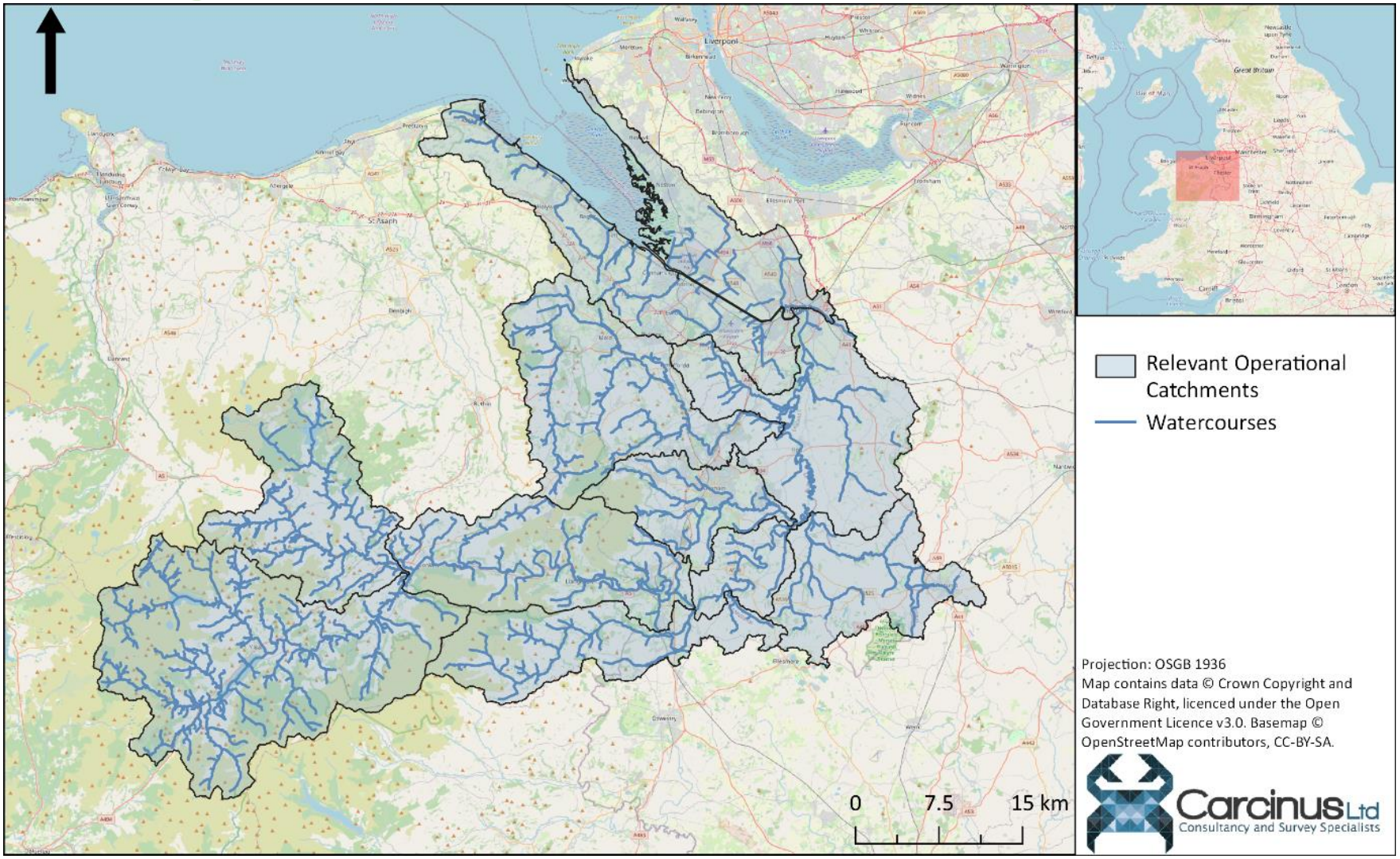


Figure 1.1 Location of the Dee estuary and its catchment in northwest England/ west Wales.

2 Shellfisheries

2.1 Description of Shellfishery

The Dee Bivalve Mollusc Production Area (BMPA) is located within the outer reaches of the Dee Estuary, which is situated between the Wirral Peninsula of northwest England and the Flintshire coast of northeast Wales, with the boundary between the two countries running down the middle of the estuary (Figure 1.1). The estuary contains an extensive intertidal area of saltmarsh, mud and sand flats, with the main river channel down the middle. The nearest Classification Zones in other BMPAs are that of Liverpool Bay, located off the Wirral Peninsula.

Classification Zones on the Welsh side of the estuary are under the jurisdiction of Flintshire County Council for food hygiene purposes, whereas those on the English side are under the jurisdiction of Wirral Council. These organisations are collectively referred to as the Local Enforcement Authorities (LEAs) throughout this report.

Harvesting of cockles within the BMPA is regulated by the Dee Estuary Cockle Fishery Order (2008), under which the Environment Agency (EA) and Natural Resources Wales (NRW) have responsibility for the English and Welsh sides of the estuary respectively. To ensure continuity of the management and regulation across the fishery, NRW take the lead on day-to-day management (NRW, 2022). Under the management plan put in place by NRW, harvesting of cockles is restricted to hand-gathering with a rake head not exceeding 30 cm, and only cockles that are retained by a square gauge with an opening of 20 mm may be collected. Harvesting is also restricted to daylight hours (1 hour either side of sunrise/sunset) between the 1st July and 31st December. Based on the determined Total Allowable Catch (TAC), approximately 50 licences are issued each year, with a maximum annual exploitation rate of 50 tonnes per licensee.

Harvesting of mussels on the English side of the BMPA is regulated by the North West Inshore Fisheries and Conservation Authority (NW-IFCA), and is subject to their byelaws. These byelaws restrict harvesting methods to hand gathering and set a minimum landing size of 45 mm (NW-IFCA, 2018). The mussel fishery on the Welsh side is regulated by the Welsh Government; the 2013 sanitary survey details that there is a closed season between May and August inclusive and a minimum landing size of 2.25 inches under Welsh Government byelaws, although no recent details could be found.

The following paragraphs detail the current classification zones and recent landing statistics (if available) for each species harvested within the BMPA.

2.1.1 Cockles

The original sanitary survey recommended the creation of seven Classification Zones, three on the Welsh side and four on the English side. However, there are currently only four zones with an active classification: *Salisbury*, *West Kirby*, *Caldy Blacks* and *Thurstaston* (the *Thurstaston East* CZ is currently classified as prohibited for all species). During initial

consultation, the representative from Flintshire Council notified the authors of this review that reclassification for the historic *Mostyn/Talacre* bed was being sought after declassification on 1st September 2021, and that 10 weeks of sampling had been undertaken. A decision was made by officers from Cefas and FSA Wales that given the small area of the desired classification, the *Salisbury* zone should be expanded rather than the *Mostyn/Talacre* zone reclassified. The cockle fishery in the Dee is active, and the landings for the most recent season are detailed in Table 2.1. These data have been taken at face value and are using NRW figures provided by the LEAs.

Table 2.1 Landings within the Dee Estuary, based on Natural Resources Wales data provided by the LEA during initial consultation.

Area/Bed	Landings (Kg)
Harvest By Bed	
Salisbury Middle (Flintshire Council)	574,133
Mostyn Deep (FC)	226,097
No. 3 Buoy (FC)	34,683
Salisbury (FC)	578,316
West Kirby (Wirral Council)	657,020
Caldy (WC)	327,878
Thurstaston (WC)	3,560
Harvest By Classification Area	
Salisbury Middle (FC)	975,677
Mostyn/Talacre (FC)	437,552
West Kirby (WC)	657,020
Caldy Blacks (WC)	331,428

2.1.2 Mussels

The original sanitary survey recommended the creation of only four zones for this species, on the basis of stock availability at that time. Two of these were on the English side and two on the Welsh. This has since increased to five: *Salisbury*, *West Kirby*, *Caldy Blacks, Thurstaston* and *Thurstaston East* (which is currently prohibited). The *Salisbury* zone has the same boundaries as at the time of the original sanitary survey, but the *West Kirby* zone is smaller (although much of the lost area is now classified as the *Caldy Blacks* zone, which has been classified since 2018). The *Thurstaston* zone has also been classified since 2018, but the original *Heswall Channel* zone was declassified in 2016.

The Wirral Council officer identified during initial consultation that they were aware that some hand gathering had taken place at *West Kirby*, but the quantity was unknown.

2.2 Classification History

The original sanitary survey recommended the creation of a total of 11 Classification Zones, 7 for cockles and 4 for mussels. There are currently 8 zones with an active classification (excluding the Prohibited *Thurstaston East* zone), 4 for each species. All zones are classified using cockle RMPs, and the CZs on the English side all hold Long-Term B Classifications (indicating stable results over at least 5 years), whereas the zones on the Welsh side hold a

Seasonal A/B classification (Class A 1st August – 31st May, Class B all other times). The location of all active classification zones within the Dee BMPA are shown in Figure 2.1.

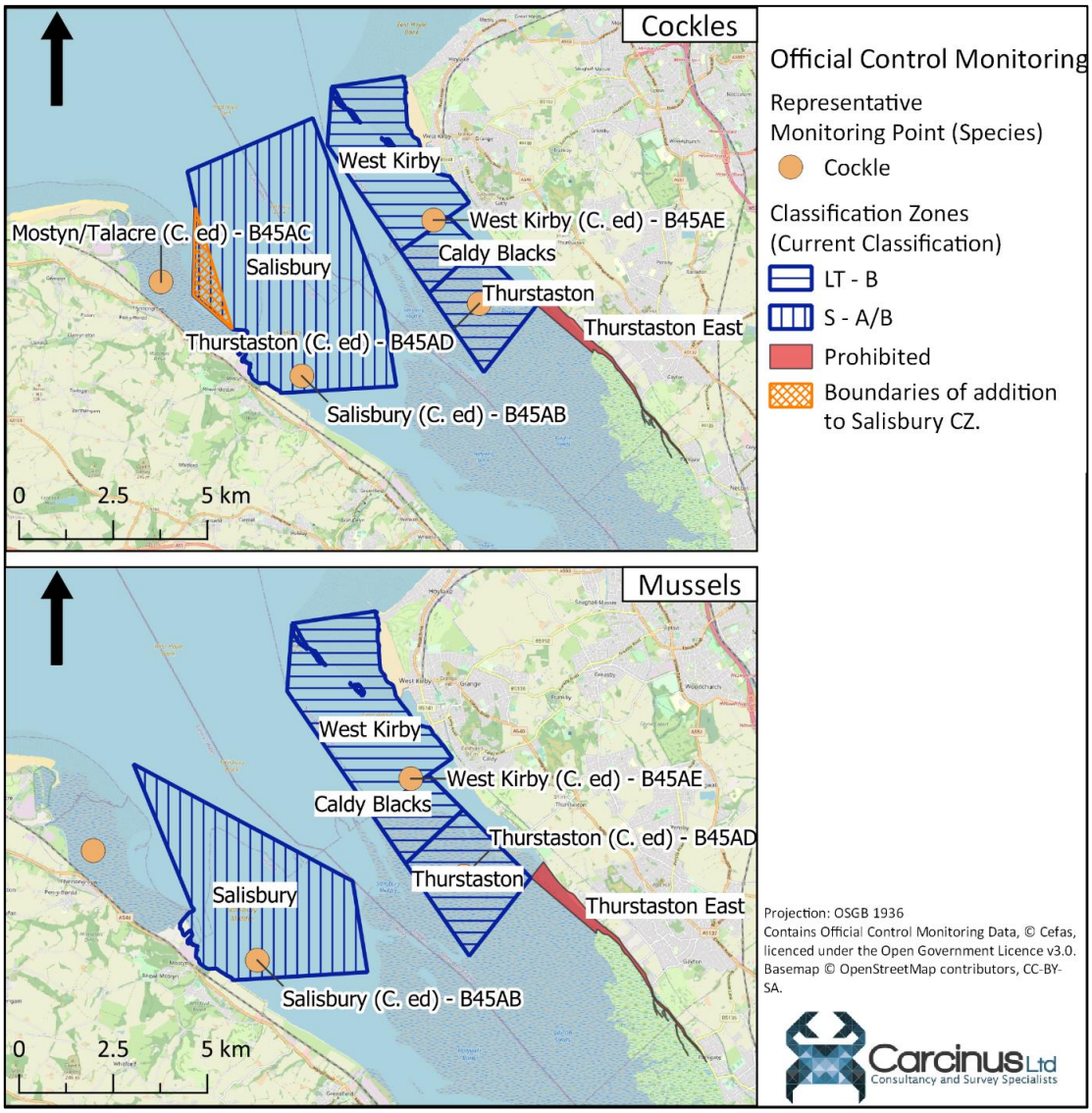


Figure 2.1 Current Classification Zones and associated Representative Monitoring Points within the Dee BMPA.

3 Pollution sources

3.1 Human Population

The original sanitary survey cites population data from the 2001 census of the United Kingdom. Since the publication of that report, the results of the subsequent 2011 census have been made available. No further population data were available to the authors of this review at the time of writing, as the results of the 2021 census have not yet been made public. The results of the 2001 and 2011 censuses have been compared to give an indication of population changes within the catchment. Changes in human population density in census Super Output Areas (lower layer) and changes in total population within Electoral

Wards wholly or partially contained within the Dee Catchment between 2001 and 2011 are shown in Figure 3.1 and Figure 3.2 respectively.

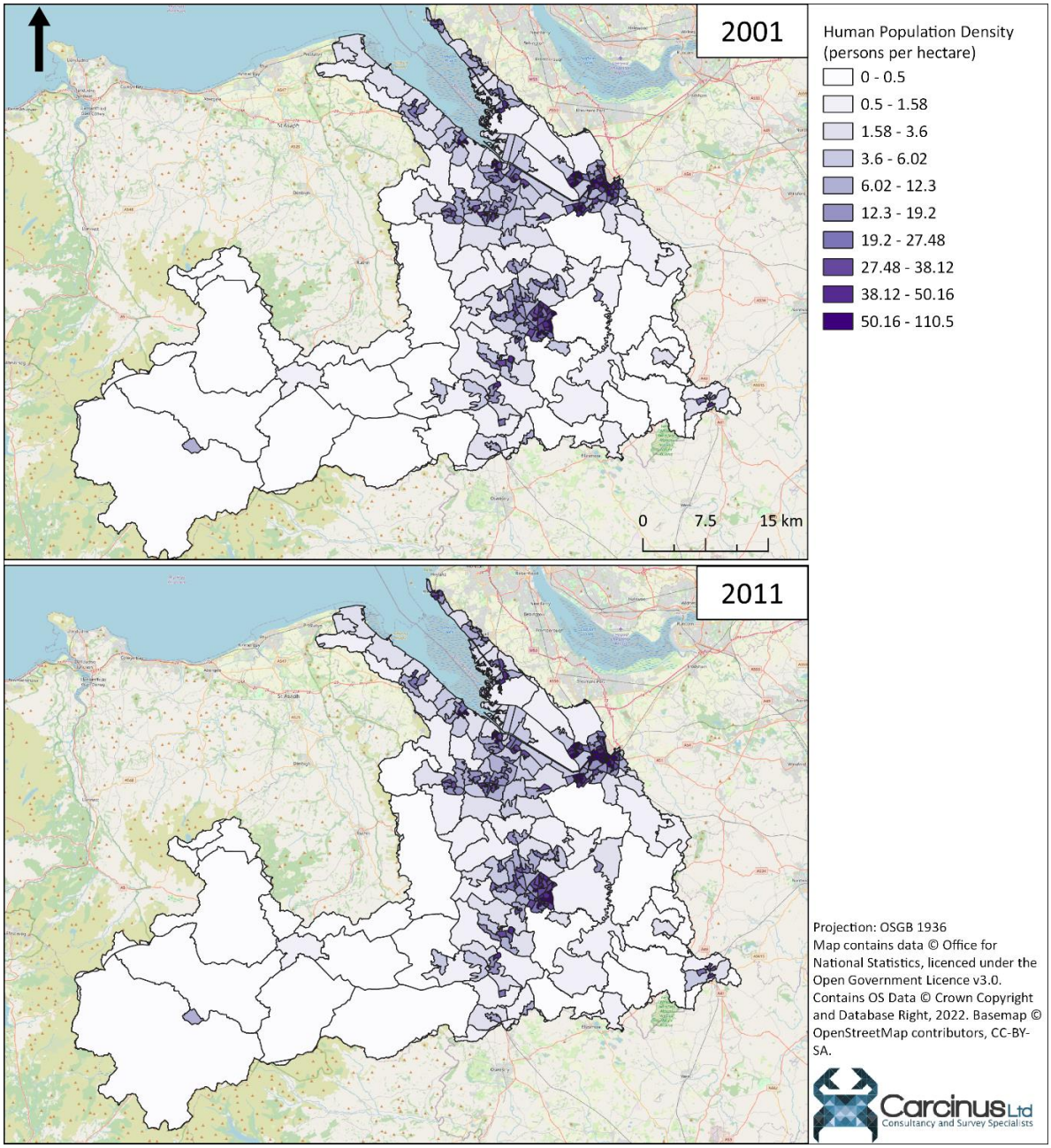


Figure 3.1 Human population density in 2001 and 2011 Census Super Output Areas (lower layer) that intersect the Dee catchment.

The human population density data suggest that the catchment has remained relatively sparsely populated, with the vast majority of the catchment still having population densities of less than 2 people per hectare. The original sanitary survey identified that the main population densities within the catchment are located around the towns of Chester and Wrexham, and to a lesser extent Connah's Quay. Population densities in these areas exceed 40 people per hectare.

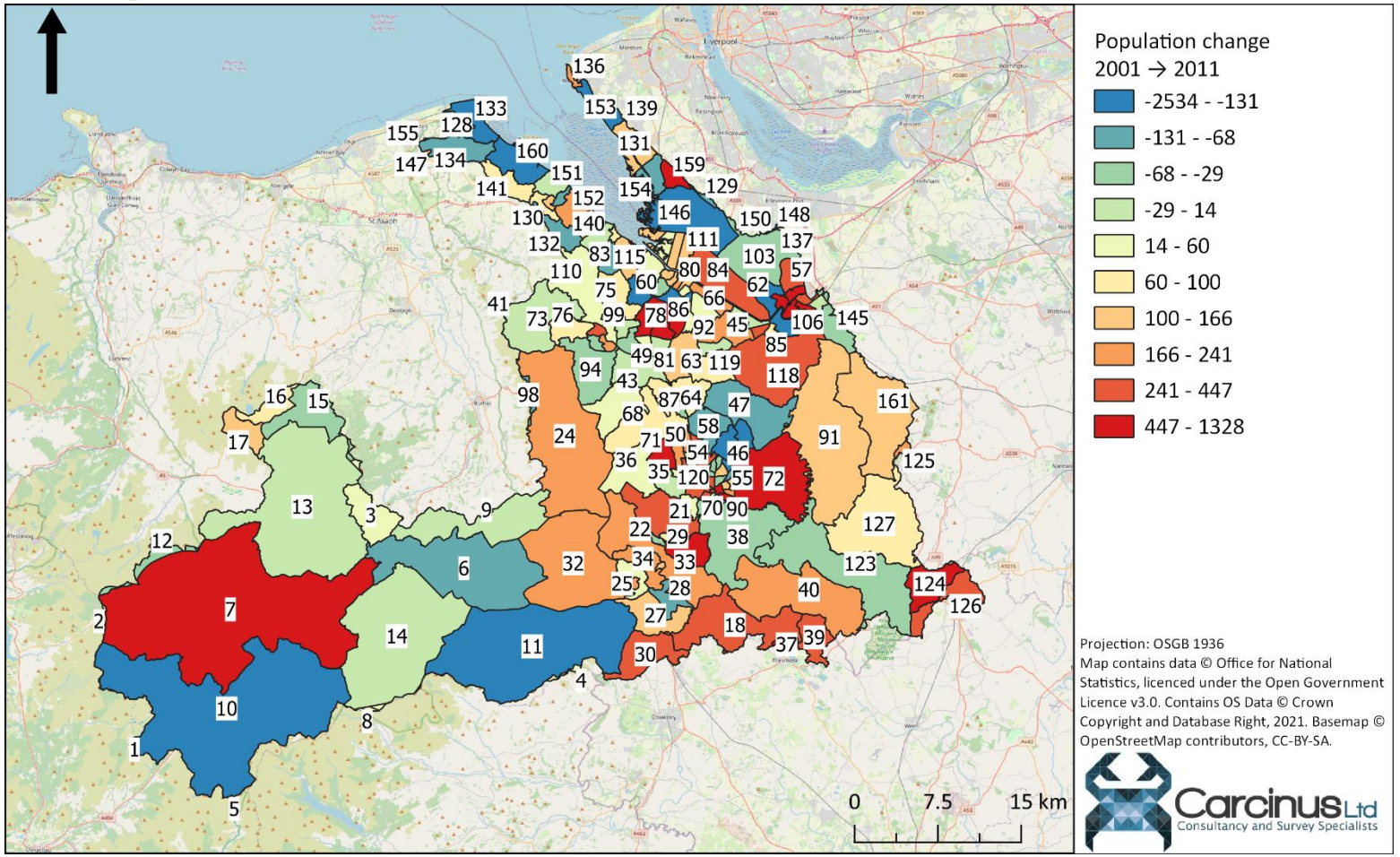


Figure 3.2 Population changes between the 2001 and 2011 censuses in Wards and Electoral divisions (based on 2011 boundaries) that are within or partially within the Dee catchment. 2001 Census data have been transposed to 2011 wards using the UK Data Service's GeoConvert tool (UK Data Service, 2021) to facilitate comparison. Numbers within wards are identifiers that can be used in combination with Appendix I to provide more detail.

The estimated total population within electoral wards wholly or partially contained within the catchment at the 2001 census was an estimated 561,734 people. By the 2011 census, this had increased by 2.70% to 576,916 people. The population of the 2011 census was collected around the time the original sanitary survey was being conducted, and so is probably more relevant to that document. Whilst the full results of the March 2021 census have not yet been published, the UK Government estimates that the national population will have increased 6.6% between 2011 and 2021 (ons.gov.uk, 2021). An increase of this proportion would see the approximate population living within the Dee catchment increase to more than 600,000 people. The potential for urban runoff remains highest from Chester at the head of the estuary, and to a lesser degree the small towns along the Flintshire and Wirral coasts. Impacts from sewage discharges will depend on the specific nature and locations of such discharges, changes to which are discussed in the next section. Consultation with the LEA did not suggest any significant housing developments in the immediate vicinity of the shellfishery, although any increase in population size will result in increased loading to the wastewater treatment network (WWTN). NRW indicated during secondary consultation however that no additional contamination would be expected from this, as water companies build in allowances for population growth within development plan periods. There also lies the potential for contamination from dog fouling and utility misconnections from conurbations along the estuary edges.

The original sanitary survey states that the city of Chester received about 8 million visitors in 2012. Statistics from 2016 suggest that tourism is increasing, with 62.18 million visitors to Cheshire West and Chester in that year (a 7.7% increase year on year) (ChesterStandard.co.uk, 2017). It is likely that the majority of this tourism will continue to occur during the summer months, and so the greatest risk of additional contamination will occur during this period. That being said, it is assumed that the existing capacity of the sewerage network is sufficient to handle this increase.

Whilst there is no recently available population data for the catchment, it is likely that the population will have increased since the last sanitary survey was published. However, the distribution of the main population centres within the catchment has not changed, and therefore the recommendations made in the original sanitary survey to account for this source of pollution remain valid.

3.2 Sewage

The catchment of the Dee BMPA contains discharges that are owned and operated by United Utilities and Dwr Cymru (Welsh Water). Details of those discharges in England were taken from the most recent update to the Environment Agency (EA's) national permit database at the time of this report (December 2021). Details of those discharges in Wales were taken from the most recent update to Natural Resources Wales (NRW's) consented discharge database at the time of this report (October 2021). The location of all current consented discharges in the Dee catchment are shown in Figure 3.3, but this figure also highlights those discharges around the Dee estuary itself, as these will be of principal significance to the bacteriological health of the shellfishery. Details of consented discharges

have been taken at face value from the relevant databases, with no additional data processing beyond that described below.

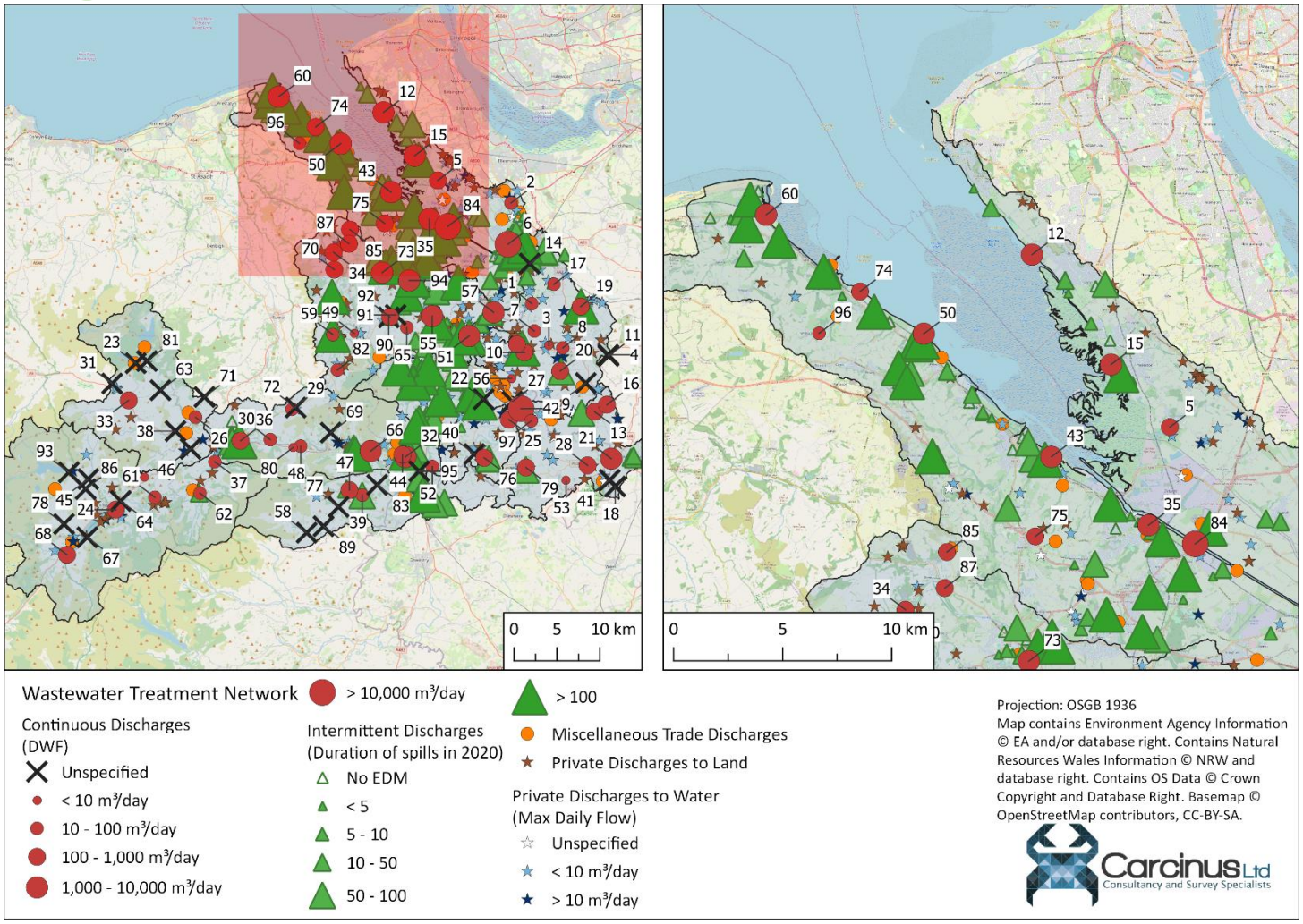


Figure 3.3 Locations of all consented discharges within the Dee catchment and those of most relevance to the shellfishery. Labels refer to continuous discharges, details which can be found in Table 3.1.

The original sanitary survey identified a total of nine water company treatment works that discharged continually to either the Dee estuary itself or to short watercourses that feed directly into the estuary, or to the canalised section of the tidal Dee (Table II.1, p 38; Figure II.1, p 39). It estimated that the most significant single discharge would be Chester Wastewater Treatment Works (WWTW), but that the majority of the sewage would be discharged to the estuary a significant distance upstream. It also noted that Llanasa, Mostyn, Greenfield and Heswall WWTW would have point source impacts due to their proximity to the shellfish beds. A few of the discharges in the catchment have seen increases to their consented discharge rate (Table 3.1), which will result in increased loading as the treatment methodologies have not been improved. Initial consultations with the Environment Agency did not indicate any further upgrades to the continuous discharges within the catchment, although a report by the Capital Delivery Alliance (2017) did confirm that under the Action Management Plan (AMP) 5 conditions, Chester WwTW was the most significant source of contamination. That report did note that upgrades were planned during AMP6, although the authors of this review are not aware of any upgrades to the continuous discharge at this asset. During secondary consultation, NRW stated that improvements were made to three assets of relevance to shellfisheries in the area: Heswall Storm Overflow, Heswall Settled Storm overflow and Riverbank Storage Tank CSO. These improvements comprised increases to storage capacity.

Table 3.1 Details of all continuous discharges within the Dee catchment.. Those discharges whose consented discharge volume has increased are highlighted in yellow.

ID	Discharge Name	NGR	Treatment	DWF (m^3/day)
1	ALDFORD SEWAGE TREATMENT WORKS	SJ4215659533	BIOLOGICAL FILTRATION	47
2	BACKFORD WASTEWATER TREATMENT WORKS	SJ3973871253	BIOLOGICAL FILTRATION	28
3	BARTON WWTW	SJ4413754679	BIOLOGICAL FILTRATION	7.8
4	BICKERTON STW	SJ5106053580	BIOLOGICAL FILTRATION	Unspecified
5	BURTON WASTEWATER TREATMENT WORKS	SJ3122073880	BIOLOGICAL FILTRATION	105
6	CHESTER WASTEWATER TREATMENT WORKS	SJ3939066450	BIOLOGICAL FILTRATION	31138
7	CHURTON WASTEWATER TREATMENT WORKS	SJ4246056350	BIOLOGICAL FILTRATION	64

ID	Discharge Name	NGR	Treatment	DWF (m^3/day)
8	CLUTTON WASTEWATER TREATMENT WORKS	SJ4576054390	BIOLOGICAL FILTRATION	20.3
9	EDGE STW (S'CEDED BY CM 952)	SJ4844050290	BIOLOGICAL FILTRATION	Unspecified
10	FARNDON SEWAGE TREATMENT WORKS	SJ4130953868	CHEMICAL - PHOSPHATE STRIPPING	210
11	GOLDFORD LA STP	SJ5109053450	UNSPECIFIED	Unspecified
12	HESWALL SEWAGE TREATMENT WORKS	SJ2490081791	UV DISINFECTION	2562
13	MALPAS WWTW	SJ4947046950	BIOLOGICAL FILTRATION	900
14	MEADOW HOUSE FARM MEADOW LANE	SJ4192064190	PACKAGE TREATMENT PLANT	Unspecified
15	NESTON WWTW	SJ2852476748	UV DISINFECTION	4074
16	NO MAN'S HEATH SEWAGE TREATMENT WKS	SJ5089747770	BIOLOGICAL FILTRATION	114
17	SAIGHTON SEWAGE TREATMENT WORKS	SJ4472661792	BIOLOGICAL FILTRATION	60
18	SPRINGHILL COTTAGES STW ALKINGTON	SJ5186038260	BIOLOGICAL FILTRATION	Unspecified
19	TATTENHALL WWTW	SJ4783159192	CHEMICAL - PHOSPHATE STRIPPING	477
20	TILSTON WWTW	SJ4546051680	BIOLOGICAL FILTRATION	130
21	WHITCHURCH (RISING SUN) WWTW	SJ5140641489	BIOLOGICAL FILTRATION	2592
22	ABENBURY WWTW	SJ 36554 48403	01: BIOLOGICAL FILTRATION	Unspecified
23	ALWEN SEPTIC TANK	SH 96080 52603	07: SEPTIC TANK AND FILTER	Unspecified
24	BALA WWTW	SH 93782 35551	01: BIOLOGICAL FILTRATION	689
25	BANGOR ON DEE STW	SJ 39500 46040	01: BIOLOGICAL FILTRATION	229
26	BETWS GWERFIL GOCH STW	SJ 03040 46310	01: BIOLOGICAL FILTRATION	20.5

ID	Discharge Name	NGR	Treatment	DWF (m^3/day)
27	BOWLING BANK STW FINAL EFFLUENT	SJ 39900 48140	01: BIOLOGICAL FILTRATION	Unspecified
28	BRONINGTON STW	SJ 48650 40710	01: BIOLOGICAL FILTRATION	125
29	BRYNEGLWYS STW	SJ 14250 47250	01: BIOLOGICAL FILTRATION	34
30	Carrog Wastewater Treatment Works	SJ 11740 43710	01: BIOLOGICAL FILTRATION	49
31	CEFN BRITH STW NR CERRIGYDRUDION	SH 93330 50240	01: BIOLOGICAL FILTRATION	Unspecified
32	CEFN MAWR WwTW	SJ 27450 41700	01: BIOLOGICAL FILTRATION	1594
33	CERRIGYDRUDION STW	SH 95258 48277	01: BIOLOGICAL FILTRATION	111
34	CILCAIN PANTYMWYN STW	SJ 19100 65500	01: BIOLOGICAL FILTRATION	241
35	CONNAHS QUAY STW	SJ 30240 69380	01: BIOLOGICAL FILTRATION	3898.3
36	CORWEN WWTW FINAL EFFLUENT	SJ 08276 43573	01: BIOLOGICAL FILTRATION	716.1
37	CYNWYD STW FINAL EFFLUENT	SJ 05280 41130	01: BIOLOGICAL FILTRATION	98.8
38	DINMAEL STW	SJ 00700 44700	01: BIOLOGICAL FILTRATION	Unspecified
39	DOLYWERN STW	SJ 22440 37250	01: BIOLOGICAL FILTRATION	57.9
40	ERBISTOCK STW	SJ 35470 42030	01: BIOLOGICAL FILTRATION	Unspecified
41	FENNS BANK STW	SJ 51230 39010	01: BIOLOGICAL FILTRATION	Unspecified
42	FIVE FORDS STW	SJ 40900 47320	01: BIOLOGICAL FILTRATION	27720
43	FLINT WWTW	SJ 25788 72517	22: UV DISINFECTION	3902.7
44	FRONCYSYLLTE STW	SJ 27110 41960	01: BIOLOGICAL FILTRATION	114
45	FRONGOCH STW	SH 90560 39120	01: BIOLOGICAL FILTRATION	Unspecified
46	GLAN YR AFON STW	SJ 02460 42640	01: BIOLOGICAL FILTRATION	Unspecified
47	GLYNCEIRIOG STW	SJ 20940 37830	01: BIOLOGICAL FILTRATION	124
48	Glyndyfrdwy Wastewater Treatment Works	SJ 15270 42950	01: BIOLOGICAL FILTRATION	25.5
49	GRAINNRHYD STW	SJ 21520 56070	11: SCREENING	10

ID	Discharge Name	NGR	Treatment	DWF (m³/day)
50	GREENFIELD WWTW (STW) GREENFIELD	SJ 19940 78160	01: BIOLOGICAL FILTRATION	3891
51	GRESFORD STW	SJ 34880 55780	01: BIOLOGICAL FILTRATION	3590
52	HALTON Wastewater Treatment Works	SJ 30582 40592	01: BIOLOGICAL FILTRATION	50
53	HANMER ARROWY STW	SJ 46130 38980	01: BIOLOGICAL FILTRATION	4.7
54	HOLT STW	SJ 40440 54810	01: BIOLOGICAL FILTRATION	210
55	HOPE WwTW	SJ 30563 58092	08: CHEMICAL - PHOSPHATE STRIPPING	2237
56	ISYCOED MARSHLEA STW	SJ 39820 50820	01: BIOLOGICAL FILTRATION	1.8
57	LAVISTER WwTW	SJ 37715 58519	08: CHEMICAL - PHOSPHATE STRIPPING	1619
58	LLANARMON DC STW	SJ 15970 32870	01: BIOLOGICAL FILTRATION	Unspecified
59	LLANARMON-YN-IAL STW	SJ 19022 55938	01: BIOLOGICAL FILTRATION	64.5
60	LLANASA WWTW COLLIERY ROAD TANLAN	SJ 12715 83618	22: UV DISINFECTION	8061
61	Llandderfel Wastewater Treatment Works	SH 98306 36993	01: BIOLOGICAL FILTRATION	22.7
62	LLANDRILLO STW	SJ 03550 37480	01: BIOLOGICAL FILTRATION	71.3
63	LLANFIHANGEL GLYN MYFYR STW	SH 98960 49460	01: BIOLOGICAL FILTRATION	Unspecified
64	LLANFOR STW FINAL EFFLUENT	SH 94340 36560	01: BIOLOGICAL FILTRATION	Unspecified
65	LLANFYNYDD STW	SJ 27620 56750	01: BIOLOGICAL FILTRATION	19
66	LLANGOLLEN WWTW	SJ 23413 42384	01: BIOLOGICAL FILTRATION	1834
67	LLANGOWER STW	SH 90440 32340	01: BIOLOGICAL FILTRATION	Unspecified
68	LLANUWCHLLYN STW LLANUWCHLLYN	SH 88098 30300	01: BIOLOGICAL FILTRATION	363.2
69	LLIDIART ANNIE STW	SJ 18774 44519	01: BIOLOGICAL FILTRATION	Unspecified
70	MAES Y GROES STW	SJ 19190 63490	01: BIOLOGICAL FILTRATION	523

ID	Discharge Name	NGR	Treatment	DWF (m^3/day)
71	MELIN-Y-WIG STW FINAL EFFLUENT	SJ 04072 48671	ZZ: Unspecified	Unspecified
72	MIN-Y-RHOS STW	SJ 14690 47440	01: BIOLOGICAL FILTRATION	Unspecified
73	MOLD WwTW	SJ 24750 63140	01: BIOLOGICAL FILTRATION	4125
74	MOSTYN WWTW	SJ 17017 80096	01: BIOLOGICAL FILTRATION	966
75	NORTHOP WASTEWATER TREATMENT WORKS	SJ 25052 68867	01: BIOLOGICAL FILTRATION	293.2
76	OVERTON WWTW	SJ 36620 41597	01: BIOLOGICAL FILTRATION	257.2
77	PANDY STW	SJ 19680 35880	01: BIOLOGICAL FILTRATION	Unspecified
78	PARC STW	SH 87740 33880	01: BIOLOGICAL FILTRATION	Unspecified
79	PENLEY STW	SJ 41480 40460	01: BIOLOGICAL FILTRATION	182
80	PENRALLT STW	SJ 14400 42796	06: SEPTIC TANK	7
81	PENTRE LLYN CYMER STW	SH 97380 52850	01: BIOLOGICAL FILTRATION	Unspecified
82	Pen-y-stryt Wastewater Treatment Works	SJ 19535 51809	01: BIOLOGICAL FILTRATION	36
83	PONTFADOG STW	SJ 24170 38440	01: BIOLOGICAL FILTRATION	Unspecified
84	QUEENSFERRY WWTW	SJ 32379 68522	22: UV DISINFECTION	11067.9
85	RHOSESMOR STW	SJ 21000 68150	01: BIOLOGICAL FILTRATION	174
86	RHYDUCHAF STW	SH 90250 37950	01: BIOLOGICAL FILTRATION	Unspecified
87	RHYDYMWYN STW	SJ 20900 66500	01: BIOLOGICAL FILTRATION	192
88	SARNAU SEWAGE TREATMENT WORKS	SH 97110 39340	01: BIOLOGICAL FILTRATION	3.95
89	TREGEIRIOG STW	SJ 17930 33630	01: BIOLOGICAL FILTRATION	Unspecified
90	TREUDDYN (BRIDGE TERRACE) STW	SJ 25520 57930	01: BIOLOGICAL FILTRATION	Unspecified
91	TREUDDYN LODGE VILLAS STW	SJ 26330 58220	01: BIOLOGICAL FILTRATION	Unspecified
92	Treuddyn Wastewater Treatment Works	SJ 25669 57978	01: BIOLOGICAL FILTRATION	275

ID	Discharge Name	NGR	Treatment	DWF (m³/day)
93	TRYWERYN DAM STW	SH 88300 39900	01: BIOLOGICAL FILTRATION	Unspecified
94	TY GWYN WWTW BUCKLEY	SJ 27890 62220	01: BIOLOGICAL FILTRATION	4061
95	WHITEHURST STW	SJ 29050 40030	01: BIOLOGICAL FILTRATION	Unspecified
96	WHITFORD STW	SJ 15140 78180	01: BIOLOGICAL FILTRATION	38
97	WORTHENBURY STW	SJ 42100 45900	01: BIOLOGICAL FILTRATION	10.8

In addition to the continuous discharges, the original sanitary survey identified a total of 1232 intermittent to the Dee estuary. Intermittent discharges comprise Combined Storm Overflows (CSOs), Storm Tank Overflows (STOs) and Pumping Station Emergency Overflows (PSs). During AMP6 and AMP7, Event Duration Monitoring (EDM) was installed at several of the discharges within the catchment, and summary data for 2020 was published by the Environment Agency in March 2021 for those discharges in England (Environment Agency, 2021). Data for those discharges in Wales was accessed from the Rivers Trust, who obtained the data from Welsh Water (Rivers Trust, 2022). Details of these data for those discharges in the vicinity of the BMPA are presented in Appendix I (note – only those discharges in the vicinity of the BMPA have been presented because there are almost 300 intermittent discharges in the catchment). The single datapoint for each discharge was joined to the main discharge database using the permit number. Beyond the data manipulation described above, the data have been taken at face value, and some locations in the consented discharge database may be erroneous, meaning that the point appears in the wrong location. Some EDM returns had multiple meters on a single discharge activity, in this case we have presented all reported spill counts as individual values, unless the comment indicated that the meters were not working properly in which case the values were nulled. The EDM returns 'Activity Reference' field did not reliably distinguish between emergency overflows and storm overflows, therefore we have included all of these in the intermittent discharge category.

The original sanitary survey presented the results of modelled spill predictions from the intermittent discharges identified as part of that report, and identified that the main spillers were Chester STW – River Weir, Saltney Chester Road SPS, Bretton SPS, Heswall WwTW settled storm sewage and Heswall WwTW storm sewage with a modelled spill volume exceeding 100,000 m³ per year each. The authors of that report did note that significant improvements to the works at Heswall were due to be completed, and the Environment Agency stated during initial consultation that additional storage was added to these works in March 2014, which should have reduced the frequency of discharges (although no EDM is available). The EA also stated that additional storage was added to Riverbank CSO in March 2013, but that the improvements to assets recommended in the Capital Delivery Alliance (2017) report were not implemented due to them failing a cost benefit analysis. A measure

is however included in the current programme of investment by Dwr Cymru to increase the storage capacity at Chester STW, which should further reduce the frequency of spills.

EDM data is available for many more of the Dwr Cymru owned intermittent discharges, and the outfalls of primary significance for the bacteriological health of the shellfishery are those around Mostyn on the Welsh side of the estuary, given their proximity to the *Salisbury* Classification Zone. The four intermittent discharges in this area spilled 60 times for more than 450 hours in 2020. On the English side of the estuary, there are two further intermittent discharges fitted with EDM of relevance to the shellfishery. These are Croft Drive CSO and Long Hey Road CSO spilled 60 times for a total of 43 hours in 2020. The Heswall WwTW discharge within the *Thurstaston East* zone is not fitted with EDM, although as discussed previously this had been found to be a significant influence on the bacteriological health the shellfish beds in this area.

In addition to the Water Company owned discharges, there are also a large number of private discharges throughout the catchment. However, there are few in the near vicinity of the BMPA and so the impact of these discharges is likely to be much less than the water company owned continuous and intermittent discharges.

No upgrades to the treatment methodologies at the continuous discharges in the immediate vicinity of the Dee estuary have occurred since the original sanitary survey, and the databases queried to produce this report suggest that the consented discharge volume from a few of the main discharges has increased, which would see a corresponding increase in faecal loading. There have been some upgrades to the storage capacity at intermittent discharges near the BMPA, which should have reduced the frequency of spills, although no comparison of EDM data was possible. Overall, the main hotspots of contamination remain similar, and so the recommendations made in the original sanitary survey continue to be valid.

3.3 Agricultural Sources

Livestock census data have been obtained for 2013 and 2016 (Defra, 2018) for Local Authority Districts that fall within or partially within the Dee catchment. No more recent data are available, but these data have been used to give an indication of livestock population trends since the original sanitary survey was published. As only a small proportion of some of the districts falls within the catchment, the livestock data have been adjusted to reflect the percentage of each district that falls within the catchment. This assumes that the livestock are distributed uniformly throughout each district, and therefore some inaccuracies may be present. The percentage change in total livestock population for each district is shown in Figure 3.4. Changes in livestock population for each district, broken down by livestock group, are shown in Table 3.2.

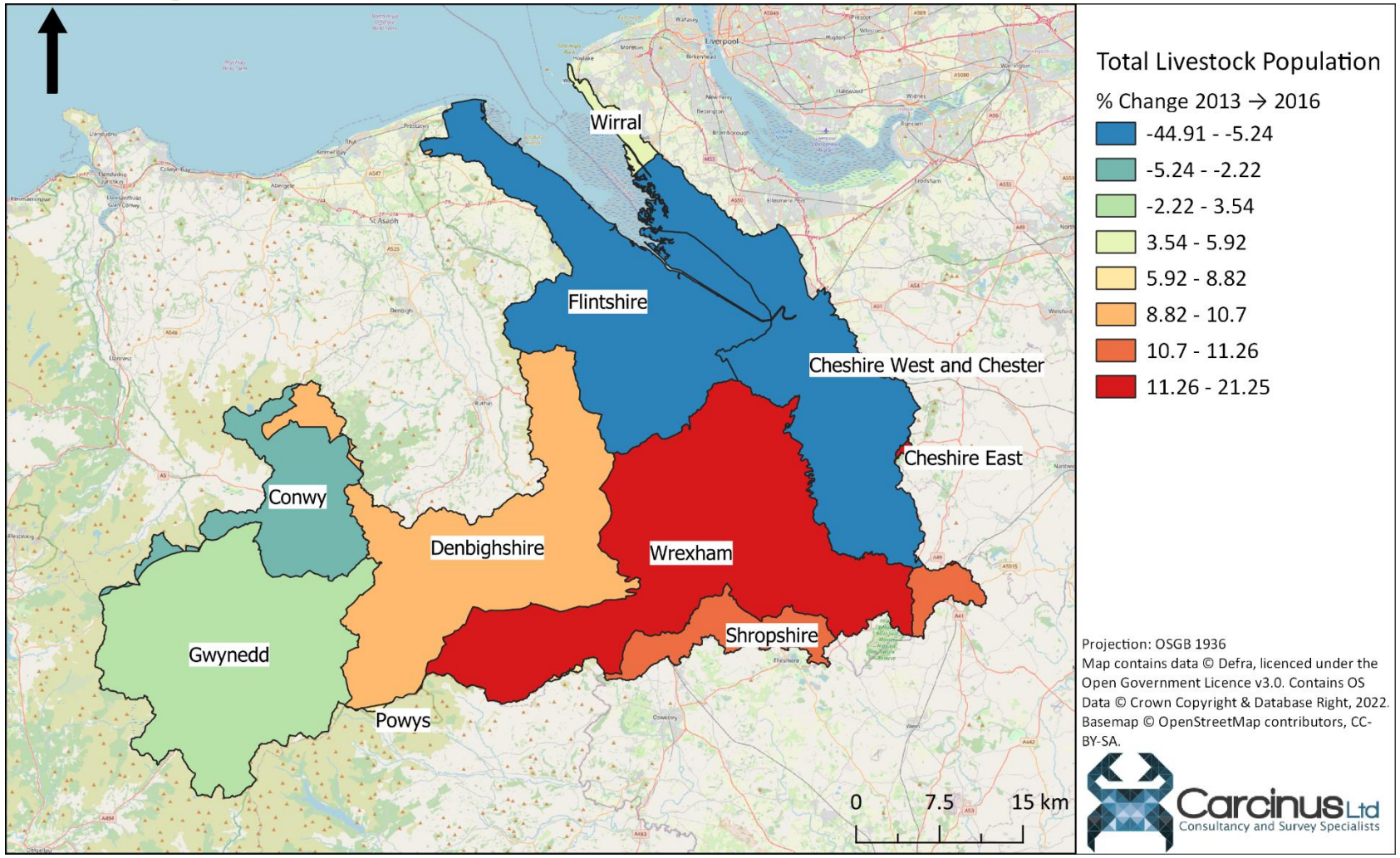


Figure 3.4 Livestock population change between 2013 and 2016 for Local Authority Districts wholly or partially contained within the Dee catchment.

Table 3.2 Livestock population Data for Local Authority Districts wholly or partially contained within the Dee catchment.

					CATTLE			SHEEP			PIGS			POULTRY		
LAD	**Area (Ha)**	**A w/in Ha**	**% w/in**	**% of catchment**	**2013**	**2016**	**% Change**	**2013**	**2016**	**% Change**	**2013**	**2016**	**% Change**	**2013**	**2016**	**% Change**
Cheshire East	116,726.00	127.50	*0.11%*	*0.06%*	*145*	*140*	*-3.61%*	*152*	*156*	*2.20%*	*13*	*9*	*-29.88%*	*1,613*	*2,027*	*25.68%*
Cheshire West & Chester	91,733.00	30,144.32	*32.86%*	*14.18%*	*32,673*	*32,527*	*-0.45%*	*14,129*	*13,948*	*-1.29%*	*6,809*	*7,147*	*4.96%*	*179,552*	*166,942*	*-7.02%*
Conwy	113,081.00	13,914.12	*12.30%*	*6.55%*	*5,591*	*6,220*	*11.26%*	*95,501*	*97,216*	*1.80%*	*50*	*39*	*-21.43%*	*12,389*	*5,421*	*-56.25%*
Denbighshire	83,904.00	37,214.63	*44.35%*	*17.51%*	*22,028*	*22,318*	*1.32%*	*207,838*	*219,457*	*5.59%*	*228*	*109*	*-52.05%*	*65,852*	*81,645*	*23.98%*
Flintshire	43,778.00	35,091.71	*80.16%*	*16.51%*	*27,341*	*27,572*	*0.84%*	*83,288*	*86,658*	*4.05%*	*1,268*	*1,152*	*-9.17%*	*454,443*	*196,636*	*-56.73%*
Gwynedd	254,913.00	37,283.65	*14.63%*	*17.54%*	*11,438*	*12,205*	*6.70%*	*172,247*	*178,162*	*3.43%*	*260*	*300*	*15.48%*	*3,244*	*2,793*	*-13.90%*
Powys	519,837.00	192.33	*0.04%*	*0.09%*	*72*	*72*	*-0.67%*	*1,368*	*1,428*	*4.38%*	*2*	*1*	*-43.85%*	*1,093*	*1,237*	*13.16%*
Shropshire	319,965.00	8,595.35	*2.69%*	*4.04%*	*6,469*	*6,318*	*-2.35%*	*19,814*	*19,943*	*0.65%*	*1,497*	*1,132*	*-24.38%*	*147,945*	*167,932*	*13.51%*
Wirral	15,717.00	1,533.99	*9.76%*	*0.72%*	*426*	*383*	*-10.01%*	*97*	*172*	*76.94%*	*3*	*22*	*571.54%*	*1,339*	*1,361*	*1.60%*
Wrexham	50,403.00	48,458.99	*96.14%*	*22.80%*	*40,406*	*40,832*	*1.05%*	*118,663*	*120,112*	*1.22%*	*390*	*469*	*20.20%*	*425,887*	*489,929*	*15.04%*
Total	*1,610,057.00*	*212,556.59*	*13.20%*	*100.00%*	*146,589*	*148,587*	*1.36%*	*713,097*	*737,252*	*3.39%*	*10,520*	*10,380*	*-1.33%*	*1,293,357*	*1,115,922*	*-13.72%*

Overall, the total livestock population in Local Authority Districts wholly or partially contained within the Dee catchment fell by 7% between 2013 and 2016, although it is still estimated to contain over 2 million animals. The two main livestock groups remain poultry and sheep, with 1.1 and 0.74 million animals respectively. The district with the largest adjusted population remains Wrexham, in the upper reaches of the catchment. Across all groups of animals and districts, the population size will vary throughout the year, with the highest numbers during spring and lowest numbers in Autumn and Winter when animals are sent to market.

The principal route of contamination of coastal waters by livestock is surface run-off carrying faecal matter. Figure 3.5 presents land cover change within the Dee catchment and how it has changed between 2012 and 2018. It suggests that a significant proportion of the catchment is reserved for pasture, particularly in the upper reaches. It does show that there are some areas of pasture immediately adjacent to the estuary, particularly on the Welsh side, as well as some areas of saltmarsh where animals may graze at low water. Run-off into coastal waters is probable, particularly following rainfall that comes after an extended dry period (the 'first flush'). However, the size of these areas of pasture have remained very similar (decreasing by 0.3%) and so the risk posed to the bacteriological health of the shellfishery remains similar, and the recommendations made in the original sanitary survey to account for this source of pollution remain valid.

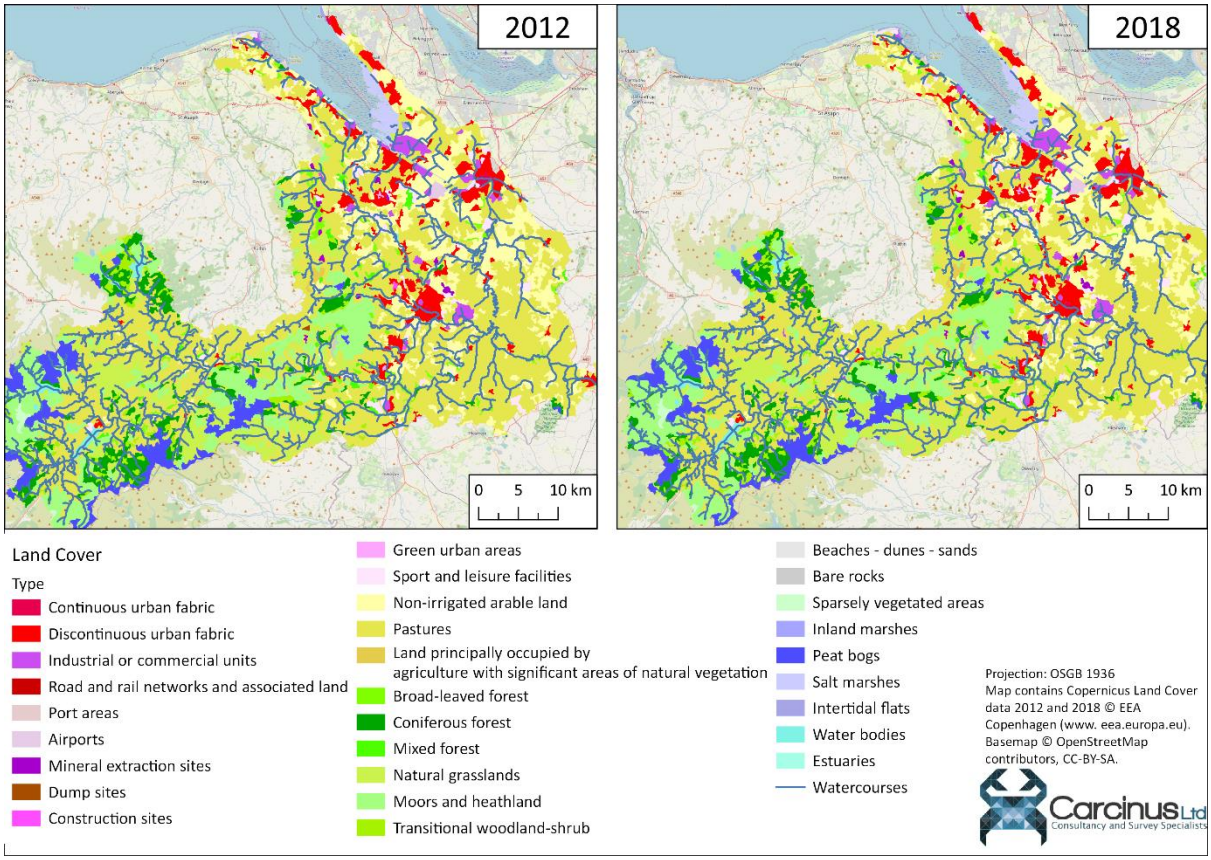


Figure 3.5 Land cover change in the Dee catchment between 2012 and 2018.

3.4 Wildlife

The land cover maps indicate that the Dee Estuary contains significant areas of saltmarsh and intertidal mudflats. These habitats support a variety of wildlife, and as a consequence the area is conferred protection through designations as a Ramsar Site, Special Protection Area, Site of Special Scientific Interest and other non-statutory designations.

These designations are due, in part to the significant populations of overwintering waterbirds and gulls. The Wetland Bird Survey conduct annual surveys of these species at rivers and estuaries around the UK, and the Dee estuary is in the top 5 sites in terms of the total count of overwintering species. In the five winters to 2012/2013, an average total count of 136,468 waterbirds (including gulls) were counted (Austin *et al.*, 2014). In the five winters to 2019/2020 (the most recent for which data are available, this had increased to 182,309 (an increase of more than 33%). This count includes internationally significant populations of Ringed Plover, Dunlin, Redshank, Cormorant and other species, as well as nationally significant populations of many more.

Contamination from birds will therefore represent a continual diffuse source as well as periodic acute one. These 'hotspot' areas of contamination source will vary from year to year as the avian species forage for food on the shifting shellfish beds, and as such it is impossible to define RMP positions that will reliably account for the pollution that bird species cause, although the effects are likely greatest in winter months when the migratory species are present.

Similar to that reported in the original sanitary survey, there is a small but active population of grey seals that haul out off the Wirral. The national population of seals has been increasing in recent years, and seals are likely to forage in the area from time to time. However, they do not represent a significant source of contamination and require no material consideration within any updated sampling plan.

No other wildlife species of significance are noted, and it remains impossible to account for the contamination that faeces from these species may cause due to the unpredictable nature of the contamination.

3.5 Boats and Marinas

The discharge of sewage from boats around the 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 3.6.

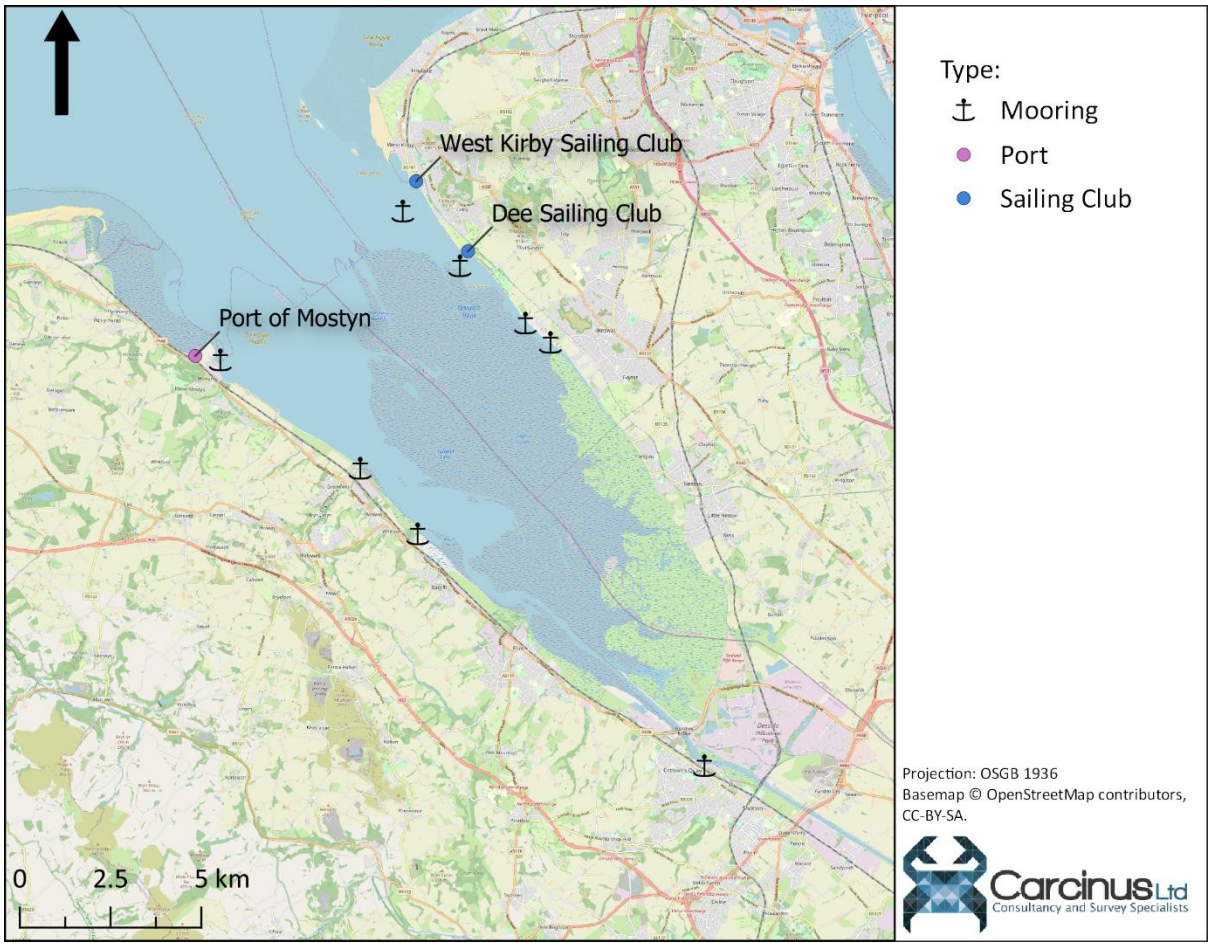


Figure 3.6 Locations of moorings, marinas and other boating activities in the Dee estuary.

The main commercial port identified in the original sanitary survey, the Port of Mostyn, is still in use, although as the regulations governing overboard discharges from commercial vessels[2] have not changed since the time of the original sanitary survey, contamination from this source is not considered to be of any material consideration to the Sampling Plan.

There remain two sailing clubs on the English side of the estuary, neither of which contain pump-out facilities (the closest are at Conwy Marina). As such vessels of a sufficient size to contain onboard toilets are liable to make occasional overboard discharges. This is most likely to occur when transiting through the main navigational channels or when moored overnight outside of marinas, as it is generally considered antisocial to discharge waste in a marina setting. Peak pleasure craft activity (and therefore the greatest risk of pollution from this source) will occur during the summer months.

There is no evidence that the level of recreational boat use in the area has increased, although occasional overboard discharges from sufficiently large pleasure craft remains possible. It is however impossible to reliably account for this source of pollution without specific information as to the locations, timings and volumes of such discharges. The same

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

was true in the original sanitary survey, and so no change to the sampling plan needs to be made on the basis of this form of pollution.

3.6 Other Sources of Contamination

Land cover maps (Figure 3.5) suggest that the English side of the Estuary has significantly more urban fabric than the Welsh side, and as such the risk of additional microbiological contamination through utility misconnections is likely greater on this side. The LEA indicated during initial consultation that work has been carried out on surface water in Chester, at the head of the estuary in the past 12 – 18 months, which should have reduced the contamination draining down the estuary. The greatest risk of pollution from this source will continue to be from the towns of Heswall and West Kirby, although the extent of these conurbations has not increased and therefore the risk of contamination remains similar.

The original sanitary survey mentions that dog walking is popular along the coastal paths that run near to the estuary, and it is likely that this activity will still take place. Dog fouling could therefore represent a minor source of diffuse microbiological contamination, although it requires no additional consideration in any updated sampling plan.

4 Hydrodynamics/Water Circulation

The original sanitary survey notes that the data for the bathymetric chart presented in that report (Figure IV.1, p60) was collected in the 1980s and 1990s and that the bathymetric profile of the estuary was unlikely to have changed significantly in the intervening period. The same is true of this review. The estuary consists of wide expanses of intertidal flats with two main water channels either side of a central bank. The channels then converge and the main channel runs near to the Welsh shore of the estuary.

Tidal circulation will continue to be the dominant force of water circulation, and whilst water exchange across the entire estuary will be quite high, due to the wide expanses of intertidal flat, dilution potential away from the drainage channels will be quite low. Generally, water will move up estuary on a flooding tide and down-estuary on the corresponding ebb. The tidal cycle at the head of the estuary continues to be asymmetric, with a prolonged ebb tide, although it becomes increasingly symmetrical as you move down the estuary.

There are unlikely to have been any significant changes to the hydrodynamics and water circulation of the Dee estuary since the original sanitary survey was published, and as such no additional consideration is required in any updated sampling plan.

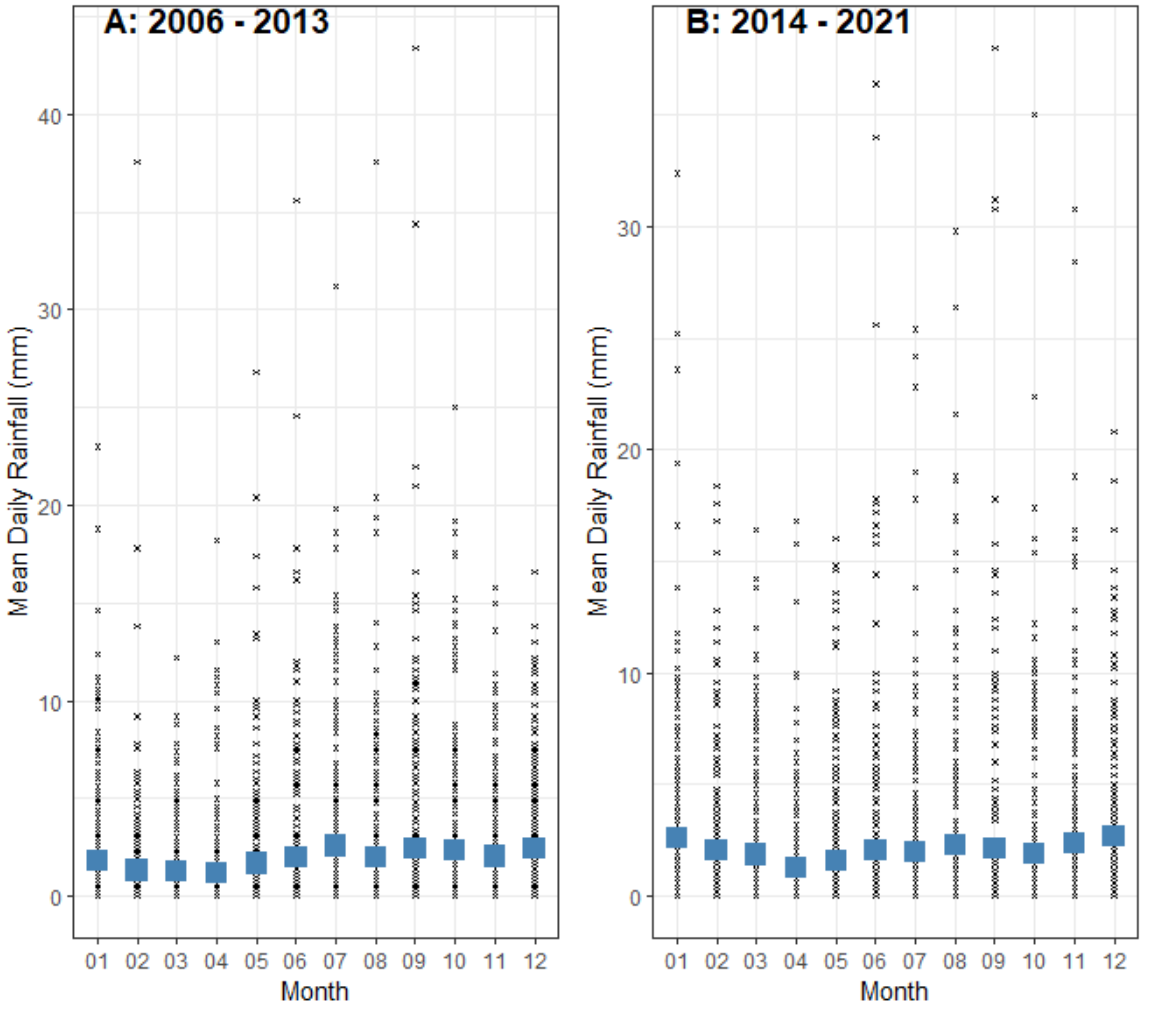
5 Rainfall

Rainfall data for the Moreton TEL rainfall monitoring station (NGR: SJ260908) were requested from the Environment Agency for the period 2010 – present. These data were then subdivided into 2006 – 2013 (pre sanitary survey) and 2014 – 2021 (post sanitary survey) and processed in R (R Core Team, 2021). These data were used to determine whether any changes in rainfall patterns had occurred since the original sanitary survey was

undertaken. Figure 5.1 shows the average daily rainfall totals per month at the Moreton TEL monitoring station. The monitoring results are summarised in Table 5.1.

Table 5.1 Summary statistics for rainfall for the period preceding and following the original sanitary survey, taken from the Moreton TEL monitoring station.

Period	Mean Annual Rainfall (mm)	Percentage Dry Days	Percentage Days Exceeding 10 mm	Percentage Days Exceeding 20 mm
2006 - 2013	700.82	46.4	27.5	17.1
2014 - 2021	743.93	47.31	28.81	17.98



Archive Daily Rainfall from the Moreton TEL monitoring station (NGR: SJ260908)
Data provided by the Environment Agency, licenced under the Open Government Licence v3.0

Figure 5.1 Mean daily rainfall per month for the Moreton TEL monitoring station (NGR: SJ260908) for the periods (A) 2006 – 2013 and (B) 2014 – 2021.

Annual rainfall was found to have increased in the period following the 2013 review compared to that of the period preceding it, as have the percentage of days with heavy rainfall (days with more than 10 mm of rain). However, two-sample t-tests indicated that there was no significant difference in the mean daily rainfall per month between the 2010 – 2013 and 2014 – 2021 periods (p=0.232).

Rainfall leads to increased faecal loading through two factors: elevated levels of surface runoff and spill events from intermittent discharges. 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

There is a total of four RMPS that have been sampled within the Dee estuary since the original sanitary survey, all of which involve the sampling of cockles. None of these were sampled prior to the publication of the 2013 report, and all are currently active. Three of the RMPs, Salisbury (B45AB), Mostyn/Talacre (B45AC) and Thurstaston (B45AD) are all in slightly different locations to that recommended in the original sanitary survey. The LEA confirmed that this is due to the guidance given in the original report that RMP positions could be revised on the basis of stock availability, as long as the principles identified in that report were adhered to. Figure 6.1 shows the geometric mean results of Official Control Monitoring at these RMPs, and summary statistics are presented in Table 6.1. All data have been taken directly from the Cefas datahub[1] and have been taken at face value. The data hub only presents the results of RMPs where a sample has been collected in the last give years, so it is possible that monitoring data for other positions exists, but is not considered within this report.

Relative to other BMPAs around the country, monitoring results from RMPs in the Dee are good, with all four having a geometric mean result of less than 800 MPN/100 g, and one (Salisbury, B45AB) having a mean result approximately equal to the lowest classification threshold, 230 MPN/100 g. None of the RMPs have ever returned a result above the maximum threshold of 46,000 MPN/100 g and only a very small percentage of results above the middle threshold of 4,600 MPN/100 g.

Table 6.1 Summary statistics of E. coli (MPN/100 g) from RMPs sampled in the Dee BMPA. Data cut off at November 2021.

RMP (Species)	NGR	Species	No.	First Sample	Last Sample	Geometric Mean	Min Value	Max Value	% > 230	% > 4,600	% > 46,000
Salisbury (C. ed) - B45AB	SJ17568056	Cockle	89	29/01/2014	10/11/2021	230.0674	18	1700	24.72	0.00	0.00
Mostyn/Talacre (C. ed) - B45AC	SJ13828306	Cockle	57	16/12/2013	24/11/2021	579.614	18	7900	52.63	1.75	0.00
Thurstaston (C. ed) - B45AD	SJ22278248	Cockle	87	08/01/2014	09/11/2021	478.4713	18	4900	39.08	1.15	0.00
West Kirby (C. ed) - B45AE	SJ21068470	Cockle	88	10/12/2013	09/11/2021	763.3295	18	35000	36.36	2.27	0.00

There is a slight geographical trend, with the two RMPs on the English side of the estuary having slightly higher results than those on the Welsh side. There is also an unexpected pattern of those RMPs farther out the estuary having marginally higher average results than those farther in, although it should be noted that the results are broadly similar (within 500 MPN/100 g) and this does not necessarily mean that there is a clear faecal concentration gradient within the estuary, as *E. coli* concentrations are inherently very variable.

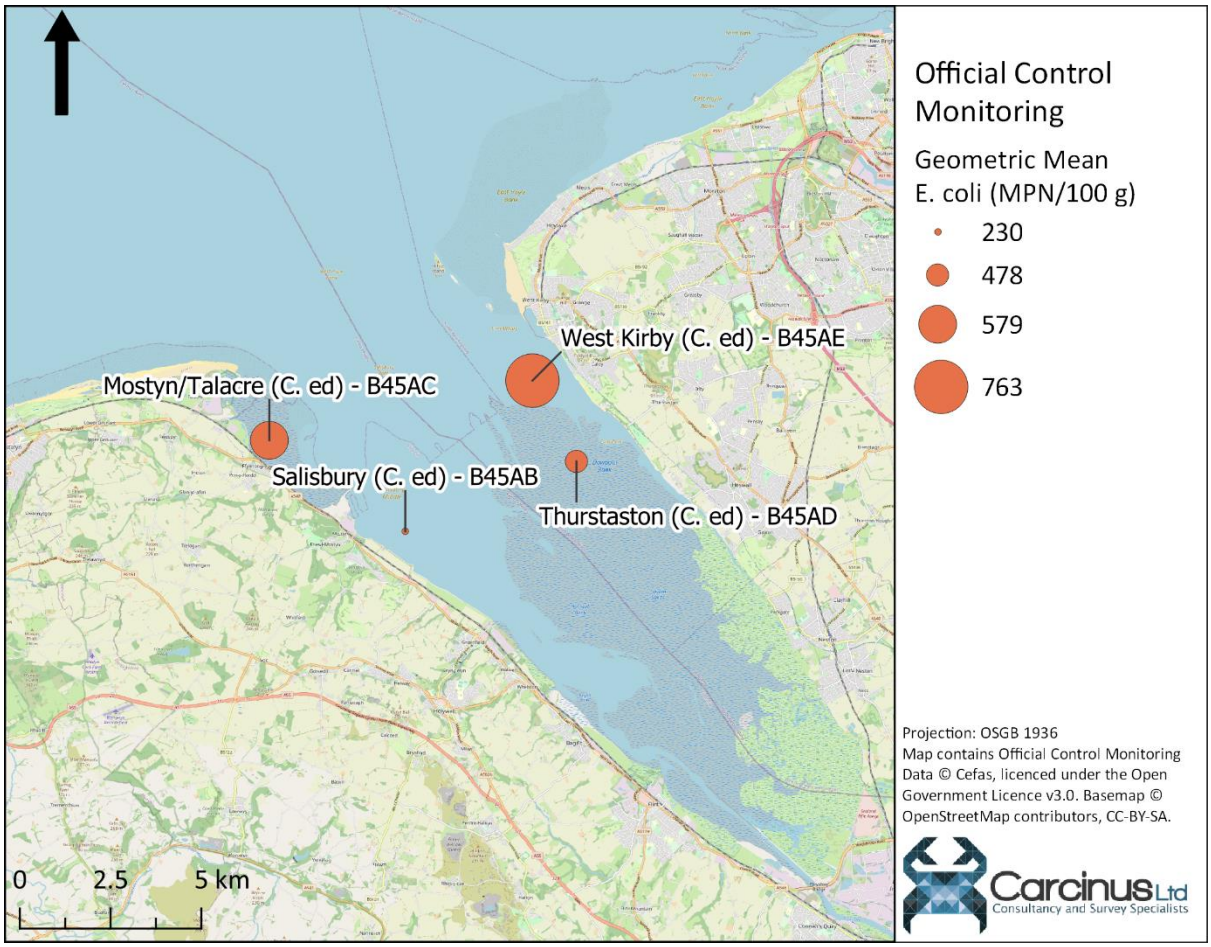


Figure 6.1 Geometric mean E. coli monitoring results from Official Control Monitoring at bivalve RMPs within the Dee BMPA.

Figure 6.2 presents boxplots of *E. coli* monitoring results from the four cockle RMPs sampled within the Dee BMPA. One-way analyses of variance (ANOVA) tests were used to investigate the statistical significance of any differences between the monitoring results from RMPs. All statistical analysis described in this section was undertaken in R (R Core Team, 2022). Significance has been taken at the 0.05 level.

Despite some visual differences in the four boxplots and some small differences in the mean monitoring result, ANOVA testing indicated no significant differences between the monitoring results from the various RMPs ($p > 0.05$).

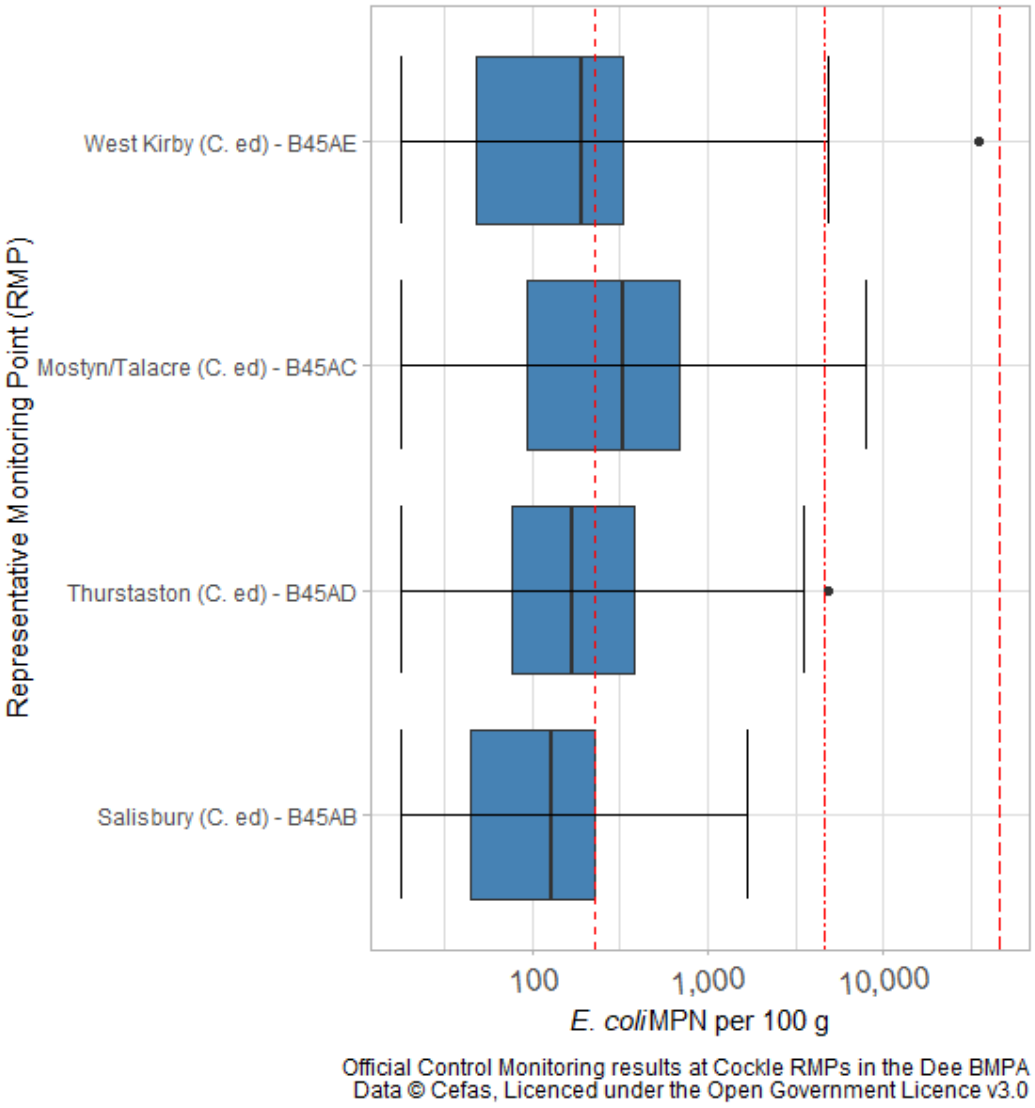


Figure 6.2 Boxplots of E. coli levels at cockle RMPs sampled within the Dee BMPA. Central line indicates the median value, box indicates the lower-upper quartile range and whisker indicates minimum/maximum values excluding outliers (points >1.5 x the interquartile range). Red lines are at classification 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 from the RMPs sampled within the Dee BMPA are shown in Figure 6.3. The figure suggests that monitoring results have been relatively consistent since late 2013 / early 2014 when sampling began, with the loess models for all four RMPs falling around the 230 MPN/100 g threshold. The Mostyn/Talacre (B45AC) RMP was sampled initially between December 2013 and August 2018, during which time water quality was seemingly worst in the vicinity of this point. However, since sampling restarted in September 2021, water quality has been much improved, and the loess trend line for this point is now the lowest of all RMPs. Water quality also appears to be improving gradually at the Salisbury (B45AB) RMP.

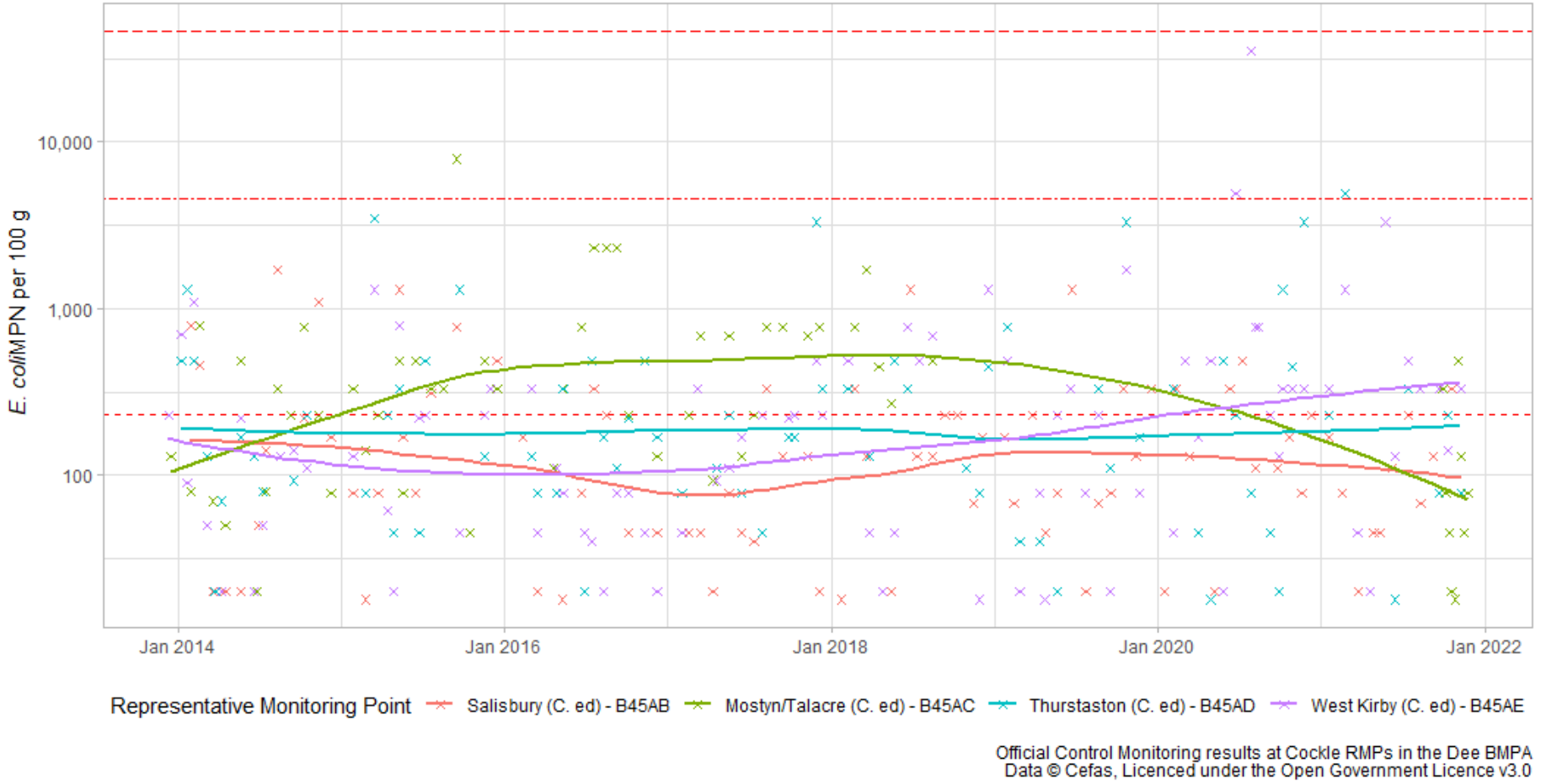


Figure 6.3 Timeseries of E. coli results at cockle RMPs sampled in the Dee BMPA. Scatter plots are overlaid with a loess model fitted to the data. Horizontal lines are classification thresholds at 230, 4,600 and 46,000 MPN/100 g.

6.3 Seasonal patterns of results

The seasonal pattern in *E. coli* levels at the various RMPs sampled within the Dee BMPA were investigated and are presented in Figure 6.4. The data for each year were averaged into the four seasons, with Winter comprising data from January – March, Spring from April – June, Summer from July – September and Autumn from October – December. Two-way ANOVA testing was used to look for significant differences in the data, using both season and RMP as independent factors (i.e., pooling the database across RMP and season respectively), as well as the interaction between them (i.e., exploring seasonal differences within a given RMP). Significance was taken at the 0.05 level.

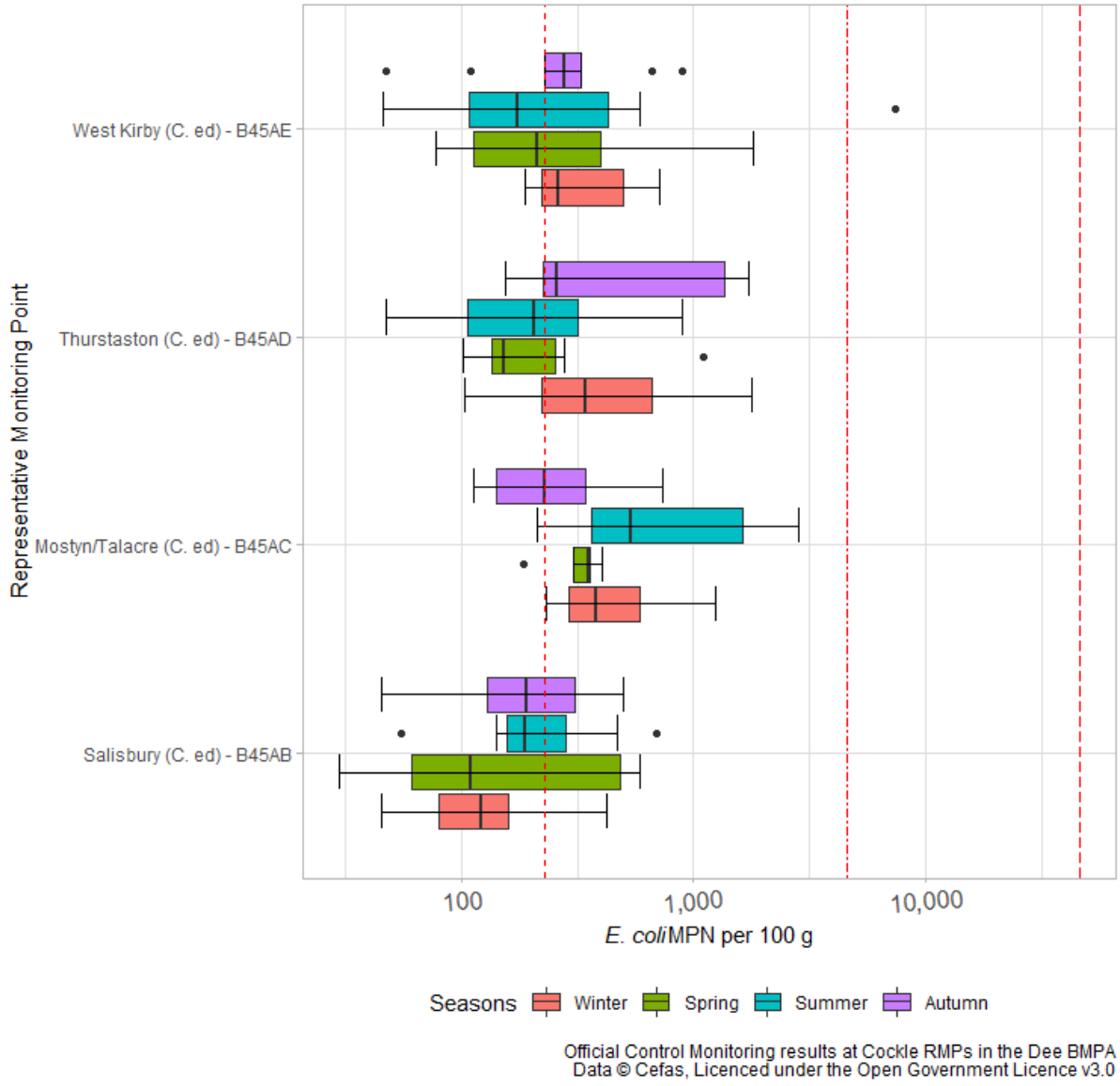


Figure 6.4 Boxplots of E. coli levels per season at cockle RMPs sampled within the Dee BMPA. Red lines are classification thresholds at 230, 4,600 and 46,000 MPN/100 g.

Two-way ANOVA tests revealed that there were no significant differences in the monitoring data from the cockle RMPs, either when the data was pooled or when the data for a single RMP was considered ($p > 0.05$).

7 Conclusion and overall assessment

The Dee BMPA is located in the outer reaches of the Dee estuary, which itself forms the boundary between northwest England and northeast Wales. Harvesting of cockles in the estuary is managed by Natural Resources Wales under Dee Estuary Cockle Fishery Order (2008), but technically those beds on the English side of the estuary are under the jurisdiction of the Environment Agency. NRW impose various restrictions on the cockle harvest, including timing restrictions, Total Allowable Catches and minimum landing sizes under their management plan. The mussel harvest on the English side is under the jurisdiction of the North West Inshore Fisheries and Conservation Authority, and the Welsh side is managed by the Welsh Government.

The BMPA was last subject to a Sanitary Survey in 2013, although a RMP assessment was undertaken in 2019 (Carcinus, 2019) to extend the *Salisbury* Cockle Classification Zone. In addition to this zone, there are four further CZs for cockles and four for mussels (including *Thurstaston East* which is Prohibited for all species). During initial consultations, the LEA stated that there has been industry interest in reclassifying the *Mostyn/Talacre* zone. FSA Wales and Cefas have assessed the findings of initial sampling and determined it would be preferable to add this area to the *Salisbury* zone rather than reclassifying *Mostyn/Talacre*. All zones are currently based on samples from Cockle RMPs.

The results of the March 2021 census have not yet been published, and so the results of the 2011 and 2001 censuses were compared to give an indication of changes in human population within the catchment. Overall, the population was found to increase by 2.70% in that period, although the distribution of the main population centres has not changed significantly. Most of the catchment remains rural, with the highest population density around the towns of Chester and Wrexham, and to a lesser extent Connah's Quay. The area is a popular tourist destination, and statistics from 2016 suggest that the level of tourism is increasing. The peak population increase will almost certainly occur in summer months, although it is assumed that the existing sewerage capacity is sufficient to accommodate this increase.

Data from the most recent updates to the NRW and EA consented discharge databases suggest that the consented discharge volume at several of the sewage treatment works in the immediate vicinity of the BMPA has increased, which will most likely have resulted in an increase in the faecal loading, as the treatment methodologies have not been increased. No comparison of intermittent spill data was possible, but consultation with the EA suggested that improvements to storage capacity at various discharges had occurred, which should have reduced the frequency of spills. Overall, the main hotspots of contamination from this source have not changed significantly.

Land cover maps suggest that a large proportion of the catchment is reserved for pasture, although comparisons of livestock census data from 2013 and 2016 do suggest a fall in total population. The principal route of contamination of shellfisheries by livestock is surface runoff carrying faecal matter, and the land cover maps do suggest that there is pasture and saltmarsh (which may well be used to graze animals) adjacent to the shellfishery. The size of these grazing areas have not changed significantly since the original sanitary survey.

The Dee estuary is conferred protection under a variety of statutory and non-statutory designations, in part due to significant populations of overwintering waterbirds. The average count of waterbirds in the five winters to 2019/2020 increased by more than 33% compared to the five years to 2012/2013. The waterbird population of the Dee estuary contains many internationally and nationally significant populations. These animals are likely to represent a potentially significant source of contamination, particularly during winter months when the migratory species are present. However, it is impossible to reliably account for this source of pollution in any updated sampling plan due to the spatial and temporal variability in their distributions. There also remains a small but significant population of seals that haul out off the north Wirral coast. These animals show wide foraging ranges and so whilst they may contribute some diffuse contamination, they do not require additional consideration within any updated sampling plan.

The main commercial port in the area, the Port of Mostyn, is still active. Contamination from commercial vessels is however considered to be unlikely given that commercial vessels are prohibited from making overboard discharges within 3 nautical miles of land. There are two sailing clubs on the English side of the estuary, although neither contain pump out facilities (no change from the original sanitary survey). This makes it more likely that pleasure craft of a sufficient size may make overboard discharges from time to time, particularly when transiting through the main navigational channels. However, these channels are all located some distance from the shellfish beds and so bear limited consequence for the bacteriological health of the shellfishery.

A total of four RMPs have been sampled in the BMPA since the original sanitary survey, none of which were sampled prior and all are currently in use. No significant differences were found between any of the RMPs, and water quality has generally been stable, although it does appear to have improved in the vicinity of the Mostyn/Talacre (B45AC) RMP in recent months. There was also no observable seasonal pattern in the monitoring results.

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

Having reviewed and compared the desk based study with the findings of the initial sanitary survey in 2013, the FSA are also content that an updated shoreline assessment is not required.

8 Recommendations

The following paragraphs give a recommendation for an updated sampling plan, which is summarised in Table 8.1. As is discussed previously in this report, the *Salisbury* zone has been expanded to include the Mostyn cockle bed, and so sampling from the Mostyn/Talacre (B45AC) RMP can cease.

8.1 Mussels

At present, all mussel Classification Zones within the Dee BMPA are classified based on samples from cockle RMPs within their boundaries. A 2014 Cefas report, commissioned by the FSA into the use of indicator species in UK BMPAs (Cefas, 2014) found that in general cockles could be used to classify mussel zones, and so the continued practice of using cockle RMPs can continue. The recommendations for these RMPs are given below.

8.2 Cockles

Salisbury

The *Salisbury* cockle zone has been expanded twice in recent years, once following a 2019 RMP assessment (Carcinus, 2019) and most recently following the addition of the Mostyn cockle bed. It now covers an area of 27.1 km² and is the only zone on the Welsh side of the estuary. The original sanitary survey recommended placing an RMP at the southern end of this zone to capture the contamination from Mostyn STW. The current RMP position is still representative and should be retained, despite it being slightly different from that recommended in the original sanitary survey.

West Kirby

This zone is the most out-estuary of any CZ on the English side of the estuary, and meets the *Caldy Blacks* zone at its southern end. It covers an area of 9.06 km². The original sanitary survey did not identify any primary causes of contamination of this zone, and recommended placing an RMP at the up-estuary extreme within the Heswall Channel. This location continues to be representative and should be retained moving forward.

Caldy Blacks

This zone covers an area of 2.06 km² and is situated between the *West Kirby* and *Thurstaston* zones. The original sanitary survey identified that the main contaminating influences on this zone were the sources discharging to the Heswall channel. It states that access to the bed at this location was not possible and so the Thurstaston (B45AD) RMP should be used instead. The LEA confirmed that there is no appropriate access point within the *Caldy Blacks* zone, and that operationally the *Caldy Blacks* and *Thurstaston* zones are considered as one zone. Therefore, we recommend formally combining the two zones (*Thurstaston & Caldy Blacks)*. This change has been reflected in the sampling presented in Table 8.1.

Thurstaston

This is the most up-estuary of any zone on the English side of the estuary, and covers an area of 4.74 km². The original sanitary survey recommended placing the RMP as near to, and

as far up the Heswall channel as possible, giving an ideal location of SJ 2245 8301. The current RMP location is at SJ 2227 8248, although this will continue to be representative as it is only ~50 m from the original proposed location and there is a proposed tolerance of 100 m around the RMPs in this BMPA. This RMP should be retained, and will be the RMP used for the new *Thurstaston & Caldy Blacks* zone.

8.3 General Information

8.3.1 Location Reference

Production Area	**Dee**
Cefas Main Site Reference	M045
Ordnance survey 1:25,000	Explorer 266
Admiralty Chart	Nos. 1978 & 1953

8.3.2 Shellfishery

Species	Culture Method	Seasonality of Harvest
Cockles (*Cerastoderma edule*)	Wild	Fishery open: daylight hours (1 hour either side of sunrise/sunset) between the 1st July and 31st December
Mussels (*Mytilus spp.*)	Wild	Year round

8.3.3 Local Enforcement Authority(s)

Name	**Wirral Council** PO Box 290 Brighton Street Wallasey CH27 9FQ
Website	https://www.wirral.gov.uk/
Telephone number	0151 606 2430
E-mail address	environmentalhealth@wirral.gov.uk

Name	**Flintshire County Council** County Hall, Mold, Flintshire CH7 6NB
Website	https://www.flintshire.gov.uk/en/Business/Food-Safety--Hygiene/Home.aspx
Telephone number	01352 702020
E-mail address	Food.safety@flintshire.gov.uk

*Table 8.1 Proposed sampling plan for the Dee 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
Salisbury (Cockles & mussels)	B45AB	Salisbury	SJ 1756 8056	53°18.93'N 3°14.34''W	Cockles; Mussels	Hand (rake)	Hand (rake)	*C. edule*	100 m	Monthly
West Kirby (Cockles & mussels)	B45AE	West Kirby Cockles	SJ 2106 8470	53°21.20'N 3°11.25'W	Cockles; Mussels	Hand (rake)	Hand (rake)	*C. edule*	100 m	Monthly
Thurstaston & Caldy Blacks (Cockles & Mussels)	B45AD	Thurstaston	SJ 2227 8248	53°20.01'N 3°10.12'W	Cockles; Mussels	Hand (rake)	Hand (rake)	*C. edule*	100 m	Monthly

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10 Appendices

Appendix I. Breakdown of population change within Electoral Wards

ID	Electoral Ward	2001 Population	2011 Population	Population Change	2001 Density	2011 Density	Density Change
1	Brithdir and Llanfachreth/Ganllwyd/Llanelltyd	1408	1444	2.56%	0.00	0.10	0.10
2	Trawsfynydd	1534	1604	4.56%	0.10	0.10	0.00
3	Efenechtyd	1656	1686	1.81%	0.22	0.20	-0.02
4	Llanrhaeadr-ym-Mochnant/Llansilin	2253	2295	1.87%	0.17	0.20	0.03
5	Corris/Mawddwy	1216	1345	10.61%	0.07	0.10	0.03
6	Corwen	2398	2325	-3.04%	0.34	0.30	-0.04
7	Llandderfel	924	1511	63.60%	0.04	0.10	0.06
8	Llanwddyn	990	1036	4.64%	0.05	0.10	0.05
9	Llanfair Dyffryn Clwyd/Gwyddelwern	2237	2227	-0.45%	0.24	0.20	-0.04
10	Bala,Llanuwchllyn	2534	0	-100.00%	8.21	0.00	-8.21
11	Dyffryn Ceiriog/Ceiriog Valley	2310	2179	-5.67%	0.20	0.20	0.00
12	Uwch Conwy	1494	1465	-1.94%	0.08	0.10	0.02
13	Uwchaled	1403	1399	-0.29%	0.11	0.10	-0.01
14	Llandrillo	1115	1122	0.63%	0.12	0.10	-0.02
15	Llanrhaeadr-yng-Nghinmeirch	1895	1856	-2.06%	0.17	0.20	0.03
16	Llansannan	1853	1925	3.89%	0.15	0.20	0.05
17	Llangernyw	1321	1435	8.63%	0.11	0.10	-0.01
18	St Martin's	4053	4333	6.91%	2.63	1.00	-1.63
19	Ponciau	4486	4842	7.94%	2.40	2.60	0.20
20	Pant	2263	2335	3.18%	30.96	31.90	0.94
21	Esclusham	2719	2766	1.73%	12.33	12.50	0.17

ID	Electoral Ward	2001 Population	2011 Population	Population Change	2001 Density	2011 Density	Density Change
22	Penycae	2247	2205	-1.87%	14.63	14.40	-0.23
23	Cefn	4866	5074	4.27%	6.38	6.70	0.32
24	Llanarmon-yn-Ial/Llandegla	2239	2456	9.69%	0.26	0.30	0.04
25	Llangollen Rural	1999	2059	3.00%	3.75	3.90	0.15
26	Brynyffynnon	3105	3448	11.05%	12.61	14.00	1.39
27	Chirk South	1870	2036	8.88%	1.38	1.50	0.12
28	Chirk North	2505	2432	-2.91%	4.53	4.40	-0.13
29	Johnstown	3372	3266	-3.14%	31.15	30.20	-0.95
30	Gobowen, Selattyn and Weston Rhyn	6595	6866	4.11%	3.81	1.60	-2.21
31	Plas Madoc	1833	1977	7.86%	44.07	47.50	3.43
32	Llangollen	3884	4079	5.02%	0.65	0.70	0.05
33	Ruabon	2400	2925	21.88%	2.70	3.30	0.60
34	Penycae and Ruabon South	2331	2533	8.67%	0.73	0.80	0.07
35	Coedpoeth	4721	4702	-0.40%	8.80	8.80	0.00
36	Minera	2437	2472	1.44%	1.62	1.60	-0.02
37	Ellesmere Urban	3383	3835	13.37%	1.65	7.80	6.15
38	Marchwiel	2418	2371	-1.94%	0.64	0.60	-0.04
39	The Meres	4280	4590	7.26%	1.06	0.40	-0.66
40	Overton	3139	3315	5.61%	0.57	0.60	0.03
41	Llandyrnog	2073	2156	4.00%	0.45	0.50	0.05
42	Maesydre	2003	1950	-2.65%	29.55	28.80	-0.75
43	Leeswood	2143	2135	-0.37%	1.83	1.80	-0.03
44	Newton	9092	9556	5.10%	83.35	46.90	-36.45
45	Saltney Mold Junction	1359	1373	1.03%	5.68	5.70	0.02
46	Borras Park	2517	2359	-6.28%	41.60	39.00	-2.60
47	Rossett	3336	3231	-3.15%	1.31	1.30	-0.01

ID	Electoral Ward	2001 Population	2011 Population	Population Change	2001 Density	2011 Density	Density Change
48	Queensferry	1923	2109	9.67%	4.71	5.20	0.49
49	Argoed	2883	2836	-1.63%	8.09	8.00	-0.09
50	Gwersyllt North	2623	2864	9.19%	11.69	12.80	1.11
51	Smithfield	2136	2671	25.05%	37.14	46.40	9.26
52	Buckley Bistre West	4509	4527	0.40%	32.87	33.00	0.13
53	Broughton South	3703	3682	-0.57%	11.95	11.90	-0.05
54	Gwersyllt West	3063	3040	-0.75%	18.56	18.40	-0.16
55	Cartrefle	2288	2393	4.59%	51.00	53.30	2.30
56	New Broughton	3173	3448	8.67%	18.46	20.10	1.64
57	Upton	8568	8905	3.93%	32.68	14.40	-18.28
58	Llay	4905	4814	-1.86%	5.41	5.30	-0.11
59	Mold South	2772	2716	-2.02%	18.33	18.00	-0.33
60	Connah's Quay South	5697	5655	-0.74%	22.14	22.00	-0.14
61	Gresford East and West	2876	2730	-5.08%	4.83	4.60	-0.23
62	Blacon	13891	13626	-1.90%	90.43	30.10	-60.33
63	Penyffordd	3715	3874	4.28%	4.18	4.40	0.22
64	Caergwrle	1650	1619	-1.88%	14.13	13.90	-0.23
65	Handbridge Park	9020	8840	-2.00%	37.47	16.50	-20.97
66	Mancot	3462	3496	0.98%	7.77	7.80	0.03
67	Saltney Stonebridge	3410	3759	10.23%	28.75	31.70	2.95
68	Llanfynydd	1752	1850	5.59%	0.90	1.00	0.10
69	Buckley Pentrobin	4078	4680	14.76%	16.04	18.40	2.36
70	Offa	2201	2648	20.31%	27.63	33.20	5.57
71	Brymbo	2653	3981	50.06%	3.78	5.70	1.92
72	Holt	2844	3587	26.11%	9.45	0.90	-8.55
73	Cilcain	1881	1874	-0.37%	0.47	0.50	0.03
74	Little Acton	2376	2322	-2.27%	44.92	43.90	-1.02

ID	Electoral Ward	2001 Population	2011 Population	Population Change	2001 Density	2011 Density	Density Change
75	Northop	2983	3049	2.21%	2.62	2.70	0.08
76	Gwernaffield	1851	1942	4.92%	2.46	2.60	0.14
77	Acton	3023	3165	4.70%	34.02	35.60	1.58
78	Buckley Mountain	2518	3013	19.66%	7.14	8.50	1.36
79	Mold Broncoed	2500	2695	7.80%	19.94	21.50	1.56
80	Shotton West	1933	2129	10.14%	22.18	24.40	2.22
81	Buckley Bistre East	3463	3445	-0.52%	11.01	11.00	-0.01
82	Garden Quarter	4189	5318	26.95%	13.64	38.80	25.16
83	Flint Trelawny	3680	3610	-1.90%	8.81	8.60	-0.21
84	Sealand	2746	2996	9.10%	1.37	1.50	0.13
85	Lache	5664	5760	1.70%	43.23	48.50	5.27
86	Ewloe	4862	5420	11.48%	7.77	8.70	0.93
87	Hope	2522	2605	3.29%	1.97	2.00	0.03
88	Gwenfro	1801	1831	1.67%	20.14	20.50	0.36
89	Queensway	2462	2685	9.06%	50.96	55.60	4.64
90	Whitegate	2035	2530	24.32%	24.12	41.80	17.68
91	Farndon	3872	4011	3.58%	1.81	0.50	-1.31
92	Hawarden	1858	1887	1.56%	5.75	5.80	0.05
93	Marford and Hoseley	2458	2280	-7.24%	7.83	7.30	-0.53
94	Gwernymynydd	1776	1726	-2.82%	1.00	1.00	0.00
95	Connah's Quay Central	3221	3356	4.19%	8.65	9.00	0.35
96	Aston	3357	3117	-7.15%	9.89	9.20	-0.69
97	Wynnstay	2210	2323	5.11%	46.91	49.30	2.39
98	Llanbedr Dyffryn Clwyd/Llangynhafal	1539	1421	-7.67%	0.54	0.50	-0.04
99	New Brighton	3005	3001	-0.13%	11.11	11.10	-0.01

ID	Electoral Ward	2001 Population	2011 Population	Population Change	2001 Density	2011 Density	Density Change
100	Rhosnesni	3775	3683	-2.45%	40.98	28.60	-12.38
101	Northop Hall	1665	1530	-8.11%	4.71	4.30	-0.41
102	Hermitage	2329	2205	-5.32%	34.00	32.20	-1.80
103	Saughall and Mollington	4531	4463	-1.49%	2.17	1.30	-0.87
104	Treuddyn	1567	1627	3.83%	1.07	1.10	0.03
105	Erddig	2217	2200	-0.77%	24.40	24.20	-0.20
106	Chester City	2795	3853	37.84%	17.19	24.50	7.31
107	Gwersyllt East and South	4370	4773	9.22%	10.97	12.00	1.03
108	Mold East	1955	2006	2.61%	8.43	8.70	0.27
109	Garden Village	2073	2036	-1.78%	36.86	36.20	-0.66
110	Halkyn	1725	1785	3.48%	0.68	0.70	0.02
111	Connah's Quay Wepre	2122	2259	6.46%	5.16	5.50	0.34
112	Connah's Quay Golftyn	5486	5504	0.33%	6.57	6.60	0.03

ID	Electoral Ward	2001 Population	2011 Population	Population Change	2001 Density	2011 Density	Density Change
113	Shotton Higher	2529	2576	1.86%	34.90	35.60	0.70
114	Bryn Cefn	1974	2175	10.18%	9.47	10.40	0.93
115	Flint Oakenholt	2920	3051	4.49%	3.50	3.70	0.20
116	Grosvenor	2334	2690	15.25%	22.28	25.70	3.42
117	Broughton North East	2088	2292	9.77%	2.27	2.50	0.23
118	Dodleston and Huntington	3685	3958	7.40%	3.73	1.00	-2.73
119	Higher Kinnerton	1634	1697	3.86%	1.83	1.90	0.07
120	Stansty	2175	2114	-2.80%	36.87	35.80	-1.07
121	Shotton East	1803	1958	8.60%	24.32	26.40	2.08
122	Mold West	2341	2641	12.82%	18.07	20.40	2.33
123	Bronington	3224	3179	-1.40%	0.50	0.50	0.00
124	Whitchurch North	6218	7005	12.66%	8.94	4.40	-4.54
125	Wrenbury	4301	4541	5.59%	0.89	0.40	-0.49

ID	Electoral Ward	2001 Population	2011 Population	Population Change	2001 Density	2011 Density	Density Change
126	Whitchurch South	4029	4399	9.18%	3.71	1.00	-2.71
127	Malpas	3887	3975	2.26%	0.60	0.60	0.00
128	Gronant	1595	1527	-4.26%	3.04	2.90	-0.14
129	Willaston and Thornton	3913	3825	-2.25%	2.78	2.70	-0.08
130	Holywell West	2311	2399	3.81%	8.74	9.10	0.36
131	Heswall	13247	13401	1.16%	8.96	11.20	2.24
132	Brynford	2249	2153	-4.27%	1.86	1.80	-0.06
133	Ffynnongroyw	2205	1808	-18.00%	2.48	2.00	-0.48
134	Trelawnyd and Gwaenysgor	1906	1838	-3.57%	1.06	1.00	-0.06
135	Flint Coleshill	4040	4028	-0.30%	7.31	7.30	-0.01
136	Hoylake and Meols	13140	13348	1.58%	11.93	13.10	1.17
137	Elton	4483	4557	1.64%	2.58	2.40	-0.18
138	Holywell Central	1835	1988	8.34%	19.50	21.10	1.60

ID	Electoral Ward	2001 Population	2011 Population	Population Change	2001 Density	2011 Density	Density Change
139	Greasby, Frankby and Irby	14389	13991	-2.77%	14.26	15.10	0.84
140	Bagillt East	1872	1941	3.69%	5.09	5.70	0.61
141	Whitford	2247	2322	3.34%	1.05	1.10	0.05
142	Holywell East	1828	1758	-3.83%	13.43	12.90	-0.53
143	Hoole	9114	9359	2.68%	126.20	53.80	-72.40
144	Flint Castle	2164	2264	4.62%	23.58	25.40	1.82
145	Chester Villages	8595	8548	-0.55%	7.91	2.50	-5.41
146	Little Neston and Burton	8852	8485	-4.15%	35.59	2.90	-32.69
147	Dyserth	2101	2269	8.02%	2.75	6.10	3.35
148	Whitby	8536	8102	-5.08%	57.80	29.00	-28.80
149	Pensby and Thingwall	13030	13007	-0.18%	10.46	12.70	2.24
150	Strawberry	5365	5086	-5.20%	69.26	44.40	-24.86
151	Greenfield	2741	2741	0.00%	5.94	5.90	-0.04

ID	Electoral Ward	2001 Population	2011 Population	Population Change	2001 Density	2011 Density	Density Change
152	Bagillt West	2046	2224	8.70%	3.23	3.60	0.37
153	West Kirby and Thurstaston	12957	12733	-1.73%	11.97	10.20	-1.77
154	Parkgate	3702	3591	-3.00%	4.71	4.60	-0.11
155	Prestatyn Meliden	2175	2066	-5.01%	13.65	13.00	-0.65
156	Great Boughton	9002	8984	-0.20%	59.33	31.10	-28.23
157	Prestatyn East	4334	4015	-7.36%	7.66	7.00	-0.66
158	Boughton	4171	5444	30.51%	43.28	52.00	8.72
159	Neston	3808	4329	13.68%	8.42	8.30	-0.12
160	Mostyn	2012	1844	-8.35%	1.72	1.60	-0.12
161	Tattenhall	4228	4374	3.44%	0.71	0.50	-0.21
	TOTAL	561734	576916	2.70%			

Appendix II. Event Duration Monitoring Data Summary for 2020

Discharge Name	Water Company	NGR	Permit Number	Total Duration of Spills (hours) in 20202	No. Spills in 2020	Percentage of Reporting Period Operational
ARGOED PS	Dwr Cymru	SJ1145983543	CM0034601	36	9	98.48
ASHGROVE PS SHOTTON STORM	Dwr Cymru	SJ3089168730	CM0165801	180.75	68	99.96
BAGILLT EAST SPS	Dwr Cymru	SJ2215575375	CM0063501	27.75	11	100
BAGILLT GREENACRE DRIVE - SSO	Dwr Cymru	SJ2264674564	CM0168801	6.5	9	99.66
BAGILLT STATION ROAD - SSO	Dwr Cymru	SJ2218275297	CM0168701	5.25	10	99.72
BAGILLT TYDDYN MESHAM LANE - SSO	Dwr Cymru	SJ2255074428	CM0168601	0	0	100
BAGILLT VERGE OFF MANOR DRIVE - SSO	Dwr Cymru	SJ2304874297	EPR/CB3090FW	0.75	3	99.99
BAGILLT WEST SPS BAGILLT	Dwr Cymru	SJ2100876433	CM0063601	33	27	99.86
BOOT & SHIP PS , ,	Dwr Cymru	SJ2096076340	CG0317101	0.25	1	100
CONNAH'S QUAY CESTRIAN STREET	Dwr Cymru	SJ2978669516	CM0086801	3.75	3	99.76
CONNAHS QUAY DEVA AVENUE - SSO	Dwr Cymru	SJ2874069230	CM0164301	0	0	70.75
CONNAHS QUAY DOCK ROAD PS	Dwr Cymru	SJ2942469777	CM0164901	1	1	94.99
CONNAHS QUAY GOLFTYN PS CSO/STORM	Dwr Cymru	SJ2850270339	CM0165601	136.75	28	100
CONNAHS QUAY LOW LEVEL SPS STORM	Dwr Cymru	SJ3018469240	CM0164601	0	0	100
CONNAHS QUAY WEPRE PS STORM	Dwr Cymru	SJ3042669108	CM0165701	17.25	27	99.94

Discharge Name	Water Company	NGR	Permit Number	Total Duration of Spills (hours) in 20202	No. Spills in 2020	Percentage of Reporting Period Operational
CROFT DRIVE CSO	United Utilities	SJ2223084820	CG037860101	0.04	2	34
CSO ADJACENT A548 ROAD BRIDGE	Dwr Cymru	SJ1956477679	CG0324302	130	55	100
DISCHARGE A 14 FFORDD DDYFRDWY	Dwr Cymru	SJ1619979900	CG0412601	0.75	2	100
FFYNNON WEST PS	Dwr Cymru	SJ1330782432	CM0034901	308.25	23	100
FFYNNONGROYW TAN LAN BACH PS	Dwr Cymru	SJ1182583130	CM0191601	105.5	11	100
FLINT BARDYN PS , ,	Dwr Cymru	SJ2472773162	CG0348401	89.5	38	100
Flint Castle No1 SPS	Dwr Cymru	SJ2446073390	Unpermitted-2794	0	0	100
FLINT DEE COTTAGES PS	Dwr Cymru	SJ2503072860	CM0194301	1.5	5	100
FLINT IN GARDEN 102 MAES GWYN	Dwr Cymru	SJ2492072410	CM0169101	51	54	95.61
FLINT MOUNTAIN SPS FLINT MOUNTAIN	Dwr Cymru	SJ2379070170	CM0010901	50.5	8	84.83
FLINT STW FLINT FLINTSHIRE	Dwr Cymru	SJ2550272391	CM0058402	387.75	51	83.86
FLINT STW (THE MEADOWS) , ,	Dwr Cymru	SJ2401072840	CG0324401	0	0	100
GARDEN CITY BRITISH LEGION - SSO	Dwr Cymru	SJ3304269232	CM0166001	154	24	99.99
GAYTON CEDARWAY PUMPING STATION	Dwr Cymru	SJ2782380339	CM0193801	0	0	68.79
GAYTON PARKWAY SSO	Dwr Cymru	SJ2826080436	CM0197201	73.25	9	100
GLADSTONE ROAD CSO	Dwr Cymru	SJ2937977444	CG0359801	2.25	6	99.99

Discharge Name	Water Company	NGR	Permit Number	Total Duration of Spills (hours) in 20202	No. Spills in 2020	Percentage of Reporting Period Operational
GREENFIELD A548 NR ABBEY MILL	Dwr Cymru	SJ1956477679	CM0169401	1	4	99.87
GREENFIELD IND EST NO 1 HOLYWELL	Dwr Cymru	SJ2002777419	CG0360801	3	2	100
GREENFIELD PARENT CSO HOLYWELL	Dwr Cymru	SJ1984077811	NPSWQD009966	290.75	73	76.86
GREENFIELD WWTW (STW) GREENFIELD	Dwr Cymru	SJ1983177909	CG0382601	87.5	34	99.94
GREENFIELDS DRIVE CSO	Dwr Cymru	SJ2950975998	CM0170201	1.5	5	100
GWESPYR OLD STW - SSO	Dwr Cymru	SJ1110483429	CM0169501	0.5	1	100
HARP INN CSO	Dwr Cymru	SJ2898676018	CM0170301	43.75	32	99.9
HESWALL STORAGE TANK CSO HESWALL	Dwr Cymru	SJ2642480609	CG0355101	40.75	11	100
HESWALL STW TARGET LANE HESWALL	Dwr Cymru	SJ2511081808	CG0362601	0.25	1	99.51
HESWELL COTTAGE LANE PS	Dwr Cymru	SJ2656980015	CM0193701	3.5	3	68.03
HOLYWELL CAR PARK STRAND WALK/RING RD	Dwr Cymru	SJ1876475901	CM0169801	0	0	93.76
HOLYWELL PEN Y MAES RD/PEN Y MAES GARDEN	Dwr Cymru	SJ1917075955	CM0169601	376.25	61	92.85
HOLYWELL STRAND WALK NR STRAND	Dwr Cymru	SJ1897176365	CM0169701	0	0	100
LONG HEY ROAD CSO	United Utilities	SJ2302083940	CM0077001	43.93	13	100
LYGAN Y WERN PS PENTRE HALKYN	Dwr Cymru	SJ2055172626	CM0045801	13.75	14	100

Discharge Name	Water Company	NGR	Permit Number	Total Duration of Spills (hours) in 20202	No. Spills in 2020	Percentage of Reporting Period Operational
MARSHLANDS ROAD PS	Dwr Cymru	SJ2899976268	CG0381201	342.5	78	95.36
MERLLYN LANE BAGILLT ,	Dwr Cymru	SJ2202375001	CG0359701	0	0	99.72
MOSTYN ARMS PS MOSTYN	Dwr Cymru	SJ1535481023	CM0070801	243.5	12	99.87
MOSTYN DOCKS CAR PARK - SSO	Dwr Cymru	SJ1557080950	CM0070901	84.25	10	100
MOSTYN NEAR FUN SHIP - SSO	Dwr Cymru	SJ1766879169	CM0198601	123.25	36	99.76
OAKENHOLT PS	Dwr Cymru	SJ2566972157	CM0038701	0	0	90.71
PARKGATE 5 DEE COTTAGES THE PA	Dwr Cymru	SJ2760578632	CM0170101	9	12	99.06
PARKGATE EARLE DRIVE/PARKGATE	Dwr Cymru	SJ2848577853	CM0169901	0	0	95.95
PEN Y FFORDD ADJ PEN Y FFORDD	Dwr Cymru	SJ1315682142	CM0168501	15.25	9	99.95
PEN Y MAES PUMPING STATION	Dwr Cymru	SJ1935076360	NPSWQD009968	82.25	43	100
PENTRE HALKYN PS EMERGENCY , ,	Dwr Cymru	SJ2033072542	CM0030202	400	32	99.03
STATION ROAD PS TALACRE	Dwr Cymru	SJ1198584321	CM0035301	130.75	17	99.13
STORMWATER TANK ADJACENT TO HALLS F	Dwr Cymru	SJ1879576591	CG0324301	148.25	77	98.37
SWN Y DWR CSO	Dwr Cymru	SJ1168681626	NPSWQD005679	27.5	11	96.34
TAI TREVOR PS LLANNERCHYMOR	Dwr Cymru	SJ1837478715	CM0038901	0	0	91.04

Discharge Name	Water Company	NGR	Permit Number	Total Duration of Spills (hours) in 20202	No. Spills in 2020	Percentage of Reporting Period Operational
TALACRE STATION ROAD PS	Dwr Cymru	SJ1235184695	CM0191701	0	0	0
WOODLAND VIEW CEFN Y BEDD ,	Dwr Cymru	SJ1014883485	CG0360001	0	0	100

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EC Regulation 854/2004

CLASSIFICATION OF BIVALVE MOLLUSC PRODUCTION AREAS IN ENGLAND AND WALES

SANITARY SURVEY REPORT

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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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Our Vision

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