2025

F

AQUALICENSE

SANITARY SURVEY AND SAMPLING PLAN FOR WEXFORD HARBOUR, CO. WEXFORD – JUNE 2025

AN t-ÚDARÁS UM CHOSAINT IASCAIGH MHARA | SEA-FISHERIES PROTECTION AUTHORITY

AQUALICENSE.COM
AQUALICENSE LTD
ARKLOW, CO. WICKLOW, IRELAND

AQUALICENSE

DISCLAIMER

Under EU Regulation 2019/627, which lays down uniform practical arrangements for the performance of official controls on products of animal origin intended for human consumption, a sanitary survey relevant to bivalve mollusc production in Wexford Harbour was undertaken in 2025. This will provide an appropriate hygiene classification zoning and monitoring plan based on the best available information with detailed supporting evidence. Aqualicense Limited undertook the desktop component of the work on behalf of the SFPA.

STATEMENT OF USE

Every effort is made in preparing the material and content of this sanitary survey for publication, but no responsibility is accepted by or on behalf of the SFPA for any errors, omissions, or misleading statements on these pages.

Report Prepared by:

Aqualicence: Dr. Kate Maloney, Maeve Guilfoyle, Paul O'Reilly and Jodie Cranny

SFPA: Niall O'Rahelly, Brian Dillon, Damian Allen. Mark Whelan

REV NO.	CREATED BY	REVIEWED BY	DATE
0.1	KM		11/04/2025
0.2	MG	JC	11/06/2025
0.3	MG	POR	13/06/2025

TABLE OF CONTENTS

FIGURES

TABLES

ABBREVIATIONS

BMPA	Bivalve Mollusc Production Area (i.e. “production area”)
CFU	Coliform forming units
COP	Code of Practice
CSO	Central Statistics Office or Combined Sewer Overflow
DWWTS	Domestic Waste Water Treatment System
E. coli	*Escherichia coli*
ED	Electoral Division
ELV	Emission Limit Value
EPA	Environmental Protection Authority
EU	European Union
GPS	Global Positioning System
GSI	Geological Survey of Ireland
IE	Industrial Emissions
IFI	Inland Fisheries Ireland
IPC	Integrated Pollution Control
I-WeBS	Irish Wetland Bird Survey
NAP	Nitrates Action Programme
NPWS	National Parks and Wildlife Service
PSU	Practical Salinity Unit
RMP	Representative Monitoring Point
SAC	Special Area of Conservation
SFPA	Sea Fisheries Protection Authority
SPA	Special Protection Area
SPR	Source-Pathway-Receptor
SWO	Storm Water Overflow
UWWTP	Urban Waste Water Treatment Plant
WFD	Water Framework Directive
WWTP	Waste Water Treatment Plant

EXECUTIVE SUMMARY

Faecal contamination in shellfish waters poses a significant public health risk, particularly for filter-feeding bivalve molluscs such as oysters and mussels, which can accumulate harmful bacteria and increase the risk of foodborne illness. To mitigate these risks, EU Regulation 2019/627 mandates that a Sanitary Survey be conducted before classifying a shellfish production or relay area.

In line with this requirement, Aqualicense was contracted by the Sea-Fisheries Protection Authority (SFPA) to carry out a sanitary survey for Wexford Harbour, Co. Wexford.

This survey supports the classification of Blue mussels (*Mytilus edulis*) and Pacific Oysters (*Crassostera gigas*) for commercial harvest and includes the following key components:

- A desk-based assessment of potential faecal contamination sources using a Source–Pathway–Receptor (S-P-R) model;
- A field-based shoreline survey conducted by SFPA officers to confirm known risks and identify additional sources;
- A bacteriological survey of selected inflows and runoff points;
- A recommendation on the extent of the production area (geographic delineation) based on hydrodynamics, catchment influence, and aquaculture activity;
- A revised official control sampling plan for the Representative Monitoring Points (RMPs) within the classified area; and Development of a species-specific sampling plan in line with EU and SFPA requirements to support the classification of Pacific oysters and a review (and update where necessary) for Blue mussels.

The desk-based study employed a Source-Pathway-Receptor (S-P-R) model to assess contamination risks within Wexford Harbour. This approach allowed for the identification of potential pollution sources, their transport pathways ("Contributing Catchment," included multiple river networks and associated sub-basins draining into the bay), and circulation patterns within the Bivalve Mollusc Production Area (BMPA) (i.e. the receptor), accounting for seasonality and microbial loads. Each key step and findings of the S-P-R model is outlined below.

1. The existing Bivalve Mollusc Production Area (BMPA), (split across the Inner Harbour and Outer Harbour) spans approximately 35.98 km² within Wexford Harbour, Co. Wexford. Blue mussel aquaculture is present in the harbour with an active classification. There are currently two Pacific oyster sites licenced awaiting a classification.

2. The desk-based study examined the movement of pollutants, hydrological pathways to, and hydrodynamics within the production area. It also assessed the influence of weather patterns on hydrography and hydrodynamics. The findings indicate that the primary source of freshwater inflow, and consequently potential contamination, is via the River Slaney in the Inner Harbour. Areas of greatest groundwater vulnerability were identified in proximity of this inflow. In relation to hydrodynamics, the ebb tide lasts longer than the flood, facilitating water exchange and likely reducing contamination levels. However, considering the size of the contributing catchment and number of inflows to the harbour, localised areas of contamination are likely to occur. Seasonal variations in surface water run-off were also noted, with heavy rainfall events in summer and winter likely to influence microbial loads entering the harbour.

3. An inventory of potential pollutants was compiled, identifying key pollution sources from sewage, industrial activities and agriculture. Seasonal variations in agricultural pollutants are expected, particularly in summer when higher livestock stocking densities may lead to increased faecal loads. Additionally, extended dry periods which lead to soil compaction and reduced infiltration capacity, resulting in higher volumes of surface runoff during subsequent rainfall. This increases the mobilisation and transport of accumulated pollutants into watercourses during heavy rainfall events.

The overall S-P-R assessment determined that the key area of concern for organic pollutants is near the River Slaney inflow to the Inner Harbour. Other areas of concern are present around the coastline, in particular in the south of the Outer Harbour, where current flow is slower and potential inflows of concern are present.

A shoreline survey was conducted by the SFPA to confirm the findings of the desk-based study, and to identify any additional sources of contamination. A total of 36 observations were recorded during the shoreline survey. These included inflows to Wexford Harbour, notably including an additional stream that had not been identified during the desk-based survey. Two areas of surface water runoff were also observed, associated with residential and agricultural land use. A number of other outfalls were identified, discharging from urban and industrial areas, in addition to the main discharge from the Wexford Town Wastewater Treatment Plant (UWWTP). Additional observations included a hotel, coastal infrastructure, vessel facilities, agricultural activity, and areas supporting wildlife, all of which may contribute to or influence sources of contamination within the harbour.

Bacteriological samples were collected from a total of 22 locations along the shoreline where contamination was either evident or suspected. The highest *E. coli* concentration was recorded at the discharge point of the Wexford Town UWWTP, with levels of 18,000 CFU/100ml, indicating this discharge as potentially a major source of contamination within the harbour. Elevated concentrations of *E. coli* were also recorded in the vicinity of the River Slaney inflow, supporting findings from the desk-based assessment regarding its potential influence. Relatively lower *E. coli* concentrations were recorded at other shoreline locations, with almost half of the samples obtained indicating no detectable presence of *E. coli*.

Considering the findings of the desk-based study, shoreline survey and bacteriological sampling, it is recommended that the existing Inner and Outer Wexford Harbour Bivalve Mollusc Production Areas (BMPAs) be merged into a single BMPA to reflect the shared catchment, demonstrated hydrodynamic connectivity, and common contamination risks. In addition, following consultation with the Port Authority, a small inlet to the northeast next to Raven Point was removed from the BMPA boundary as this area is typically dry throughout the year.

For blue mussels, three Representative Monitoring Points (RMPs) are proposed within the amended BMPA, reflecting key contamination risks identified during the sanitary survey. RMP 1 (within the Inner Harbour) is recommended at the centre of Site T03-049D (52°21'39.88"N, 6°28'49.19"W) (influenced by the River Slaney and local inflows), mussel harvesting in the inner harbour is contingent upon the availability of stock. In the absence of mussel production, the RMP will remain inactive until harvesting activities resume.

Two additional RMPs are recommended in the Outer Harbour, RMP 2 at the centre of Site T03-035B2 (52°19'57.56"N, 6°25'19.25"W) (near the Wexford Town UWWTP discharge) and RMP 3 within the centre

of Site T03-077A (52°19'15.67"N, 6°25'42.04"W)(Located in proximity to a potential contamination inflow and within a zone characterised by reduced hydrodynamic circulation). For Pacific oysters, a single RMP is proposed at Site T09/079, located centrally between the main contamination sources.

In conclusion, a sanitary survey has been completed following EU Regulation 2019/627. Based on the desk-based study, shoreline survey, and bacteriological monitoring, a three RMPs were identified for blue mussels and one RMP identified for Pacific oyster. Species-specific sampling plans were developed for the Wexford Harbour BMPA's microbiological monitoring programme, which will inform the annual review of classifications.

1 INTRODUCTION

The presence of faecal contamination in the marine environment can result in the accumulation of harmful microorganisms in shellfish, posing a public health risk. Bivalve molluscs such as oysters, mussels, and clams are filter feeders, meaning they draw in and process large volumes of water, which can lead to the concentration of microbial contaminants. *Escherichia coli* (*E. coli*) is a key indicator organism used to assess faecal contamination, as its presence suggests potential pollution from human or animal waste. If such contamination includes pathogenic bacteria or viruses, it can increase the risk of foodborne illness for consumers.

To mitigate these risks, the European Union has established a regulatory framework (Regulation (EC) No 2073/2005) governing the classification and monitoring of shellfish production and relaying areas. Ireland transposed the Shellfish Waters Directive via S.I. No. 268/2006 (as amended by S.I. No. 464/2009). EU Regulation 2019/627 outlines the requirements for sanitary surveys. Article 56 of the Regulation mandates that competent authorities (i.e. the SFPA in an Irish context) conduct a sanitary survey before classifying a production or relaying area. This survey must include:

a) *an inventory of the sources of pollution of human or animal origin likely to be a source of contamination for the production area;*
b) *an examination of the quantities of organic pollutants released during the different periods of the year, according to the seasonal variations of human and animal populations in the catchment area, rainfall readings, waste-water treatment, etc.; and*
c) *determination of the characteristics of the circulation of pollutants by virtue of current patterns, bathymetry and the tidal cycle in the production area.*

Furthermore, under the SFPA Code of Practice (SFPA, 2020), a sanitary survey may include four elements:

1. A desk-based study to identify pollution sources
2. A shoreline survey to confirm initial findings of the desk-based study
3. A bacteriological survey; and
4. Data assessment

In the case of this report, due to logistical constraints, The SFPA assessed contamination inputs into the BMPA, along with a shoreline survey to validate the findings, prior to Aqualicense being contracted to carry out the wider Sanitary Survey Desktop Review. Aqualicense is satisfied that the shoreline survey adequately validated all findings presented in the subsequent Desktop Review.

In addition, ongoing monitoring is required under Article 57, ensuring that sampling programmes are informed by sanitary surveys and designed to produce representative data on water quality and potential contamination risks. Article 58 further stipulates that authorities must establish procedures to ensure that both sanitary surveys and monitoring programmes accurately reflect the conditions within shellfish production areas.

Wexford Harbour has previously been classified as two Bivalve Mollusc Production Areas (Wexford Inner and Wexford Outer). However, a sanitary survey has not previously been produced. Therefore, this sanitary survey will enable a review of existing RMPs for blue mussel to determine their suitability. Additionally, since its previous classification, two new licenses exist in the Outer Harbour for Pacific

oyster, for which an additional species-specific RMP will be required. This report examines all potential sources of faecal contamination, pathways, circulation and seasonal variations, with particular consideration of the area's urban context and large contributing catchment. The report aims to inform classification decisions and provide the necessary evidence for effective monitoring in line with EU regulatory requirements.

2 DESK-BASED STUDY

2.1 INTRODUCTION TO THE GENERAL AREA

Wexford Harbour is a natural harbour that lies at the mouth of the River Slaney in Co. Wexford. The harbour faces eastwards, with shallow bars at the entrance. Wexford Town is situated on the innermost part of the Outer Harbour, on the western coast. The inner harbour is characterised by the River Slaney and is separated from the Outer Harbour by Wexford Bridge.

Bivalve aquaculture is currently the only type occurring within the harbour. This will be characterised in further detail in the subsequent section. No commercial fisheries are targeted within the confines of the harbour (Marine Institute, 2025).

2.2 CHARACTERISATION OF THE PRODUCTION AREA

Key characteristics of the production area are outlined in *Table* 2-1.

Table 2-1. Characterisation of the production area.

Criteria	Description
Location and extent	This Bivalve Mollusc Production Area (BMPA) is split in two, covering the Inner Wexford Harbour and Outer Wexford Harbour, covering a total area of c. 35.98 $km^{2,}$
Bivalve species	Blue mussel (*Mytilus edulis*) and Pacific oyster (*Magallana gigas*).
Aquaculture or wild stocks	As of 21st March 2025, following a number of recent determinations by the Aquaculture Licenses Appeals Board (Aquaculture Licenses Appeals Board, 2025), there are 27 licenses in the harbour *(Figure* 2-2*)*. Of these sites, 25 are for mussels and 2 are for Pacific oysters. There is no commercial harvesting of wild bivalve stocks within the BMPA.
Seasonality of harvest	Generally, shellfish may be harvested year-round in accordance with market demand. However, under the license conditions of T03/092 there is a stipulation that aquaculture activities can only occur outside the breeding seasons for Little Tern (c. September to March inclusive).
Growth and harvesting techniques	Blue Mussels Bottom culture and harvesting by dredge. Pacific Oyster Bags and trestles.
Any conservation controls (e.g. closed season)	No conservation controls are employed, with the exception of those under license T03/092 detailed above.
Existing classification data	For both the Inner and Outer Harbour, the most recent annual classification is Class B for Blue Mussel aquaculture. There is currently no historic classification for oyster production.
Norovirus data	There is currently no historic norovirus data for Wexford Harbour

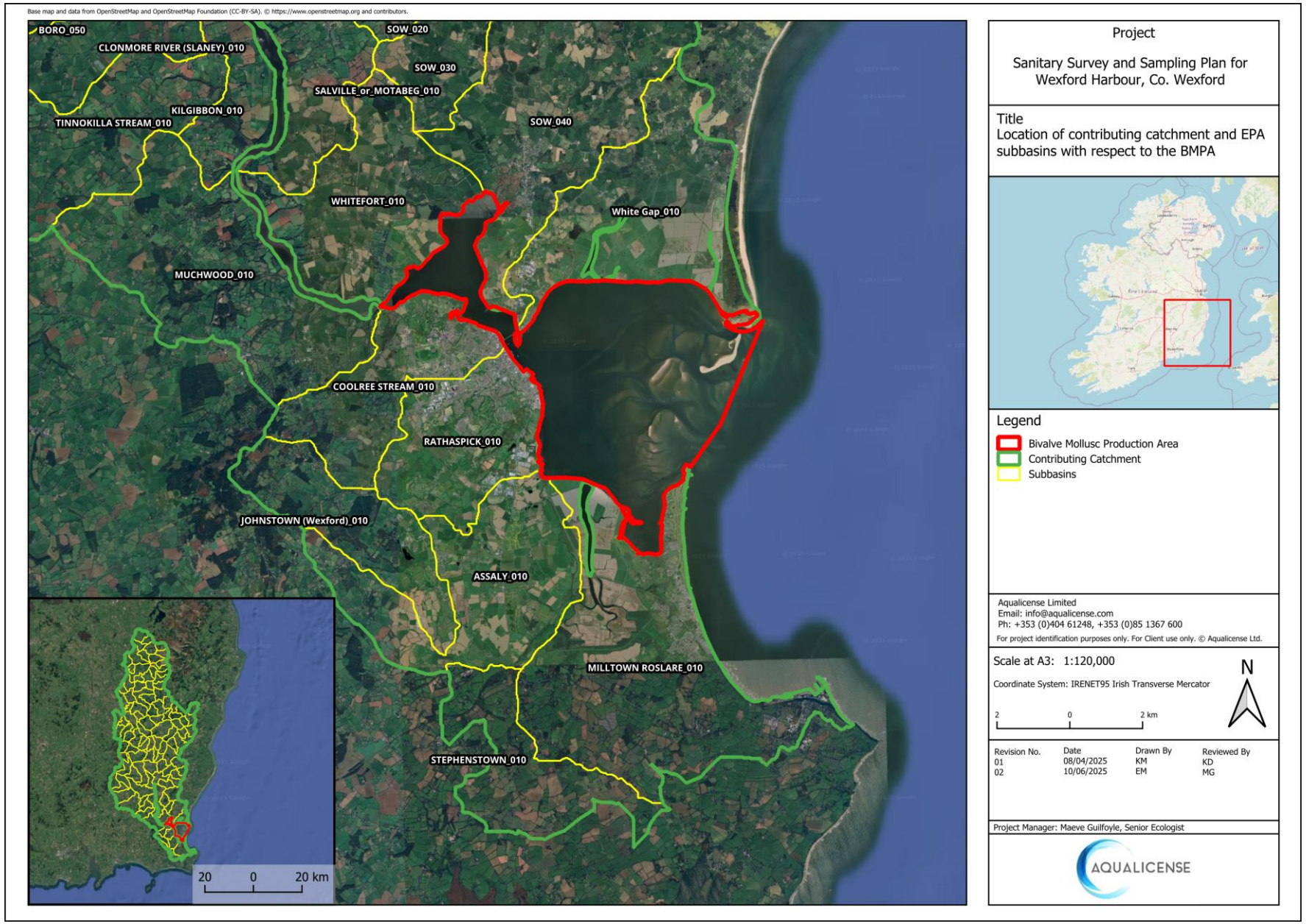

Figure 2-1. Location of contributing catchment and EPA mapped subbasins with respect to the BMPA.

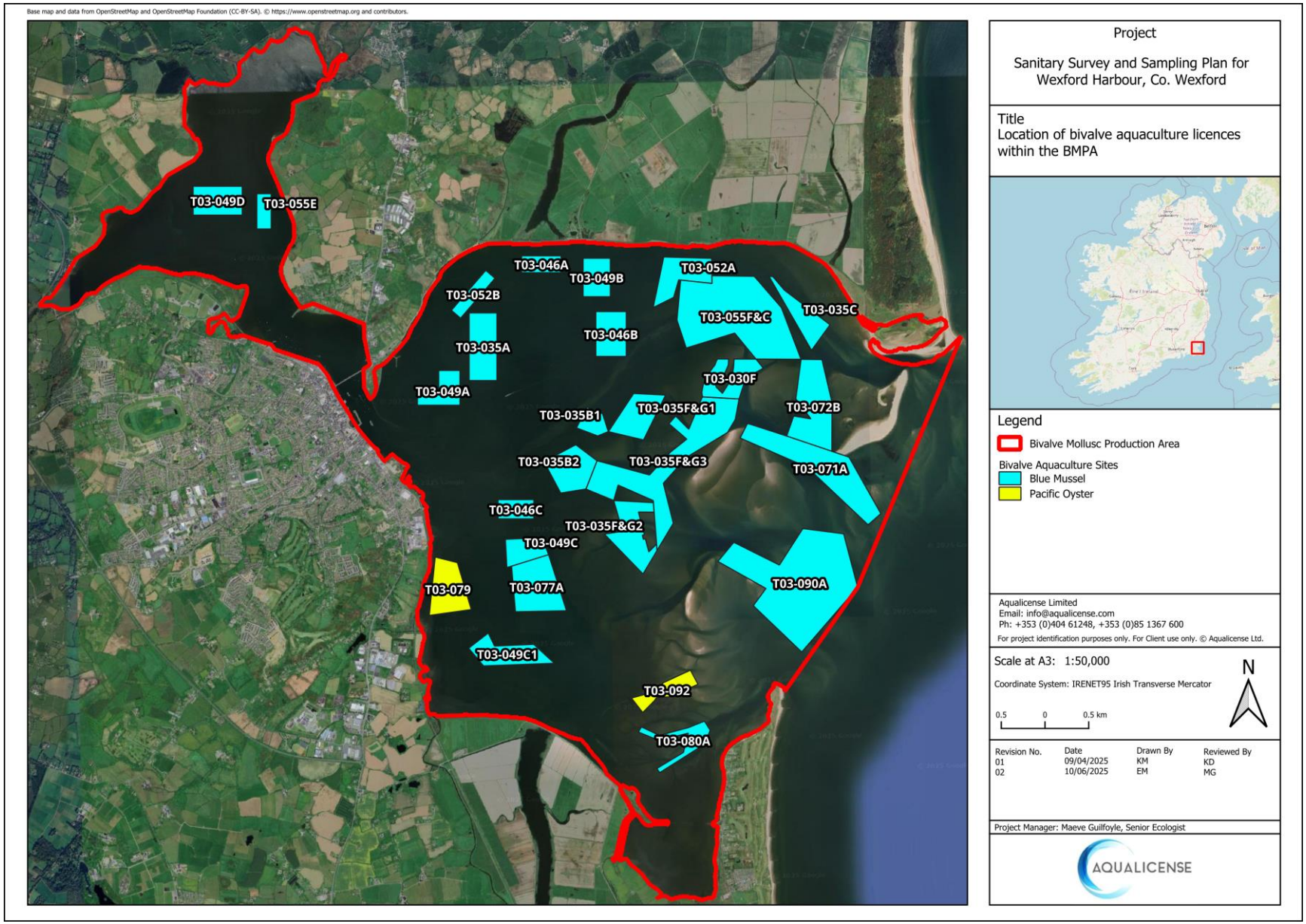

Figure 2-2. Location of bivalve aquaculture licences within the BMPA.

2.2.1 Bivalve Mollusc Production Area Delineation Process

The process for defining a Bivalve Mollusc Production Area (BMPA) boundary is that the SFPA proposes the BMPA boundary by assessing the maximum area suitable for aquaculture that can be effectively covered by a localised sanitary survey. This is done in consultation with key stakeholders involved in aquaculture development and licensing, such as BIM, industry representatives, and the Department of Agriculture, Food and the Marine (DAFM).

The boundary is then finalised based on the outcomes of the sanitary survey, specifically with regard to the area that can be reliably represented by the designated Representative Monitoring Point(s) (RMPs).

2.3 Assessment Methodology

The desk-based study will follow SFPA guidelines (COP SH01) and align with EU Regulation 627/2019, Article 56. It forms the first part of the sanitary survey, informing the shoreline and bacteriological surveys (if required).

The data from the desktop study is used to inform a Source-Pathway-Receptor (S-P-R) model, to determine and describe the flow of possible environmental pollutants from a source, through different pathways to the potential receptor, the study ensures a focused assessment by identifying contamination risks.

This assessment applies the S-P-R model (*section 2.5.4.2* and *Table* 2-8) to evaluate the ecological risk associated with faecal contamination within the BMPA (i.e. the receptor).

- **Source:**
  Faecal contaminants originate from identifiable inputs including agricultural runoff, wastewater treatment plant effluents, combined sewer overflows, and diffuse urban or wildlife sources. These inputs introduce microbiological pollutants such as E. coli, enteric viruses, and protozoan cysts into the aquatic environment.
- **Pathway:**
  Contaminants are transported via hydrological and tidal processes, surface water flows, and stormwater conveyance systems. Transport dynamics are influenced by rainfall events, land use, catchment topography, and the retention or resuspension of faecal material in sediments. Temporal variation is considered to identify peak contamination windows.
- **Receptor:**
  Shellfish species, particularly filter feeders, accumulate faecal contaminants present in the water column. These organisms serve as biological indicators and direct receptors of microbial loading.

If any element (source, pathway, receptor) is absent, no impact occurs, allowing targeted evaluation for the production area.

Key S-P-R components are indicated in *Figure* 2-3.

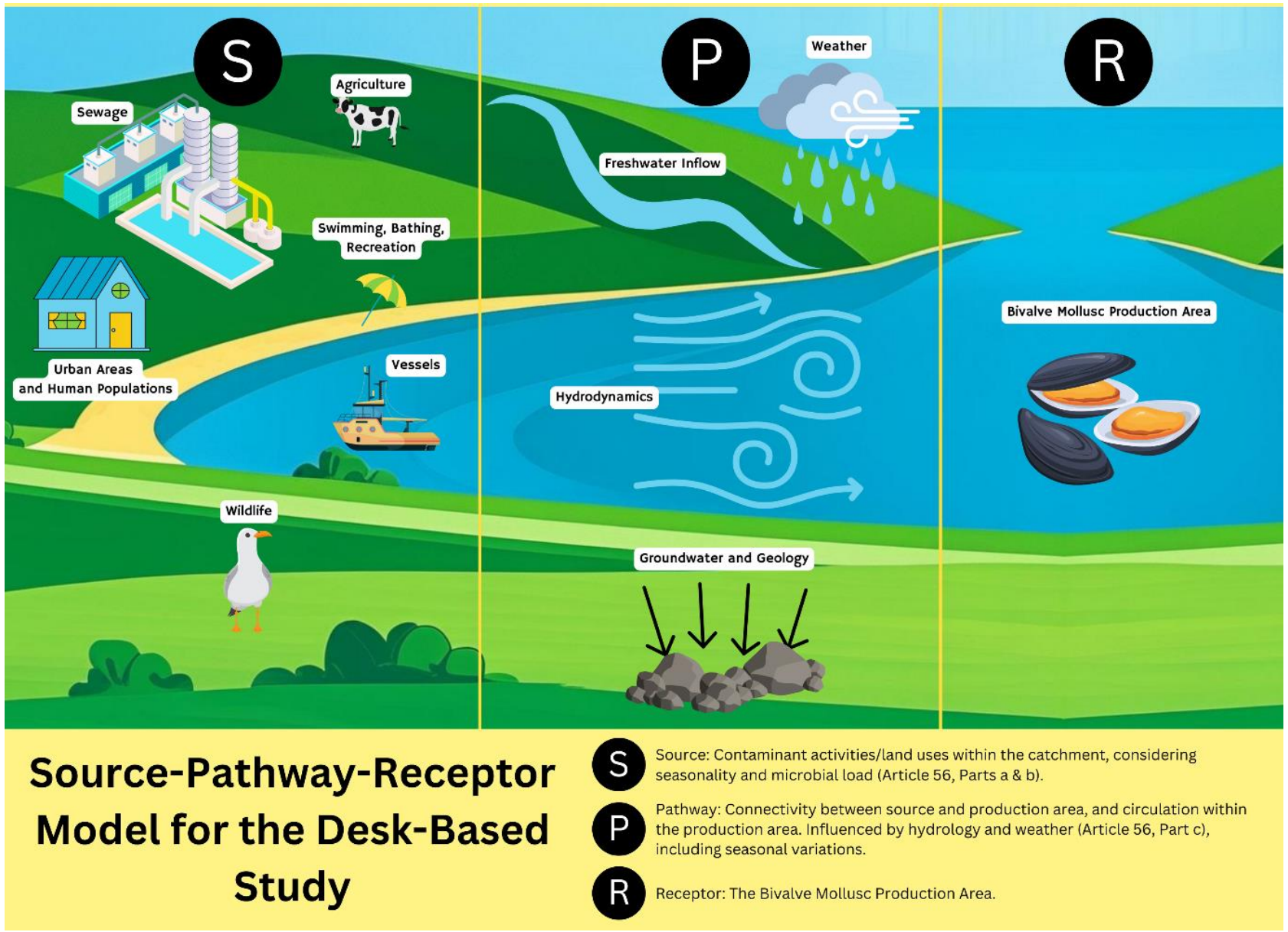

Figure 2-3. Key elements to be considered in this Desk-Based Study under the S-P-R Model.

2.3.1 CONTRIBUTING CATCHMENT

As the receptor has been defined as the BMPA, to assess sources and pathways the "Contributing Catchment" was defined. These are the areas from which there is a pathway from potential sources to the production area.

A catchment is defined as "*an area of land that drains into a river, lake or other body of water*" (EPA, 2025a). The EPA further identifies catchments and subcatchments for the purposes of Water Framework Directive (WFD) monitoring, however, depending on the receptor, these may not be at a suitable scale for the purposes of a sanitary survey. Therefore, a specific "Contributing Catchment" has been allocated solely for the purposes of this survey.

This contributing catchment has been selected by identifying all river networks (EPA, 2022) which enter the BMPA. Subsequently, to account for land draining into these river networks, the EPA river sub-basin (EPA, 2022), through which each river flows, is also included in the contributing catchment (EPA, 2022).

The identified contributing catchment covers an area of 1,978 km^2 and contains 112 subbasins. The defined contributing catchment is identified in *Figure* 2-1.

2.4 CHARACTERISTICS OF CIRCULATION OF POLLUTANTS

Prior to identifying pollution sources and their seasonality, an examination of pollutant circulation in the production area will be conducted. This will provide a foundation for detailed analysis of pathways in subsequent sections of this desk-based study. This section examines the movement of pollutants and explores hydrological pathways to, and hydrodynamics within, the production area. It also considers weather patterns, which may have seasonal influences on hydrography and hydrodynamics.

2.4.1 FRESHWATER INFLOWS

The contributing catchment *(Figure* 2-1*)* consists of 112 river subbasins. These subbasins and associated watercourses have been categorised based on their points of inflow to the BMPA *(Table* 2-2*).* Assessing these inflows is the first step in understanding the entry of pollutants and lays the foundation for further examination of pollutant circulation. Considering that Inflow 11 drains the majority of subbasins in the contributing catchment, it is considered the largest inflow (Figure 2-4).

The WFD aims to protect and enhance the quality of rivers, lakes, transitional waters, coastal waters, and groundwater. WFD monitoring assesses biological, physicochemical, and hydromorphological parameters to determine waterbody status. While not all WFD parameters are directly relevant to sanitary surveys, some, such as the assessment of nutrients (nitrogen and phosphorus) and dissolved oxygen, serve as key indicators of organic pollution, including faecal contamination. WFD monitoring also identifies pressures on water quality, such as nutrient enrichment, wastewater discharges, and diffuse pollution, which are further explored in Section 2.5 to assess their relevance as pollutant sources.

The WFD status (2016-2021) of the River Slaney as it enters the BMPA is "Poor". The majority of inflows entering the BMPA are classified as "Moderate," with the exception of a number of inflows to the north of the Inner Harbour *(Table* 2-2*).* This will be discussed in more detail in *Section 2.5* in respect of individual pollution sources.

Table 2-2. Locations of freshwater inflow to the BMPA.

CODE	NUMBER OF SUBBASINS*	SUBBASIN NAMES	WFD STATUS (2016-2021) AT INFLOW POINT
1	1	Milltown Roslare_010	Moderate
2			Moderate
3	3	Johnstown (Wexford)_010, Assaly_010, Stephenstown_010	Moderate
4	1	Rathaspick_010	Moderate
5			Moderate
6			Moderate
7			Moderate
8	1	Coolree Stream_010	Moderate
9			Moderate
10			Moderate
11	101	Ballyedmond_010, Askinvillar Stream_010, Bann_010, Bann_020, Bann_030, Bann_040, Bann_050, Bann_060, Bann_070, Boro_010, Boro_020, Boro_030, Boro_040, Boro_050, Boro_060, Brown's Beck Brook_010, Blacklion Stream (Carlow)_010, Blacklion Stream (Carlow)_020, Borris Stream (Slaney)_010, Ballingale Stream_010, Ballingale Stream_020, Ballycarney Stream_010, Ballycarney Stream_020, Blackwater Stream (Bann)_010, Ballaghmore Distributary_010, Clody_010, Clody_020, Corbally Stream_010, Corbally Stream_020, Corbally Stream_030, Corbally Stream_040, Clonmore Stream_010, Carrigower_010, Carrigower_020, Coolboy_010, Coolboy_020, Camolin Stream_010, Clonmore River (Slaney)_010, Clashavey River_010, Derreen_010, Derreen_020, Derreen_030, Derreen_040, Derreen_050, Derreen_060, Derreen_070, Derreen_080, Derreen_090, Derreen_100, Derry_010, Derry_020, Derry_030, Derry_040, Derry_050, Derry_060, Douglas (Ballon)_010, Douglas (Ballon)_020, Douglas (Kiltegan)_010, Douglas (Kiltegan)_020, Glasha (Slaney)_010, Knickeen_010, Killeen Stream (Boro)_010, Kildavin Stream_010, Kilgibbon_010, Knockboy_010, Lask_010, Lask_020, Little Slaney_010, Mine_010, Mine_020, Muchwood_010, Rosnastraw Stream_010, Rosnastraw Stream_020, Shillelagh_010, Slaney_010, Slaney_020, Slaney_030, Slaney_040, Slaney_050, Slaney_060, Slaney_070, Slaney_080, Slaney_090, Slaney_100, Slaney_110, Slaney_120, Slaney_130, Slaney_140, Slaney_150, Slaney_160, Slaney_170, Salville_or_Motabeg_010, Tinnacross Stream_010, Tinnacross Stream_020, Tinnokilla Stream_010, Urrin_010, Urrin_020, Urrin_030, Urrin_040, Urrin_050, Whitefort_010.	Poor
12	1	Whitefort_010	Good
13			Good
14			Good
15			Good
16			Good

CODE	NUMBER OF SUBBASINS*	SUBBASIN NAMES	WFD STATUS (2016-2021) AT INFLOW POINT
17			Good
18	4	Sow_010, Sow_020, Sow_030, Sow_040	Good
19	1	Sow_040	Good
20	1	Sow_040	Good
21	1	Sow_040	Good
22	1	Sow_040	Good
23	1	White Gap_010	Moderate
24			Moderate
25			Moderate
26			Moderate
27			Moderate

*Note, subbasins when summed do not sum to the total number, as some inflows may drain a differing number of subbasins, depending on the source location.

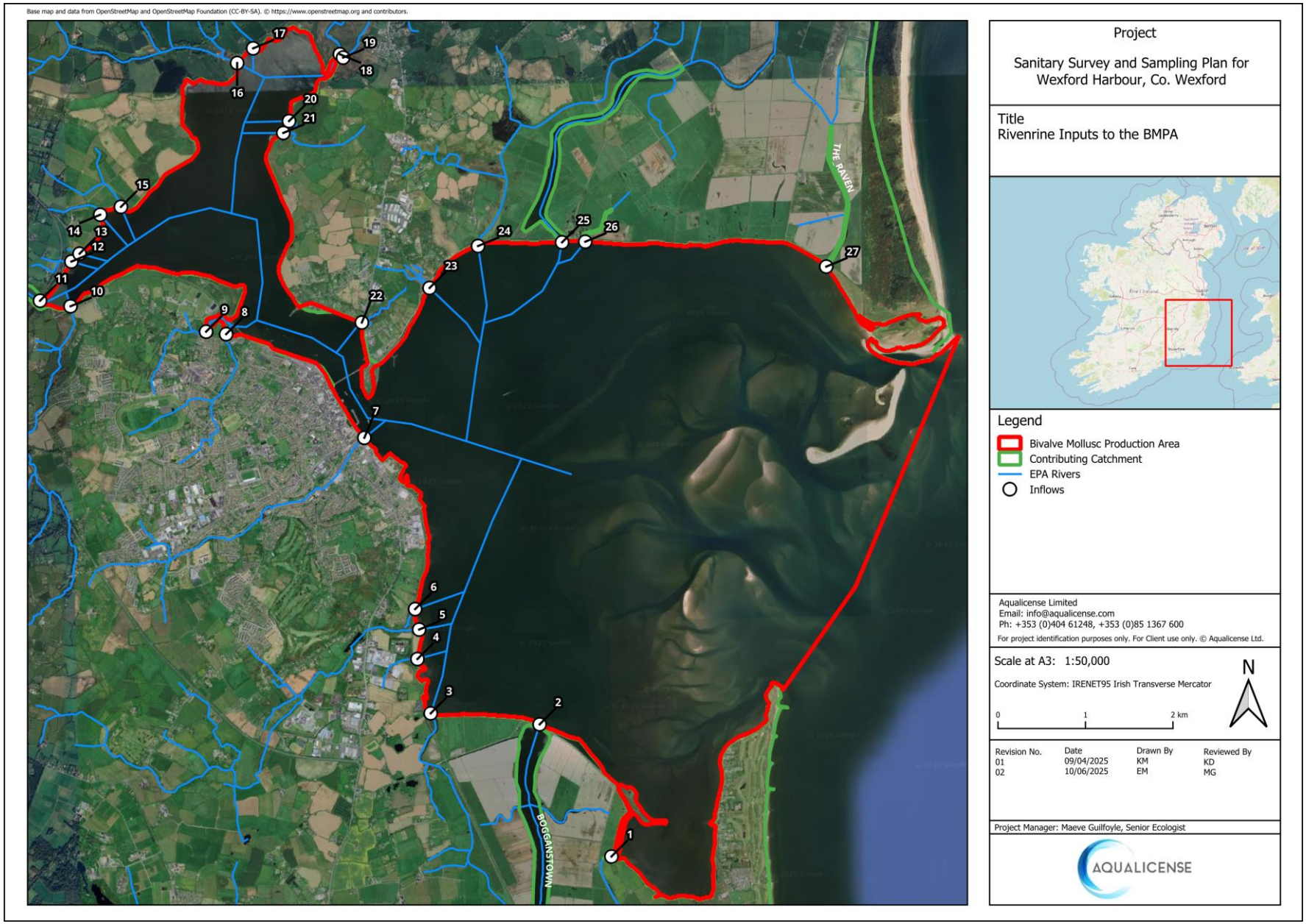

Figure 2-4. Riverine inputs to the BMPA

2.4.1.1 GEOLOGY AND GROUNDWATER

The movement of microbial pollutants, such as *E. coli*, within a catchment is influenced by the underlying geology. Groundwater plays a role in contaminant transport, as pollutants can infiltrate through soil and bedrock, entering the marine environment. Understanding the geological features, particularly groundwater vulnerability, helps assess how contaminants may disperse. *Section 2.5* will provide further detail on groundwater in relation to individual pollution sources.

Pollutants can enter the marine environment via groundwater through two primary pathways. The first is via surface water, where groundwater inflow contributes to rivers, lakes, and other surface waters that eventually discharge into the marine environment. The second pathway is direct submarine groundwater discharge, where groundwater seeps directly into the sea from the seabed, including the intertidal zone (Arévalo-Martínez *et al.*, 2023).

An analysis of groundwater vulnerability (GSI, 2021) within the contributing catchment reveals 27.5% and 31.3% of the contributing catchment as having “Rock at or near Surface or Karst” and “Extreme” vulnerability respectively *(*

Figure 2-5*).* In proximity of the BMPA, areas of elevated groundwater vulnerability exist near the coastline of the Inner Harbour at Inflow 11. Other areas near to coast exist in Wexford Town (near Inflow 3), and in proximity of Castlebridge (to the north of the Inner Harbour). These areas, in addition to areas of elevated vulnerability in the central portion of the contributing catchment, pose the highest risk for pollutant infiltration via groundwater, particularly where they intersect with surface water pathways.

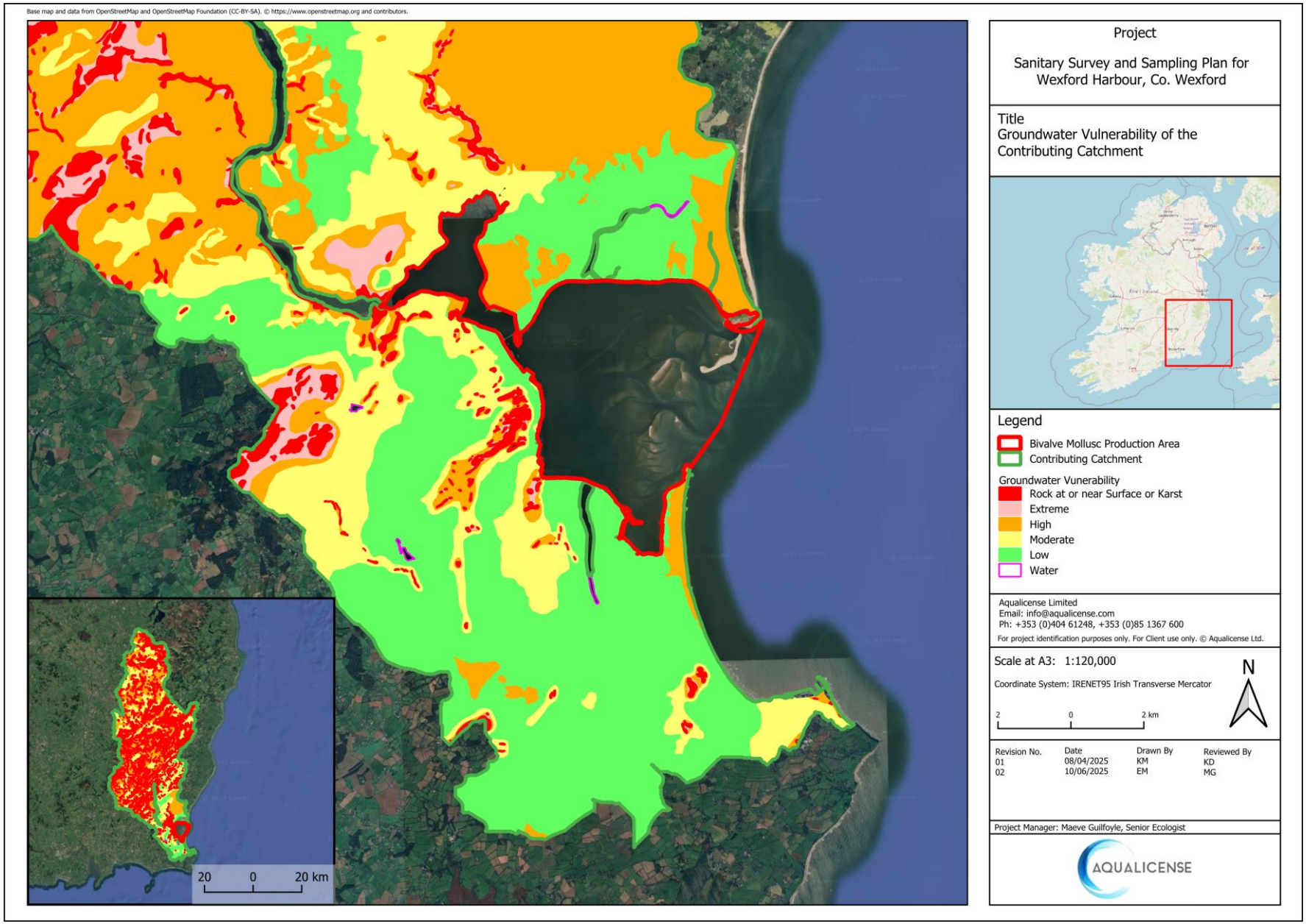

Figure 2-5. Groundwater vulnerability of the contributing catchment.

2.4.1.2 HYDRODYNAMICS

Several hydrodynamic studies have been produced for Wexford Harbour. The most relevant is the Hydrodynamic Dispersion Modelling conducted for a proposed trade discharge outfall (Hydro Environmental Ltd, 2016, 2017). Additional insights were derived from Admiralty Map 1772 (UK Hydrographic Office, 2025). To supplement this information, further data on the Inner Harbour was obtained from Hartnett and Nash (2004). These sources are considered valid for the purposes of this sanitary survey, with any limitations and assumptions discussed below where relevant.

2.4.1.3 BATHYMETRY

Bathymetry was assessed using Admiralty Chart 1722 and data from Hydro Environmental Ltd (2016), providing full coverage of both the Inner and Outer Harbour. The bathymetric profile is complex, shaped by riverine input and tidal action.

In the Outer Harbour, extensive intertidal areas dominate the southern region, extending northwards towards the harbour mouth. A narrower intertidal zone is also present along the northern coast. Between these intertidal areas, deeper channels are evident.

A deeper channel also separates the Inner Harbour from the Outer Harbour. Depths within these channels reach approximately -10m OD. In the Inner Harbour, the southern section, where the River Slaney enters, is notably deeper, while the northern section features a more gradually sloping intertidal area. However, the Admiralty chart highlights the dynamic nature of the Outer Harbour, where depths are continually changing due to sediment movement and hydrodynamic forces.

2.4.1.4 TIDAL INFLUENCE

In accordance with Admiralty Map 1722, the predicted spring and neap tidal ranges are 1.6 metres and 0.5 metres, respectively. The entire BMPA is tidally influenced, with the River Slaney become tidal at Enniscorthy Bridge (EPA, 2023). The duration of the ebb tide exceeds the flood tide by 45-60 minutes, allowing more exchange of water out to the open sea (Hartnett and Nash, 2004). At low water, extensive areas of mudflats become exposed (Hartnett and Nash, 2004). Tidal currents within the harbour will be further elaborated on below (Section 2.4.1.6).

2.4.1.5 TEMPERATURE AND SALINITY

No data is available for temperature and salinity modelling within Wexford Harbour. However, this absence does not undermine the determinations made in this sanitary survey, as there is an abundance of data on tides and currents. Given the significant freshwater input, particularly from the River Slaney, salinity and temperature are expected to fluctuate throughout the tidal cycle, consistent with findings from other sanitary surveys, such as Roaringwater Bay Salinity Survey (SFPA, 2024).

2.4.1.6 CURRENT PATTERNS

Data from Hydro Environmental Ltd (2016) was used to assess current patterns in the Outer Harbour (Figure 2-7). During the flooding tide, a strong inflow occurs through the harbour's mouth, with water directionality becoming more variable upon entry, particularly during neap tides.

Water primarily moves along the northern shore before entering the narrow channel to the Inner Harbour, where velocities increase significantly. The highest velocities (>1.0 m/s) are concentrated in this constricted region. In contrast, the southern portion of the harbour experiences weaker currents, with water moving towards the southwestern shore on the flooding tide. The ebbing tide follows a similar overall pattern, with water exiting through the narrow channel and flowing predominantly

along the northern shoreline. However, current direction is more variable in certain areas due to the presence of sandbanks and mudflats.

Hydro Environmental Ltd (2016) did not provide comprehensive coverage of the Inner Harbour's hydrodynamics. To address this gap, additional data from Hartnett and Nash (2004), collected in 1998/1999, was incorporated. However, given the significant time lapse since data collection, certain limitations must be acknowledged.

The complex and dynamic nature of the harbour's hydrodynamics suggests that current patterns may have changed over time. Nonetheless, a comparison of depth data from Hartnett and Nash (2004) with the most recent bathymetric surveys indicates no substantial geographical changes. Therefore, this dataset remains valid for the purposes of the sanitary survey in the Inner Harbour. During the ebbing tide, a well-defined current pattern exists towards the Outer Harbour. Currents are slacker in the northern, intertidal portion, indicating a slower flushing time in this area. At low water, currents remain weak and follow a similar direction as during the mid-ebb.

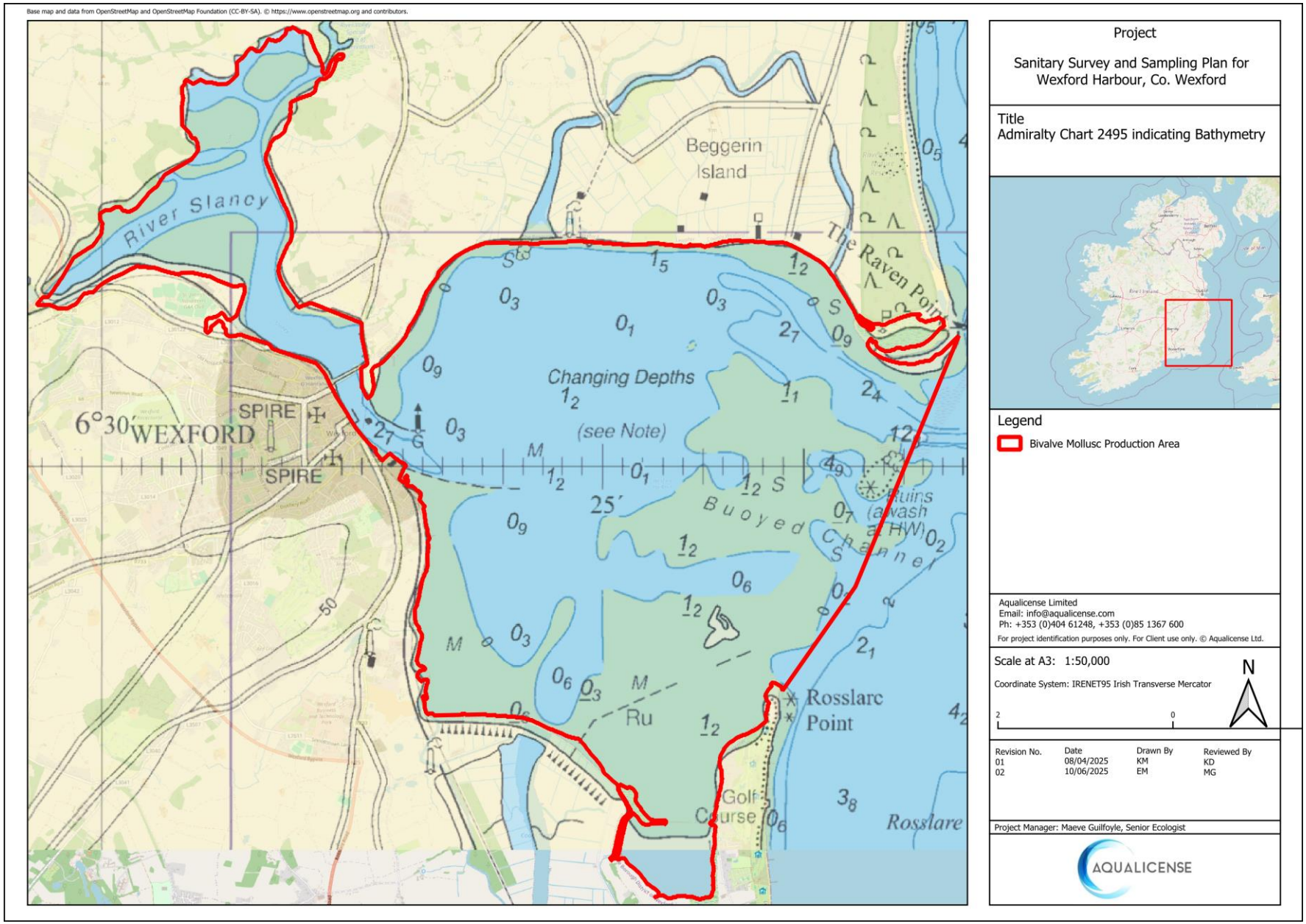

Figure 2-6. Admiralty Map 1172 indicating bathymetry.

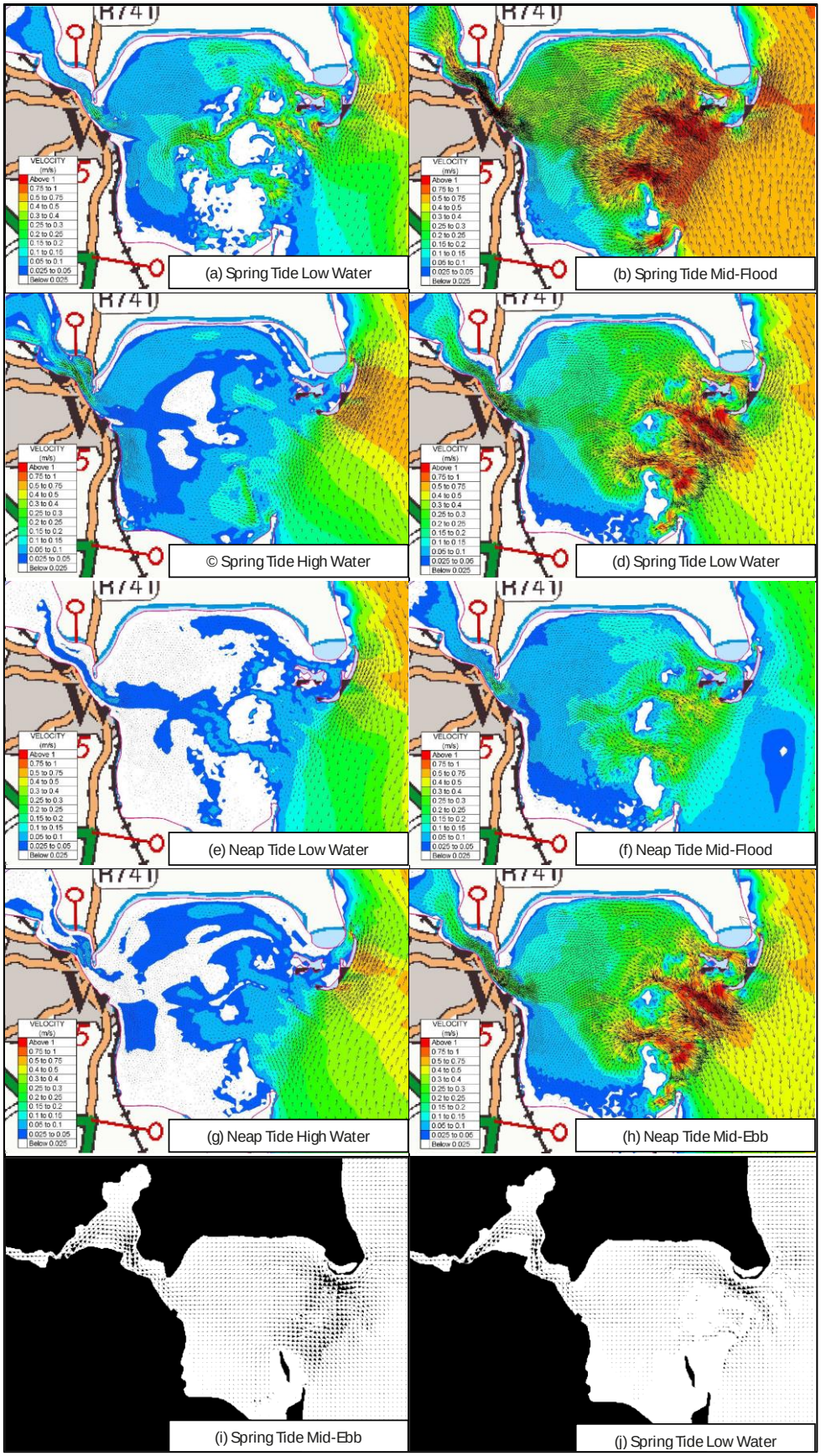

Figure 2-7. Vector arrows representing current direction within Wexford Harbour from Hydro Environmental Ltd (2016; a to h) and Hartnett and Nash (2004; i to j).

2.4.2 WEATHER

Weather patterns significantly influence the transport of organic pollutants. The nearest synoptic weather station to the production area is Johnstown Castle, located c. 4 km southwest. Data from this station from March 2015 to February 2025 inclusive (Met Éireann, 2025a, 2025b) have been used to infer weather patterns and seasonality influencing pollutant circulation within the production area.

2.4.2.1 WIND AND WAVES

Waves and currents play a crucial role in hydrographic conditions. Of particular relevance to sanitary surveys, wind-driven waves facilitate sediment resuspension and transport (Green and Coco, 2014) These waves are primarily generated by local prevailing winds and travel in the direction of those winds. Their characteristics are influenced by factors such as wind speed, duration, and fetch (Young, 1999).

The prevailing wind direction is south-westerly, accounting for 26.8% of all winds *(Figure* 2-8*).* Mean wind speeds for this direction are relatively high, at 9.3 m/s. Westerly and southerly winds account for 14.7% and 17.8% of occurrences, respectively, with mean wind speeds comparable to the prevailing wind (9.2 m/s and 9.4 m/s). The highest mean wind speeds are recorded in a westerly direction (23.5 m/s), followed closely by south-westerly (22.7 m/s), southerly (21.5 m/s), and southeasterly winds (21.4 m/s). For further details refer to *Appendix 1.*

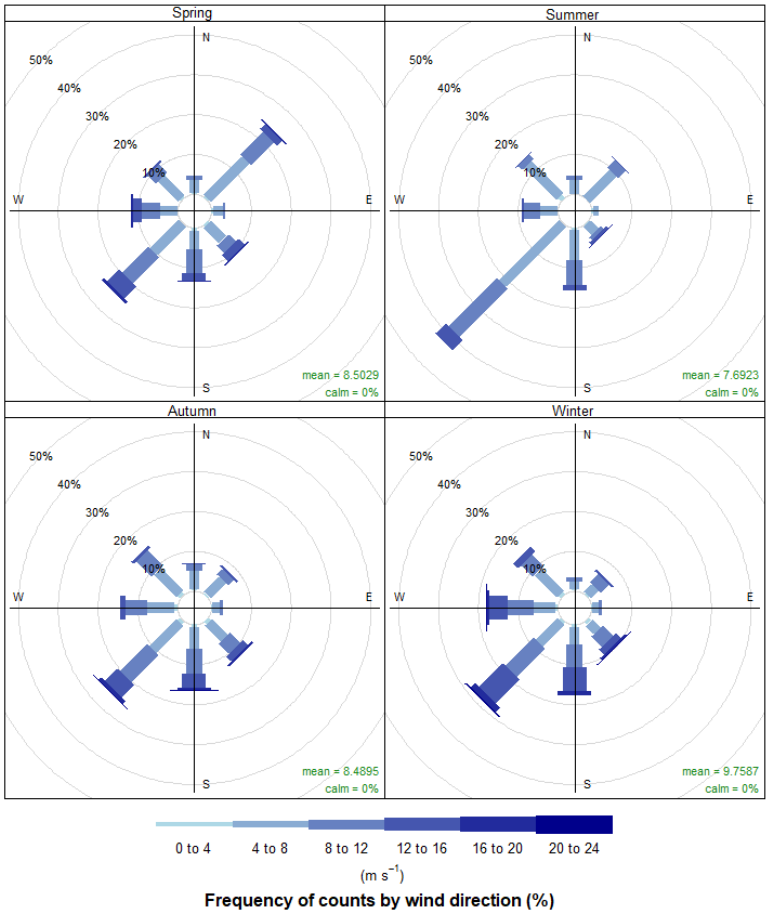

Figure 2-8. Seasonal wind roses for Johnstown Castle (March 2015 to February 2025 inclusive).

A study of the coastal wave and water levels of Wexford, the Burrow and Ferrybank has been conducted (RPS, 2021). Wexford Harbour is primarily exposed to offshore waves from the north-east to south-east, with local waves originating from various wind directions. Notably, winds from the south-east are expected to generate offshore waves directed towards the harbour (RPS, 2021). Given the prevailing wind patterns (Met Éireann, 2025a, 2025b), locally generated waves within the harbour are most likely to move towards the north-east, potentially facilitating contamination transport towards the northern shores of the harbour. However, due to the relatively strong currents in the Outer Harbour, contamination is likely to be carried offshore during the ebb tide. In contrast, the weaker currents to the north of the Inner Harbour may facilitate the accumulation of contamination in these areas.

2.4.2.2 PRECIPITATION

Heavy rainfall can lead to surface runoff, transporting organic pollutants from land-based sources, such as farms and wastewater overflows, into surface water bodies and potentially to the production area. Monthly rainfall is lowest in spring, followed by summer, and peaks in autumn and winter *(Figure 2-9).*

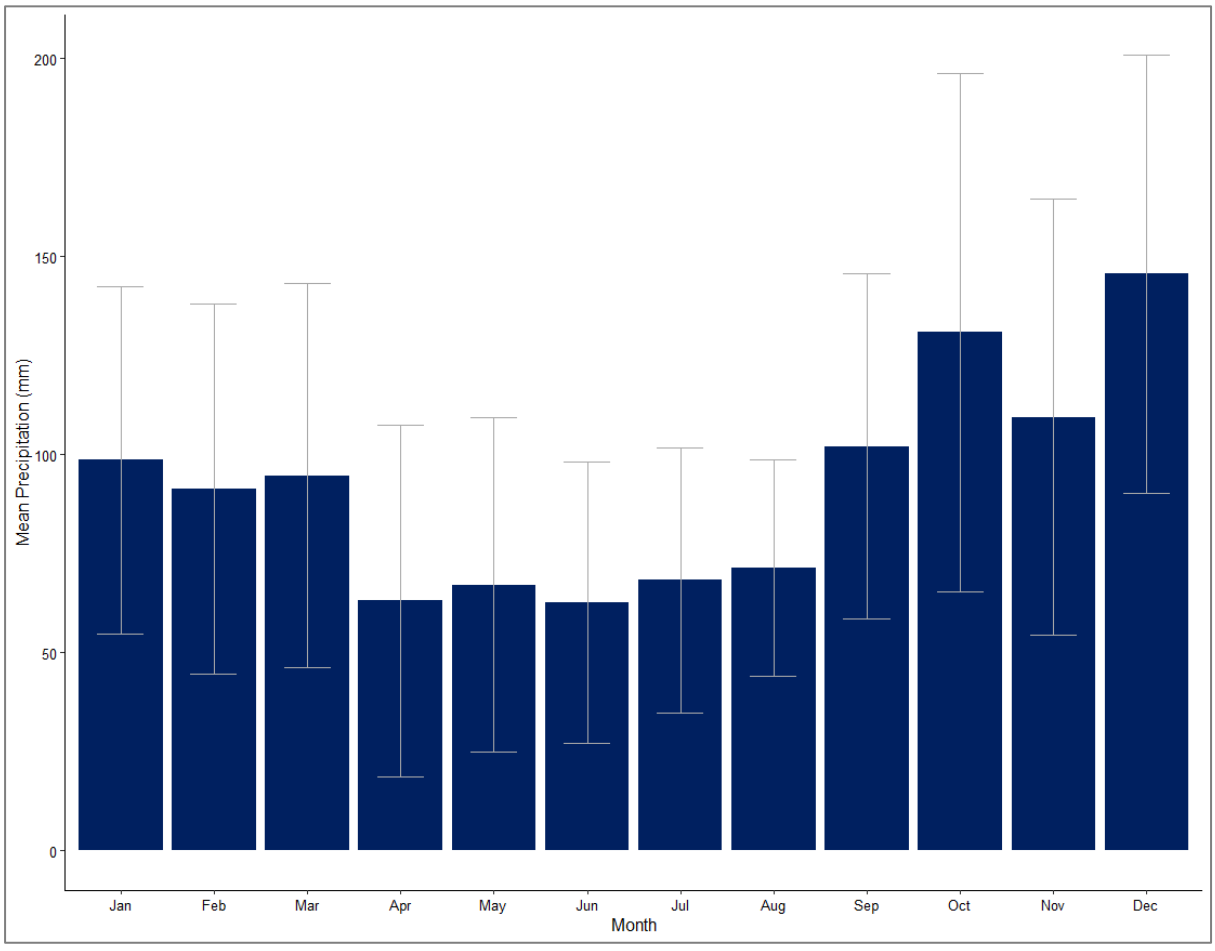

Figure 2-9. Mean monthly precipitation (± 1 standard deviation) at Johnstown Castle (March 2015 to February 2025 inclusive).

Although the mean daily rainfall is highest in December (4.7 mm), significant variation is observed. While heavy rainfall events can occur year-round, they primarily occur in winter, autumn and spring. Heavy rainfall during the spring and summer, when the land is dry and compacted, reduces the soil's

ability to absorb water (Qiu *et al.*, 2021), leading to increased runoff. During this period, higher faecal loadings are likely due to increased stocking densities and the accumulation of faecal contamination throughout the summer. Therefore, the influence of precipitation on circulation of pollutants will be further discussed in *Section 2.5* as relevant for each source of contamination.

2.4.3 Summary of the Characteristics of Circulation of Pollutants

For clarity at this stage of the sanitary survey, a brief overview of the findings of this section of the report will be provided. Key characteristics identified include:

- **Freshwater Inflows**: The majority of watercourses within the contributing catchment enter via the River Slaney at Inflow 11. This is considered to be the primary inflow of freshwater to the harbour.
- **Groundwater**: Groundwater vulnerability along the coastline of the BMPA is elevated in the vicinity of Inflow 11 and Inflow 3. These are the areas at greatest risk in terms of groundwater infiltration.
- **Hydrodynamics**: Current and tidal patterns in Wexford Harbour may lead to localised areas of pollutant concentration, particularly in the northern, intertidal portion of the Inner Harbour, where currents are weaker, and the flushing time is slower. Weaker currents are also experienced in the intertidal areas to the south of the Outer Harbour.
- **Weather**: Sediment resuspension and movement of contaminants may occur during south-easterly winds. Heavy rainfall may influence the seasonality of surface water run-off, particularly during the summer and winter seasons.

These factors collectively affect the entry, movement, and dispersion of pollutants in the production area, with further details on individual pollution sources to be discussed in subsequent sections

2.5 Inventory of Pollution Sources and Seasonal Variations of Pollutants

An inventory will be compiled detailing potential pollution sources of human and animal origin, focusing solely on those containing faecal matter. All identified sources within the contributing catchment *(Figure* 2-1*)* will be assessed, considering seasonal variations where relevant. This assessment complies with Part 1a and 1b of Article 56 of Commission Implementing Regulation (EU) 2019/627 (see *Section 1* for details).

2.5.1 Sewage Discharges

This section examines sewage discharges from human sources, primarily Urban Wastewater Treatment Plants (UWWTPs) and septic tanks. Contamination risk is influenced by factors such as location, size, treatment level, and discharge frequency. The following sections will provide a detailed analysis of all identified discharges within the contributing catchment.

2.5.1.1 Urban Wastewater Treatment Plants

UWWTPs are linked to various discharges, primarily the continuous release of treated and untreated sewage. They also produce intermittent discharges, including rainfall-dependent releases via combined sewer overflows (CSOs) and stormwater overflows, as well as emergency discharges under exceptional circumstances.

An examination of EPA data (EPA, 2025b) identified 33 Urban Waste Water Treatment Plants (UWWTPs) in the contributing catchment, serving a Population Equivalent (PE) of less than 500. Additionally, 19 active Waste Water Discharge Authorisations (WWDAs) exist for UWWTPs serving a PE of more than 500[1]. The most recent Annual Environmental Reports (Uisce Eireann, 2023) were reviewed to characterise these UWWTPs, as summarised in *Table* 2-3. All Annual Environmental Reports indicated a deterioration in water quality downstream of the UWWTPs. However, it was not possible to determine whether this decline was directly attributable to the UWWTP discharges.

The majority of UWWTPs (13) discharge via Inflow 11, located to the east of the Inner Harbour through the River Slaney. Of these, three were non-compliant with Emission Limit Values (ELVs) in 2023. Direct emissions are also occurring to the BMPA via the Wexford Town UWWTP (D0030-02), which discharges into the centre-east of the Outer Harbour. Several Storm Water Overflows (SWOs) associated with this UWWTP have also been identified as discharging into inflows around the harbour. While some SWO locations may be inaccurately recorded, they have been included in this assessment to reflect a worst-case scenario. A further two UWWTPs discharge via Inflow 18 to the north of the Outer Harbour, one of which was non-compliant in 2023. Additionally, two UWWTPs discharge via Inflow 1 in the south-east of the Outer Harbour, both of which were compliant with ELVs in 2023.

Given the number of UWWTPs discharging via Inflow 11 and the associated non-compliance issues, the east of the Inner Harbour (and areas of subsequent circulation) is considered the primary area of concern for UWWTP-related discharges. Additionally, discharges from the Wexford Town UWWTP to the Outer Harbour, along with those via Inflow 1, are also of concern due to the reduced current velocity in these areas, which may allow for the accumulation of contaminants.

1 A number of WWDAs cover multiple WWTPs in close proximity however for the purposes of this assessment and calculations, each WWDA is considered to be a single WWTP.

Table 2-3. Characterisation of all Waste Water Discharge Authorisations for UWWTPs serving a Population Equivalent >500 within the Contributing Catchment.

Name	Discharge Point Reference (Inflow Point)	Storm Water Overflows (Irish Grid, Approx. Ultimate Inflow point)	Treatment	Capacity Remaining/ Exceeded	2023 AER Compliant (Y/N)	Parameters Failing	Capacity to be exceeded by 2026	Incidents in 2023	Notes
D0029-01 Enniscorthy	TPEFF3300D0029SW001 (11)	SW003 (52.4926, -6.5698; 11) SW004 (52.4967, -6.5668; 11) SW005 (52.5008, -6.5641; 11) SW007 (52.5058, -6.5694; 11) SW008 (52.5153, -6.5956; 11) SW009 (52.5049, -6.5885; 11) SW011 (52.4888, -6.5688; 11) NA (52.5042, -6.5691; 11) NA (52.506, -6.5694; 11)	Secondary Treatment	11531 Remaining	N	Total Nitrogen	NA	2	All discharges will ultimately enter the BMPA via the Inflow 11. Deterioration in Ammonia BOD downstream of the effluent discharge was noted. Deterioration in water quality identified but not known if caused by the WWTP. No observable negative impact on WFD status.
D0030-02 Wexford Town	TPEFF3300D0030SW001 (Lower Slaney Estuary)	SW009 (52.3827, -6.4565; 11) SW011 (52.2837, -6.4925; 3) SW003 (52.3152, -6.4499; 5) SW004 (52.3349, -6.4553; 7) SW005 (52.331, -6.4637; 7) SW006 (52.3463, -6.4789; 8) SW010 (52.3205, -6.65; Not in CC) SW012 (52.2837, -6.4925; 3) SW014 (52.3351, -6.4608; 7) SW007 (52.3044, -6.4617; 3) - (52.3795, -6.4478; 18) SW013(52.3482, -6.4557; 22) SW002(52.2869, -6.5259; 3) - (52.3295, -6.4714; 7)	Tertiary N&P Removal	13117 Remaining	Y	Pass	NA	58	Primary emission point directly to BMPA. Shellfish Impact Assessment Required by license but not in the 2023 report. Deterioration in cBOD mg/l and Dissolved Oxygen mg/l concentrations downstream of the effluent discharge was noted. Deterioration in water quality identified but not known if caused by the WWTP. No observable negative impact on WFD status.
D0064-01 Carnew	TPEFF3400D0064SW001 (11)	SW002 (52.7087, -6.5106; 11)	Secondary Treatment	625 Remaining	Y	Pass	No	0	All discharges will ultimately enter the BMPA via the Inflow 11. Deterioration in Ortho-P concentration downstream of the effluent discharge was noted. Deterioration in water quality identified but not known if caused by the WWTP. No observable negative impact on WFD status.
D0089-01 Baltinglass	TPEFF3400D0089SW001 (11)	SW002 (52.931, -6.6962; 11)	Tertiary P Removal	621 Remaining	Y	Pass	No	0	All discharges will ultimately enter the BMPA via the Inflow 11. Deterioration in BOD and Ortho-P concentrations downstream of the effluent discharge was noted. Deterioration in water quality identified but not known if caused by the WWTP. No observable negative impact on WFD status.

Name	Discharge Point Reference (Inflow Point)	Storm Water Overflows (Irish Grid, Approx. Ultimate Inflow point)	Treatment	Capacity Remaining/ Exceeded	2023 AER Compliant (Y/N)	Parameters Failing	Capacity to be exceeded by 2026	Incidents in 2023	Notes
D0091-01 Tullow	TPEFF0100D0091SW001 (11)	SW006 (52.8024, -6.7382; 11) SW005 (52.8072, -6.747; 11) SW004 (52.797, -6.7345; 11) SW003 (52.8012, -6.7368; 11) SW007 (52.8034, -6.703; 11) TBC (52.8, -6.7341; 11) SW008b (52.7932, -6.7464; 11) SW010 (52.7994, -6.7344; 11)	Tertiary P Removal	Exceeded by 2433	Y	Pass	No	3	All discharges will ultimately enter the BMPA via the Inflow 11. No observable impact on water quality. No observable negative impact on WFD status.
D0163-01 Bunclody	TPEFF3300D0163SW001 (11)	SW-2 (52.6531, -6.6473; 11)	Tertiary P Removal	3671 Remaining	Y	Pass	No	2	All discharges will ultimately enter the BMPA via the Inflow 11. Deterioration in Ammonia Ortho Phosphate concentrations downstream of the effluent discharge was noted. Deterioration in water quality identified but not known if caused by the WWTP. No observable negative impact on WFD status.
D0165-01 Rosslare Harbour	TPEFF3300D0165SW001 (Coastal Water near Rosslare)	TBC (52.2428, -6.3462; Not in CC) SW-2 (52.2491, -6.3595; 1) SW-3 (52.2538, -6.344; Coastal Water outside BMPA) TBC (52.2464, -6.3538;1) TBC (52.2445, -6.3367; Not in CC) TBC (52.2455, -6.3404; Not in CC)	Secondary Treatment	6733 Remaining	Y	Pass	No	1	Primary discharge enters coastal water and does not directly enter the BMPA. However, some SWOs present in the contributing catchment, ultimately discharging via the Inflow 1. No observable impact on water quality. No observable negative impact on WFD status.
D0169-01 Ferns and Environs	TPEFF3300D0169SW001 (Ferns South WWTP; 11)	None	Tertiary P Removal	580 Remaining	N	Ammonia-Total (as N) Ortho-Phosphate (as P) Suspended Solids	No	2	All discharges will ultimately enter the BMPA via the Inflow 11. Deterioration in Ammonia concentrations downstream of the effluent discharge was noted. Deterioration in water quality identified but not known if caused by the WWTP. No observable negative impact on WFD status.
	TPEFF3300D0169SW002 (Ferns North WWTP; 11)	None	Primary	Exceeded by 125	N	Ammonia-Total (as N) Carbonaceous BOD COD-Cr Ortho-Phosphate (as P) Suspended Solids mg/l	Yes		All discharges will ultimately enter the BMPA via the Inflow 11. Deterioration in Ammonia BOD concentrations downstream of the effluent discharge was noted. Deterioration in water quality identified but not known if caused by the WWTP. No observable negative impact on WFD status.
D0173-01 Rosslare Strand and Environs	TPEFF3300D0173SW001 (Coastal Water outside BMPA)	TBC (52.2641, -6.3921; 1) SW002 (52.2919, -6.3863; Coastal Water outside BMPA)	Secondary Treatment	1541 Remaining	N	Ammonia-Total (as N)	No	10	Primary discharge enters coastal water and does not directly enter the BMPA. However, one SWO ultimately discharges via Inflow 1. Deterioration in water quality identified but not known if caused by the WWTP. No observable negative impact on WFD status.
D0221-01 Tinahely	TPEFF3400D0221SW001 (11)	SW002 (52.7983, -6.4611; 11) SW003 (52.7988, -6.4622; 11)	Secondary Treatment	2 Remaining	Y	Pass	Yes	0	All discharges will ultimately enter the BMPA via the Inflow 11. Deterioration in Ammonia and Ortho-P concentrations downstream of the effluent discharge was noted. Deterioration in water quality identified but not known if caused by the WWTP. No observable negative impact on WFD status.

Name	Discharge Point Reference (Inflow Point)	Storm Water Overflows (Irish Grid, Approx. Ultimate Inflow point)	Treatment	Capacity Remaining/ Exceeded	2023 AER Compliant (Y/N)	Parameters Failing	Capacity to be exceeded by 2026	Incidents in 2023	Notes
D0237-01 Rathvilly	TPEFF0100D0237SW001 (11)	TBC (52.8822, -6.7024; 11)	Tertiary N&P Removal	833 Remaining	Y	Pass	No	16	All discharges will ultimately enter the BMPA via the Inflow 11. No observable impact on water quality identified. No observable negative impact on WFD status.
D0243-01 Hacketstown	TPEFF0100D0243SW001 (11)	SW2 (52.8691, -6.5701; 11)	Tertiary N&P Removal	1172 Remaining	Y	Pass	No	0	All discharges will ultimately enter the BMPA via the Inflow 11. Deterioration in BOD concentrations downstream of the effluent discharge was noted. Deterioration in water quality identified but not known if caused by the WWTP. No observable negative impact on WFD status.
D0247-01 Ballon	TPEFF0100D0247SW001 (11)	SW002 (52.7433, -6.7697; 11)	Tertiary P Removal	493 Remaining	Y	Pass	No	2	All discharges will ultimately enter the BMPA via the Inflow 11. No observable impact on water quality identified. No observable negative impact on WFD status.
D0390-01 Myshall	TPEFF0100D0390SW001 (11)	SW002 (52.6882, -6.79; 11)	Tertiary P Removal	453 Remaining	N	Temperature	No	2	All discharges will ultimately enter the BMPA via the Inflow 11. No observable impact on water quality identified. No observable negative impact on WFD status.
D0397-01 Tagoat and Environs	TPEFF3300D0397SW001 (1)	N/A	Secondary Treatment	290 Remaining	Y	Pass	Yes	0	All discharges will ultimately enter the BMPA via the Inflow 1. Deterioration in Ammonia and BOD concentrations downstream of the effluent discharge was noted. Deterioration in water quality identified but not known if caused by the WWTP. No observable negative impact on WFD status.
D0398-01 Ballaghkeen and Environs	TPEFF3300D0398SW001 (Ballaghkeen WWTP; 18)	TBC (52.4792, -6.4241; 18)	Tertiary P Removal	105 Remaining	N	Ammonia-Total (as N)	Yes	8	All discharges will ultimately enter the BMPA via the Inflow 11. Deterioration in Ammonia Ortho-phosphate concentrations downstream of the effluent discharge was noted. Deterioration in water quality identified but not known if caused by the WWTP. No observable negative impact on WFD status.
	TPEFF3300D0398SW002 (Thornbrook Estate WWTP; 18)		Tertiary P Removal	51 Remaining	N	Ammonia-Total (as N)	No		All discharges will ultimately enter the BMPA via the Inflow 11. No observable negative impact on WFD status.
D0404-01 Clonroche	TPEFF3300D0404SW001 (11)	TBC (52.8822, -6.7024; 11)	Secondary Treatment	137 Remaining	Y	Pass	No	0	All discharges will ultimately enter the BMPA via the Inflow 11. Deterioration in BOD Ortho-phosphate concentrations downstream of the effluent discharge was noted. Deterioration in water quality identified but not known if caused by the WWTP. No observable negative impact on WFD status.
D0405-01 Camolin and Environs	TPEFF3300D0405SW002 (Camolin Secondary Discharge, 11)	TBC (52.6146, -6.4233; 11) - (52.6134, -6.4329; 11)	Primary Treatment	Exceeded by 152	N	Ammonia-Total (as N) Carbonaceous BOD COD-Cr ortho-Phosphate (as P) Suspended Solids	Yes	2	All discharges will ultimately enter the BMPA via the Inflow 11. Deterioration in BOD, Ammonia and Ortho-Phosphate concentrations downstream of the effluent discharge was noted. Deterioration in water quality identified but not known if caused by the WWTP. No observable negative impact on WFD status.
	TPEFF3300D0405SW001 (Camolin WWTP (North), 11)		Primary Treatment	Exceeded by 102	N	Ammonia-Total (as N) mg/l Carbonaceous BOD COD-Cr Ortho-Phosphate (as P) Suspended Solids mg/l	Yes		All discharges will ultimately enter the BMPA via the Inflow 11. Deterioration in BOD, Ammonia and Ortho-Phosphate concentrations downstream of the effluent discharge was noted. Deterioration in water quality identified but not known if caused by the WWTP. No observable negative impact on WFD status.

Name	Discharge Point Reference (Inflow Point)	Storm Water Overflows (Irish Grid, Approx. Ultimate Inflow point)	Treatment	Capacity Remaining/ Exceeded	2023 AER Compliant (Y/N)	Parameters Failing	Capacity to be exceeded by 2026	Incidents in 2023	Notes
D0407-01 Ballymurn and Environs	TPEFF3300D0407SW001 (18)	N/A	Tertiary P Removal	42 Remaining	Y	Pass	Yes	2	All discharges will ultimately enter the BMPA via the Inflow 11. Deterioration in BOD, Ammonia Ortho-Phosphate concentrations downstream of the effluent discharge was noted. Deterioration in water quality identified but not known if caused by the WWTP. No observable negative impact on WFD status.

2.5.1.2 SEPTIC TANKS AND OTHER SEWERAGE TYPES

Ireland has nearly half a million Domestic Waste Water Treatment Systems (DWWTSs), primarily septic tanks (EPA, 2021). In 2023, 45% of these systems failed inspection, posing risks to household drinking water and the wider environment, including surface and groundwater. The EPA categorises DWWTS risk zones as follows:

- Zone 1: Higher risk to surface waters.
- Zone 2: Higher risk to household wells.
- Zone 3: Lower risk areas.

Currently, no comprehensive database exists for DWWTS locations. Therefore, this section relies on Census 2022 small-area statistics (CSO, 2023c). A total of 491 Small Areas overlap the contributing catchment. *Appendix 2* and *Figure* 2-10 present the percentage of each small area overlapping the contributing catchment and its population density.

Population density within the study area ranges from 4 people per km² in Knockrath (A257053001) to 9,157 people per km² in the Enniscorthy Rural (A247045027), with a mean population density of 1,447 people per km². The majority of these small areas drain into the River Slaney, which ultimately discharges into the BMPA at the Inner Harbour. Additionally, areas of high population density, particularly in Wexford Town, directly border the BMPA, potentially influencing water quality in the region.

Sewerage type estimates were also obtained from Census 2022 data (CSO, 2023b). These figures are presented as percentages for entire small areas, as individual data for overlapping catchments would not be representative (small areas do not directly align with the contributing catchment, see *Figure* 2-11 highlights that approximately half of the households in the contributing catchment rely on UWWTPs, while the other half depend on individual septic tanks. This distribution reflects the diverse nature of the large contributing catchment, which includes both urban and rural areas. Rural households, being more dispersed and located farther from UWWTP infrastructure, are more likely to rely on individual septic tanks for wastewater treatment.

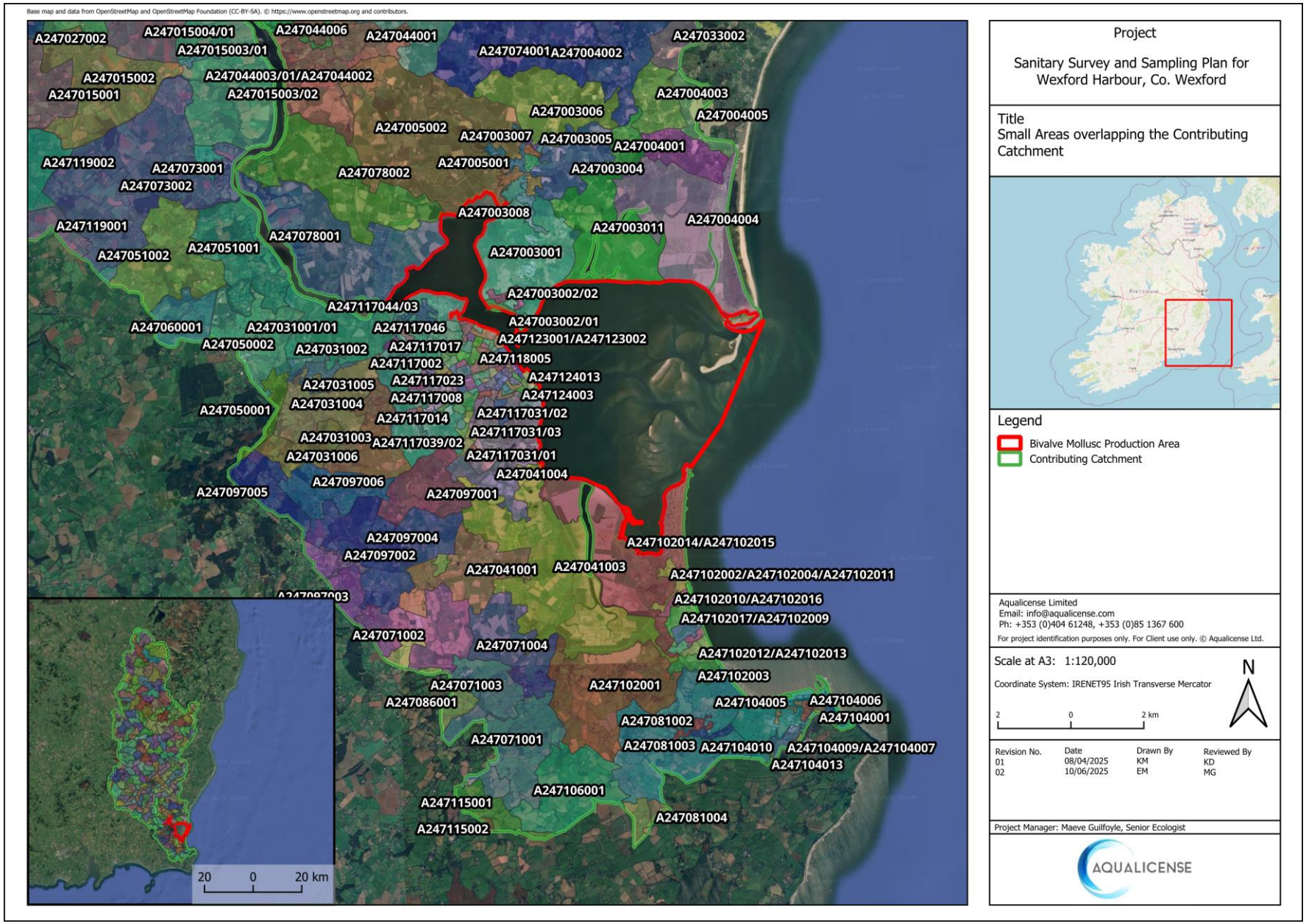

Figure 2-10. Small Areas overlapping the contributing catchment.

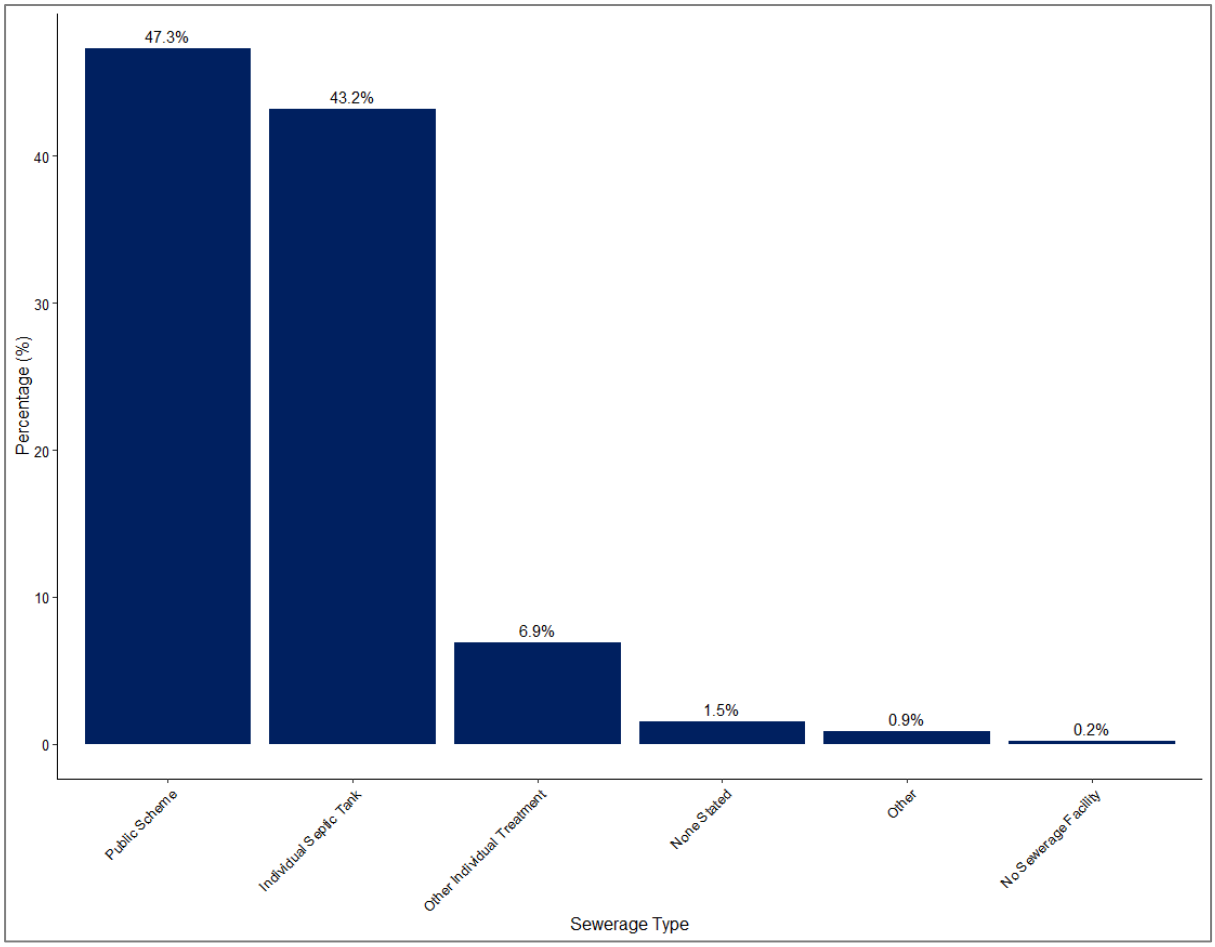

Figure 2-11. Percentage estimates of sewerage types for permanent private households according to the 2022 census.

The majority of the contributing catchment falls within Zone 3 (Low Risk) for Domestic Wastewater Treatment Systems (DWWTSs) (EPA, 2021), with smaller portions classified as Zone 2, which poses a higher relative risk to household wells, and Zone 1, which presents a higher relative risk to surface waters *(Figure* 2-12*).* Two notable areas of Zone 1 exist within the contributing catchment, indicating a heightened potential for contamination.

One of these high-risk areas is located in the vicinity of Ballaghkeen, Glenbrien, and Ballymurn, along the Sow Watercourse (EPA Code: 12S03) and its associated tributaries. This watercourse ultimately discharges at Inflow 18 in the Inner Harbour. As this risk zone lies predominantly within a separate groundwater body from the coastal areas overlapping the BMPA, contamination from this source is primarily expected to occur via surface water pathways.

The second area of concern is situated immediately adjacent to the BMPA, south of Wexford Town, along the Assaly (EPA Code: 12A02) and its associated tributaries, which discharge into the south of the Outer Harbour via Inflow 3. This area also overlaps a region of elevated groundwater vulnerability directly bordering the BMPA, further increasing the risk of contamination.

While these risk zones highlight areas of potential contamination, other factors must be considered when assessing the susceptibility of DWWTSs to failure or non-compliance. Given that a considerable proportion of the population relies on septic tanks, contamination potential exists even outside these

designated risk zones. Considering the extensive land area and large population contributing to the River Slaney, Inflow 11 is likely the greatest risk area for introducing contaminants from DWWTSs into the BMPA. Nonetheless, the area surrounding Inflows 3 and 18 are also of concern due to a combination of elevated groundwater vulnerability, surface water flows, and the presence of slacker circulation, which may allow for contamination accumulation.

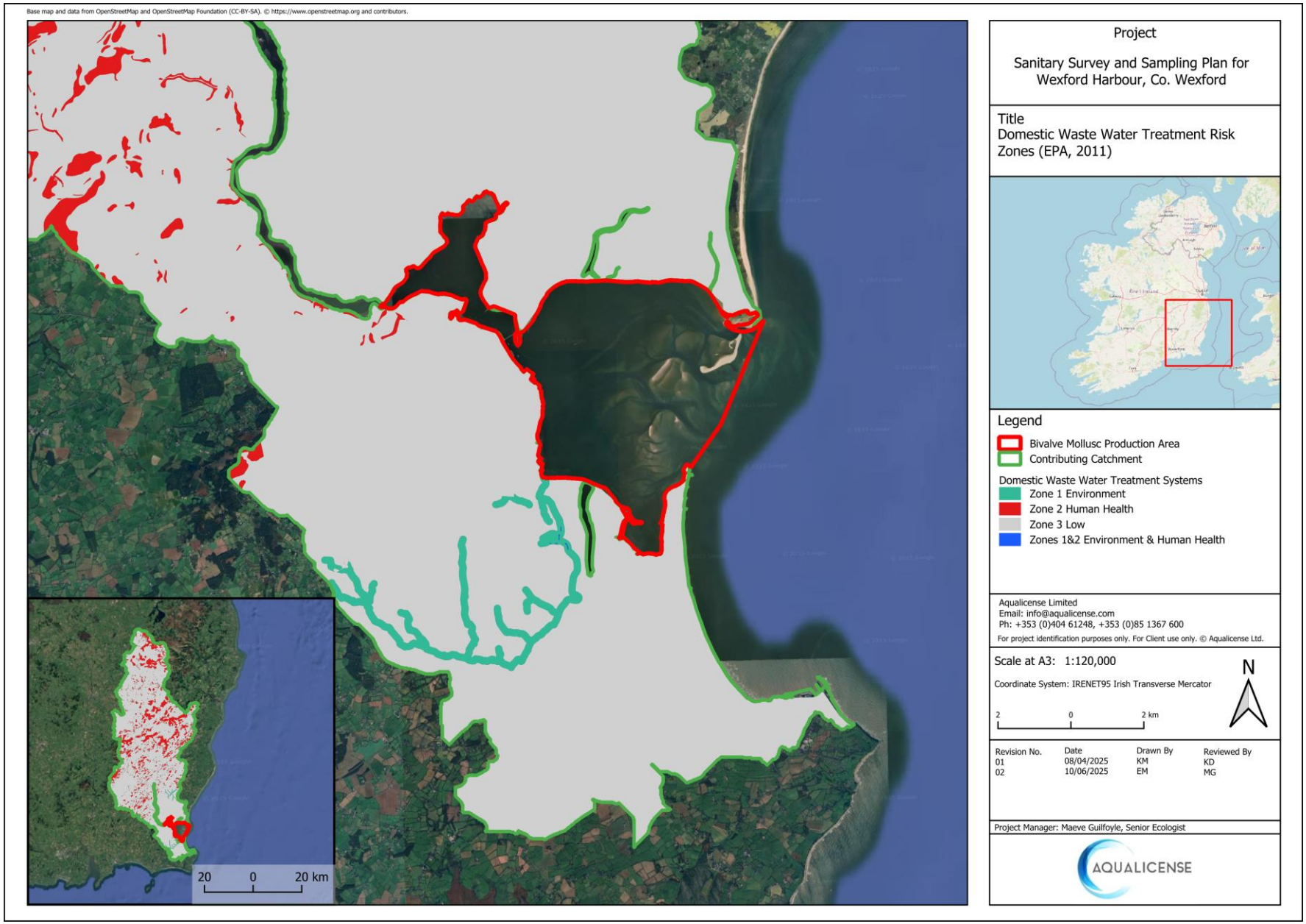

Figure 2-12. Domestic Waste Water Treatment System Risk Zones (EPA, 2021).

2.5.2 INDUSTRIAL EMISSIONS

2.5.2.1 IE AND IPC LICENSES

The EPA regulates specific industrial and agricultural activities in Ireland through Industrial Emissions (IE) licences and Integrated Pollution Control (IPC) licences. While these cover a broad range of activities, only those relevant to potential faecal contamination from human or animal sources are considered in this desk-based study. The key categories assessed include:

- Food and Drink
- Waste
- Intensive Agriculture (Poultry and Pigs)
- Other Activities (including wastewater treatment)

A total of eight relevant licenses have been granted within the contributing catchment (EPA, 2024a). Excluding any licences previously discussed in *Section 2.5.1.1*, the *Table* 2-4 examines these licenses in detail, utilising information from the License and Enforcement Access Portal (EPA, 2025c).

Considering surface water pathways, seven licensed facilities have potential connectivity with surface water that ultimately discharges via Inflow 11 in the Inner Harbour. Among these, two facilities have recorded relevant non-compliances related to surface water since 2023. Additionally, one licensed facility is situated adjacent to the Assaly (EPA Code: 12A02), which discharges into the BMPA via Inflow 3 in the Outer Harbour.

In terms of groundwater, four licensed facilities are located within groundwater bodies that lie adjacent to the BMPA. Three of these facilities overlie the Castlebridge North groundwater body, which borders the southern coast of the Inner Harbour and extends along the coast of the Outer Harbour near Wexford Town. Two of these facilities have had relevant non-compliances since 2023. The presence of elevated groundwater vulnerability in the vicinity of Inflow 11 further increases the risk of contamination in this area. Another facility is situated over the Fardystown groundwater body, which borders the southern Outer Harbour, though no recent non-compliances have been recorded there.

Overall, Inflow 11 emerges as the primary area of concern for contamination from licensed facilities due to the number of connected surface water pathways, the presence of non-compliant facilities, and the elevated groundwater vulnerability in this region. Inflow 3 is also a potential risk area, particularly in relation to surface water connectivity, and considering reduced current velocities in the area.

Table 2-4. Characterisation of the relevant IE and IPC licenses granted within the contributing catchment.

LICENSE TYPE	LICENSE NUMBER	NAME	PATHWAYS	LATITUDE (WGS 84)	LONGITUDE (WGS 84)	SECTOR	RELEVANT COMPLIANCE INFORMATION
IEL	P0310	Mr Brian Dowley	Overlies a different groundwater body (Ballyglass) to those bordering the BMPA. In vicinity of Lumcloon 12 (12L11) which ultimately discharges to Inflow 11.	52.8159	-6.6539	Intensive Agriculture (Pig Rearing)	Elevated ammonia recorded at monitoring points in a 2024 inspection.
IEL	P0453	Rennard Pig Farms Limited (The Deeps/Cornwall)	Overlies a groundwater body (Castlebridge North) that borders the BMPA. In vicinity of Slaney (12S02) which ultimately discharges to Inflow 11. Castlebridge North GWB, which bounds portions of the southern Inner Harbour and outer Harbour near Wexford Town	52.3844	-6.5614	Intensive Agriculture (Pig Rearing)	2023 AER indicated no impacts on surface water or groundwater quality,
IEL	W0016	Killurin Landfill Site	Overlies a groundwater body (Castlebridge North) that borders the BMPA. In vicinity of Slaney (12S02), which ultimately discharges to Inflow 11	52.3816	-6.5612	Waste (Landfill)	This site was identified as having a significant pressure on the groundwater body under the third-cycle River Basin Management Plan (2022-2027).
IEL	W0066	Rampere Landfill	Overlies a different groundwater body (Ballyglass) to those bordering the BMPA. In vicinity of Gibraltar 12 (12S02), which ultimately discharges to Inflow 11	52.9688	-6.7130	Waste (Landfill)	As indicated in the 2024 AER, this landfill closed in 2010. Leachate monitoring was below EPA limits based in 2024 AER.
IEL	W0191	Holmestown Waste Management Facility	Overlies a groundwater body (Castlebridge North) that borders the BMPA. In vicinity of Holmestown_Great (12H04), which ultimately discharges to Inflow 11	52.3512	-6.5737	Waste (Waste Management)	Non-compliance issue in April 2024 relating to green waste stored in an undesignated area posing a risk to groundwater and surface water. This was subsequently removed by October.

License Type	License Number	Name	Pathways	Latitude (WGS 84)	Longitude (WGS 84)	Sector	Relevant Compliance Information
IEL	P0470	Mr Patrick Moore	Overlies a different groundwater body (Ballyglass) to those bordering the BMPA. In vicinity of Rath_East (12R33), which ultimately discharges to Inflow 11	52.8007	-6.6749	Intensive Agriculture (Pig Rearing)	2023 AER indicated no impacts on surface water or groundwater quality,
IEL	W0204	Brownfield Restoration Ireland Ltd	Overlies a different groundwater body (Ballyglass) to those bordering the BMPA. In vicinity of Carrigower (12C06), which ultimately discharges to Inflow 11	53.0017	-6.6413	Waste (Remediation and Restoration)	No compliance records as not commenced.
IEL	P0429	Rennard Pig Farms Limited (South Slobs)	Overlies a groundwater body (Fardystown) that borders the BMPA. In vicinity of Assaly (12A02), which ultimately discharges to Inflow 3	52.3038	-6.4409	Intensive Agriculture (Pig Rearing)	2023 AER indicated no impacts on surface water or groundwater quality,

2.5.2.1 SECTION 4 DISCHARGES

Section 4 Discharge licences, issued under Section 4 of the Local Government (Water Pollution) Act 1977 (as amended in 1990), regulate the discharge of trade and sewage effluent into surface water and groundwater. These licences set conditions to ensure effluent is treated and controlled to protect the receiving environment.

A total of 39 Section 4 discharges are present within the contributing catchment (EPA, 2024b), which will be characterised and discussed in *Table* 2-5. Data from the relevant local authorities regarding the specifics of Section 4 discharges, including whether they were directed to groundwater or surface water, were not available online. To characterise potential effluent types, Google Maps and satellite imagery were consulted on 27/03/2025 *(Table* 2-5*)* However, due to the lack of detailed information, a precautionary approach was taken, assuming that each Section 4 discharge could be a potential source of faecal contamination to both surface and groundwater.

Of the Section 4 discharges identified, the majority (26) ultimately enter the BMPA via Inflow 11 in the Inner Harbour, with an additional discharge occurring in close proximity to this inflow (Inflow 10). Elsewhere in the Inner Harbour, four discharges enter the BMPA to the north. In the Outer Harbour, a single discharge reaches the south via Inflow 3, while another four discharge into the northern section via Inflow 24 and Inflow 25.

Considering groundwater, 15 discharges overlie groundwater bodies that directly border the BMPA. The majority (13) of these are located within the Castlebridge North groundwater body, which extends along the southern coast of the Inner Harbour and continues along the Outer Harbour near Wexford Town. Areas of elevated groundwater vulnerability exist along the coastline, especially near Inflow 11. Additionally, two discharges overlie the Castlebridge South groundwater body, which borders the northern shores of both the Inner and Outer Harbour. Areas of “High” groundwater vulnerability are also present along the eastern section of the Inner Harbour.

Given the potential volume of pollutants entering via Inflow 11, this area presents the greatest risk of contamination, particularly in zones where circulation may lead to the accumulation of pollutants. Additionally, the intertidal area to the north of the Inner Harbour is an area of concern due to reduced circulation and slower current velocities, which may further contribute to the retention of contaminants. The presence of elevated groundwater vulnerability along the coastline, particularly near Inflow 11, exacerbates this risk, while discharges into the Castlebridge North and Castlebridge South groundwater bodies further highlight the potential for groundwater-mediated pollution entering the BMPA, particularly in proximity of Inflow 11.

Table 2-5. Characterisation of the Section 4 Discharges within the contributing catchment.

REFERENCE	NAME	PATHWAY	LATITUDE (WGS 84)	LONGITUDE (WGS 84)	NOTES
RPS06	Liffey Meats	Overlies a different groundwater body (Ballyglass) to those bordering the BMPA. In the vicinity of the Derren 12 (112D01), which ultimately enters the BMPA via Inflow 11.	52.86895	-6.55748	Potential association with agricultural emissions.
SS/W188/05	Francis Fenlon & Michael Goff	Overlies a different groundwater body (Enniscorthy) to those bordering the BMPA. In the vicinity of the Garryphelim 12 (12G63), which ultimately enters the BMPA via Inflow 11.	52.53068	-6.48597	Effluent type unknown, likely to involve agricultural emissions as it overlies agricultural land.
SS/W218/06	Ashfield (Tombrack) Property Management Company Ltd.,	Overlies a different groundwater body (Ballyglass) to those bordering the BMPA. In the vicinity of the Ballingale (Stream) (12B06), which ultimately enters the BMPA via Inflow 11.	52.60024	-6.55703	Effluent type unknown, likely to involve agricultural emissions as it overlies agricultural land.
SS/G666/10	Michael O'Loughlin	Overlies a different groundwater body (Ballyglass) to those bordering the BMPA. In the vicinity of the Millquarter 12 (12M39), which ultimately enters the BMPA via Inflow 11.	52.71814	-6.39733	Effluent type unknown, likely to involve agricultural emissions as it overlies agricultural land.
SS/W481/07	Lawrence Kelly,	Overlies a groundwater body (Castlebridge North) that borders the BMPA. In the vicinity of the Upper Clonmore (12U29), which ultimately enters the BMPA via Inflow 18.	52.46984	-6.49243	Effluent type unknown, likely to involve agricultural emissions as it overlies agricultural land.
SS/W363/07	Murntown Community Centre	Overlies a groundwater body (Castlebridge North) that borders the BMPA. In the vicinity of the Johnstown 12 (12J04), which ultimately enters the BMPA via Inflow 3.	52.28951	-6.51688	Effluent type unknown, likely to involve waste water treatment in association with community centre.
SS/W111/00	Guy Urbin	Overlies a different groundwater body (Enniscorthy) to those bordering the BMPA. In the vicinity of the Park 12 (12P03), which ultimately enters the BMPA via Inflow 11.	52.45481	-6.57526	Effluent type unknown, likely to involve waste water treatment in association with residential estate.

Reference	Name	Pathway	Latitude (WGS 84)	Longitude (WGS 84)	Notes
SS/W374/07 B	James O'Brien & Paula Corley	Overlies a different groundwater body (Castlebridge Gravels) to those bordering the BMPA. In the vicinity of the Turkyle (12T52), which ultimately enters the BMPA via Inflow 18.	52.43211	-6.44431	Effluent type unknown, likely to involve agricultural emissions as it overlies agricultural land.
SS/W146/04	Cloney Developments Ltd	Overlies a different groundwater body (Castlebridge Gravels) to those bordering the BMPA. In the vicinity of the Ballinacoola_More (12B16), which ultimately enters the BMPA via Inflow 24.	52.39173	-6.39083	Effluent type unknown, likely to involve waste water treatment in association with residential estate.
SS/W200/05	William Hassey	Overlies a different groundwater body (Enniscorthy) to those bordering the BMPA. In the vicinity of the Boro (12B02), which ultimately enters the BMPA via Inflow 11.	52.46851	-6.60117	Effluent type unknown, likely to involve agricultural emissions as it is adjacent to agricultural land.
SS/W327/06	Marius Kriauciuwas	Overlies a different groundwater body (Ballyglass) to those bordering the BMPA. In the vicinity of the Kiltilly (12K87), which ultimately enters the BMPA via Inflow 11.	52.66248	-6.54769	Effluent type unknown, likely to involve agricultural emissions as it is adjacent to agricultural land.
SS/W252/06	Kilconnib Management Co. Ltd	Overlies a groundwater body (Castlebridge North) that borders the BMPA. In the vicinity of the Garryduff 12 (12G52), which ultimately enters the BMPA via Inflow 11.	52.51268	-6.46194	Effluent type unknown, likely to involve agricultural/forestry emissions as it is adjacent to agricultural land and forestry.
SS/W244/06	Doevale Limited	Overlies a different groundwater body (Ballyglass) to those bordering the BMPA. In the vicinity of the Lask (12L01), which ultimately enters the BMPA via Inflow 11.	52.67722	-6.38031	Effluent type unknown, likely to involve agricultural/forestry emissions as it is adjacent to agricultural land and forestry.
SS/G642/09	Winefride Crean Murphy	Overlies a groundwater body (Castlebridge South) that borders the BMPA. In the vicinity of the White Gap (12W33), which ultimately enters the BMPA via Inflow 24.	52.38624	-6.37377	Effluent type unknown, likely to involve waste water treatment related to adjacent caravan park.
SS/W024/ 81/99R1	Roadstone Ltd	Overlies a different groundwater body (Enniscorthy) to those bordering the BMPA. In the vicinity of the Slaney (12S02), which ultimately enters the BMPA via Inflow 11.	52.4752	-6.56172	Effluent type unknown, likely to be associated with quarry.

Reference	Name	Pathway	Latitude (WGS 84)	Longitude (WGS 84)	Notes
SS/W025/82/99R1	Crosbie Brothers	Overlies a groundwater body (Castlebridge North) that borders the BMPA. In the vicinity of the Coolree stream (12C13), which ultimately enters the BMPA via Inflow 10.	52.33935	-6.51085	Effluent type unknown, likely to be associated with industrial facility.
SS/W645/09	Damon Zund	Overlies a groundwater body (Castlebridge North) that borders the BMPA. In the vicinity of the Garrantrowlan 12 (12G60), which ultimately enters the BMPA via Inflow 11.	52.50574	-6.47411	Effluent type unknown, likely to involve agricultural/forestry emissions as it is adjacent to agricultural land and forestry.
SS/W491/07	William & Lisa Breen	Overlies a different groundwater body (Ballyglass) to those bordering the BMPA. In the vicinity of the Ballingale (Stream) (12B06), which ultimately enters the BMPA via Inflow 11.	52.63016	-6.55663	Effluent type unknown, likely to involve agricultural emissions as it overlies agricultural land.
SS/W389/07	John Murphy	Overlies a different groundwater body (Ballyglass) to those bordering the BMPA. In the vicinity of the Lask (12L01), which ultimately enters the BMPA via Inflow 11.	52.67726	-6.38037	Effluent type unknown, likely to involve agricultural/forestry emissions as it is adjacent to agricultural land and forestry.
SS/W564/08	Elaine Cullen	Overlies a groundwater body (Castlebridge North) that borders the BMPA. In the vicinity of the Garrantrowlan 12 (12G60), which ultimately enters the BMPA via Inflow 11.	52.49861	-6.46736	Effluent type unknown, likely to involve agricultural emissions as it overlies agricultural land.
SS/W476/07	Denis Aspel	Overlies a different groundwater body (Enniscorthy) to those bordering the BMPA. In the vicinity of the Clonmore River (Slaney) (12C09), which ultimately enters the BMPA via Inflow 11.	52.41802	-6.62016	Effluent type unknown, likely to involve agricultural emissions as it overlies agricultural land.
SS/W342/07 B	James Nolan	Overlies a groundwater body (Castlebridge North) that borders the BMPA. In the vicinity of the Mullinagore_or_Oilgate (12M10), which ultimately enters the BMPA via Inflow 11.	52.40597	-6.54351	Effluent type unknown, likely to involve agricultural emissions as it overlies agricultural land.
SS/W123/01	John Hanrahan,	Overlies a different groundwater body (Curracloe Gravels) to those bordering the BMPA. In the vicinity of the Ballinacoola_More (12B16), which ultimately enters the BMPA via Inflow 24.	52.39309	-6.39369	Effluent type unknown, likely to involve waste water treatment related to adjacent hotel.

Reference	Name	Pathway	Latitude (WGS 84)	Longitude (WGS 84)	Notes
SS/W217/06	J.J. Byrne	Overlies a groundwater body (Castlebridge North) that borders the BMPA. In the vicinity of the Corbally (Stream) (12C04), which ultimately enters the BMPA via Inflow 11.	52.50625	-6.47417	Effluent type unknown, likely to involve agricultural/forestry emissions as it is adjacent to agricultural land and forestry.
SS/W199/05	Monart House Hotel	Overlies a different groundwater body (Enniscorthy) to those bordering the BMPA. In the vicinity of the Pullinstown Big (12P24), which ultimately enters the BMPA via Inflow 11.	52.50452	-6.61008	Effluent type unknown, likely to involve waste water treatment related to adjacent hotel.
SS/W422/07	The Board of Management, St. Patricks National School	Overlies a groundwater body (Castlebridge North) that borders the BMPA. In the vicinity of the Whitefort 12 (12W01), which ultimately enters the BMPA via Inflow 16.	52.38911	-6.50458	Effluent type unknown, likely to involve waste water treatment related to adjacent school.
SS/G242/06	Peter & Christine Moroz	Overlies a groundwater body (Castlebridge North) that borders the BMPA. In the vicinity of the Brownswood (12B40), which ultimately enters the BMPA via Inflow 11.	52.46785	-6.52209	Effluent type unknown, likely to be associated with industrial facility.
SS/W040/94 /99R1	Eamonn Mernagh	Overlies a groundwater body (Castlebridge North) that borders the BMPA. In the vicinity of the Mullinagore_or_Oilgate (12M10), which ultimately enters the BMPA via Inflow 11.	52.42462	-6.53153	Effluent type unknown, likely to be associated with commercial premises.
SS/W149/04	Gerard O'Connor,	Overlies a different groundwater body (Ballyglass) to those bordering the BMPA. In the vicinity of the East Mocurry 12 (12E10), which ultimately enters the BMPA via Inflow 11.	52.56846	-6.68161	Effluent type unknown, likely to be associated with commercial, industrial and agricultural premises.
SS/W490/07	William & Mary Kehoe	Overlies a groundwater body (Castlebridge North) that borders the BMPA. In the vicinity of the Corbally (Stream) (12C04), which ultimately enters the BMPA via Inflow 11.	52.51262	-6.45767	Effluent type unknown, likely to involve agricultural emissions as it overlies agricultural land.
SS/W083/95	Jack Kenny	Overlies a different groundwater body (Ballyglass) to those bordering the BMPA. In the vicinity of the Lask (12L01), which ultimately enters the BMPA via Inflow 11.	52.68218	-6.38903	Effluent type unknown, likely to involve agricultural emissions as it lies adjacent to agricultural buildings.

Reference	Name	Pathway	Latitude (WGS 84)	Longitude (WGS 84)	Notes
SS/W374/07 A	Padraig & Trudi Coone	Overlies a different groundwater body (Castlebridge Gravels) to those bordering the BMPA. In the vicinity of the Turkyle (12T52), which ultimately enters the BMPA via Inflow 18.	52.43211	-6.44431	Effluent type unknown, likely to involve agricultural emissions as it overlies agricultural land.
SS/W591/08	Mark Murphy	Overlies a groundwater body (Castlebridge North) that borders the BMPA. In the vicinity of the Corbally (Stream) (12C04), which ultimately enters the BMPA via Inflow 11.	52.50495	-6.47483	Effluent type unknown, likely to involve agricultural/forestry emissions as it is adjacent to agricultural land and forestry.
WPL/43	Ardeen Cheshire Home	Overlies a different groundwater body (Ballyglass) to those bordering the BMPA. In the vicinity of the Derry [Slaney] (12D02), which ultimately enters the BMPA via Inflow 11.	52.75643	-6.53237	Effluent type unknown, likely to involve waste water treatment related to residential centre.
WPL/79	St. Patricks Missionary	Overlies a different groundwater body (Ballyglass) to those bordering the BMPA. In the vicinity of the Douglas [Kiltegan] (12D04), which ultimately enters the BMPA via Inflow 11.	52.90135	-6.55963	Effluent type unknown, likely to involve waste water treatment related to missionary.
SS/W676/20	Ciaran Foley	Overlies a groundwater body (Castlebridge South) that borders the BMPA. In the vicinity of the North_West_Slob (12N02), which ultimately enters the BMPA via Inflow 25.	52.3615	-6.4185	Effluent type unknown, likely to involve agricultural emissions as it overlies agricultural land.

2.5.3 LAND USE

According to Corine (2018), land cover within the contributing catchment is dominated by Pastures (11612 km^2, 58.7%, *Figure* 2-13). Non-irrigated arable land is the next most dominant land cover type (430 km^2, 21.7%). Other land use types within the contributing catchment are: Coniferous Forest (100 km^2, 5.1%), Land principally occupied by agriculture, with significant areas of natural vegetation (56 km^2, 2.8%), Peat bogs (47 km^2, 2.4%), Transitional woodland-shrub (35 km^2, 1.8%), Moors and heathland (31 km^2, 1.6%), Discontinuous urban fabric (26 km^2, 1.3%), Mixed forest (26 km^2, 1.3%), and Complex cultivation patterns (23 km^2, 1.1%). A number of land cover types cover areas of less than 1%, namely: Natural grasslands, Broad-leaved forest, Sports and leisure facilities, Construction sites, Industrial or commercial unites, Inland marshes, Mineral Extraction sites, Continuous urban fabric, Burnt areas, Salt marshes, Water courses, Dump sites, Sparsely vegetated areas, Sea and ocean, Port areas, Beaches, dunes, sands, Intertidal flats, and Estuaries.

Of the above land cover types, those associated with agriculture and human residence are the most likely to give rise to faecal contamination in the contributing catchment.

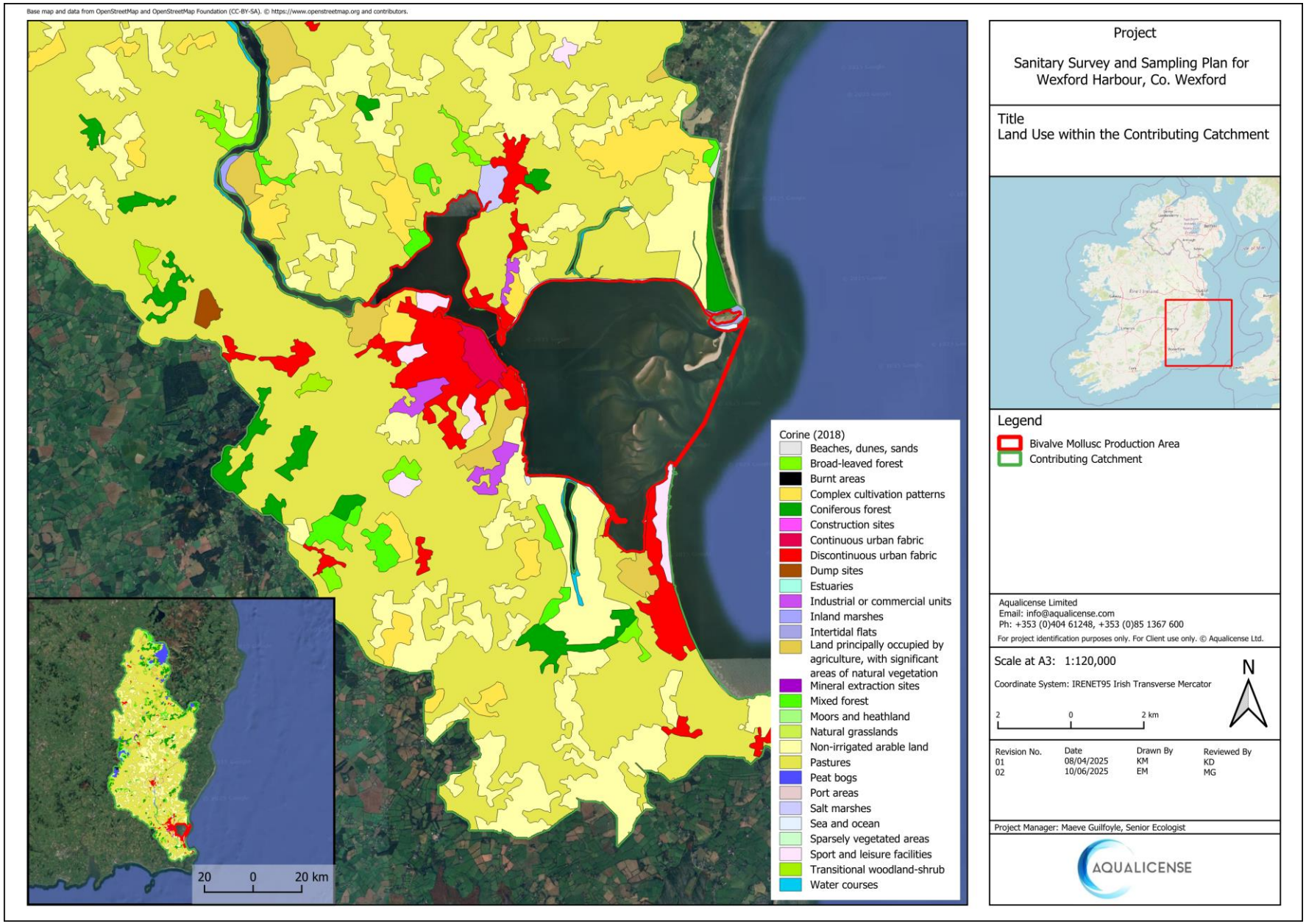

Figure 2-13. Land use within the contributing catchment.

AQUALICENSE

2.5.3.1 AGRICULTURE

Animals

Faecal production and *E. coli* loads from domestic animals are often comparable to or greater than those from humans (Table 2-6). Sheep have the highest daily *E. coli* load, followed by pigs, cows, humans, and chickens. Contamination can occur through direct deposition into watercourses or run-off following rainfall, with seasonal patterns influencing agricultural contamination (see Section 2.4.2.2). Stocking densities also play a role, with higher faecal contamination typically observed during summer months (Hunter *et al.*, 1999).

Table 2-6. Estimated faecal production and E. coli loadings of selected domestic animals in comparison with humans (Jones and White, 1982 as read in Taylor (2003)).

	FAECAL PRODUCTION (G/DAY)	AVERAGE NUMBER (E. *COLI*/G)	DAILY LOAD (*E. COLI*)
Man	150	13×10^6	1.9×10^9
Cow	23600	0.23×10^6	5.4×10^9
Sheep	1130	16×10^6	18.1×10^9
Chicken	182	1.3×10^6	0.24×10^9
Pig	2700	3.3×10^6	8.9×10^9

The most comprehensive agricultural data available is derived from 2020 Census of Agriculture (CSO, 2020) with the smallest reporting unit being the Electoral Division (ED). While data are not provided on chickens or pigs, intensive poultry farms (>40,000 places[2]) and pig farms requiring licences (>750 sows or >3,000 production pigs) that fall under EPA licensing control are discussed in Section 2.5.2.1.

A total of 137 Electoral Divisions (EDs) overlap with the contributing catchment (Figure 2-14). However, these EDs do not directly correspond to the contributing catchment boundary, requiring an estimation of the percentage overlap (Appendix 3). Appendix 3 also presents grazing animal census data for each ED, including both total livestock numbers and corrected estimates based on an assumed even distribution of animals across the ED.

[2] Refers to places for birds e.g. broilers, layers etc.

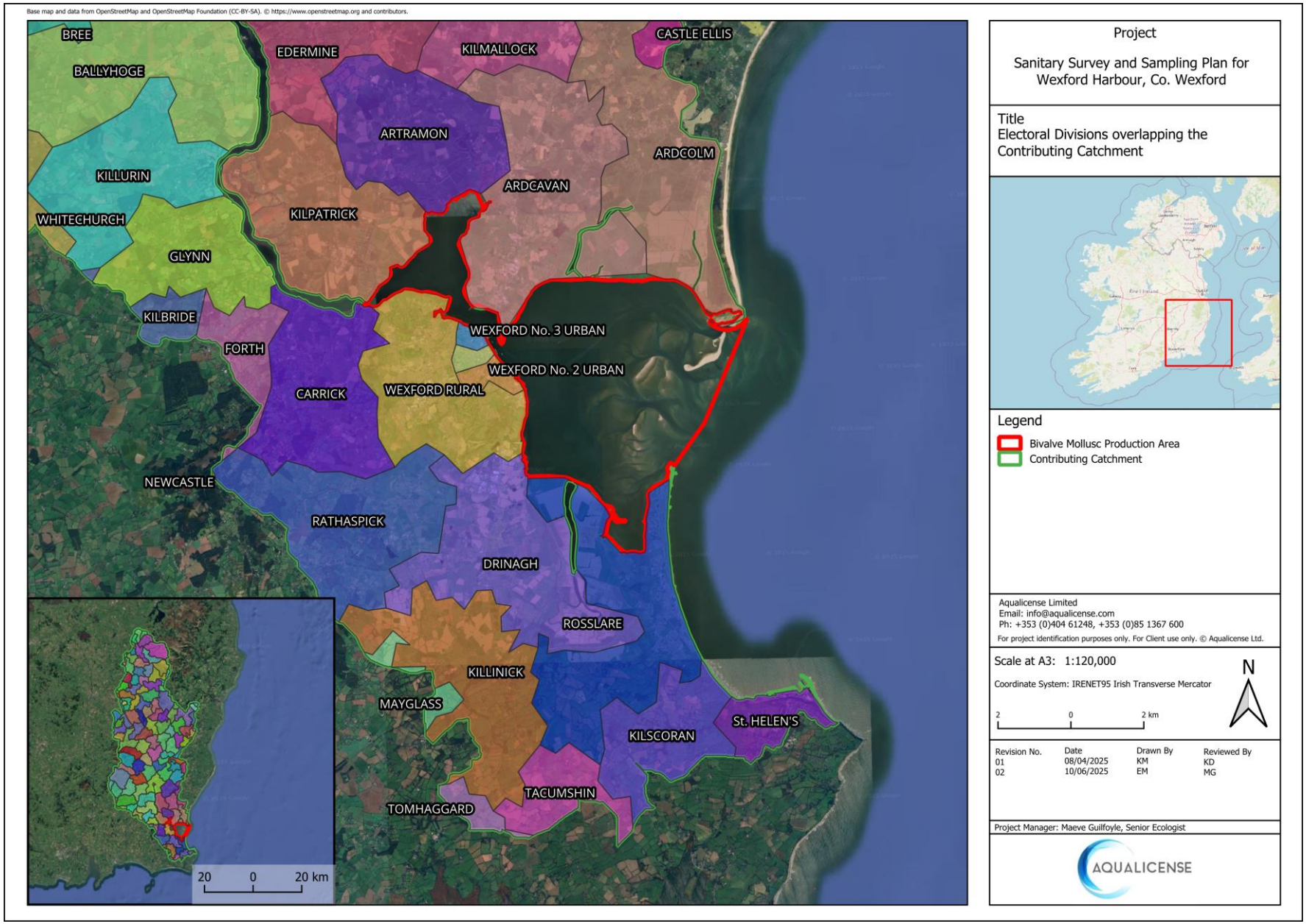

Figure 2-14. Electoral Divisions overlapping the contributing catchment.

Under Ireland's Water Framework Directive (WFD) monitoring programme, waterbodies classified as "At Risk" of failing to meet their water quality objectives undergo assessment for significant pressures that must be addressed. Of particular relevance to this section are pressures from agriculture[3]. As part of the third WFD cycle, seven groundwater bodies underlying the contributing catchment (Cahore Point, Waste Facility (W0016-02), Kilkullen, Industrial Facility (P0062-02), Industrial Facility (P0394-01), Enniscorthy, and Ballyglass) are considered "At Risk" and therefore have been classified for agricultural pressures. Agricultural pressures to groundwater have been identified for the following groundwater bodies: Cahore Point, Kilkullen, Enniscorthy and Ballyglass. While these groundwater bodies do not directly border the BMPA, they each have potential connectivity with the River Slaney and its tributaries, ultimately entering the BMPA at Inflow 11.

Surface waters in the contributing catchment are classified as "At Risk", "Review", and "Not at Risk"[4]. Of the surface waters classified as "At Risk," 24 watercourses have been identified as having agricultural pressures. Of these, 22 ultimately enter the BMPA via Inflow 11, with one entering at Inflow 3 and one at Inflow 18.

Sheep are the dominant grazing animals in the catchment, with a corrected population of 262,756 recorded across all EDs overlapping the contributing catchment. The highest sheep population is in Cranemore ED (10,391), located in the centre-east of the catchment, which ultimately drains to Inflow 11. As previously discussed, sheep contribute the highest daily *E. coli* load *(Table* 2-6*).* While cattle farming is more widely distributed across the catchment, the highest livestock population is in Enniscorthy Rural (6,218.1), situated centrally in the catchment and also draining to Inflow 11. Given the high livestock densities and their associated *E. coli* loads, Inflow 11 remains the primary area of concern regarding agricultural contributions to contamination.

Therefore, considering grazing animal densities, groundwater vulnerability, and surface water inflows, the Inner Harbour at Inflow 11 remains the most likely location for pollution discharges from farm animals. The potential for contamination is likely to be greatest during the summer months and following periods of high precipitation.

Land

In addition to the direct source of organic pollution from animals, agricultural land use contributes to organic pollution through the spreading of slurry and soiled water. To provide a clearer understanding of agricultural land use, the 2020 Census of Agriculture (CSO, 2020) can again be consulted, with a correction to account for the percentage overlap of each ED in the contributing catchment *(Appendix 3).* The largest assumed area of farmed land is in the Bree Electoral Division, followed by Killann, both of which ultimately enter the BMPA via Inflow 11. The majority of farmland (103547.8 hectares) is used as grassland, with 31472.6 hectares of cereals. This indicates a landscape used for mainly for grazing rather than arable farming.

[3] Not all parameters from the WFD apply, please refer to Section 2.3.

[4] Waterbodies fall into the "Review" category for one of two reasons:

1. Additional information is required to determine their status before allocating resources and implementing targeted measures.
2. Measures have already been undertaken, but their effectiveness has yet to be assessed.

In accordance with the 5th Nitrates Action Programme (Government of Ireland, 2022), the contributing catchment lies in Zone A, where a closed period for slurry spreading runs from 1st October to 12th January. The spreading of soiled water is also prohibited in December. Therefore, the greatest risk to the BMPA primarily exists outside this period, assuming the regulations are adhered to.

In areas designated as "Extreme Vulnerability Areas on Karst Limestone Aquifers" under S.I. No. 113/2022, there are further restrictions on the spreading of soiled water. In areas within the contributing catchment overlying a karst limestone aquifer (GSI, 2023), the spreading of soiled water is restricted if the total volume exceeds 25,000 litres per hectare over a 42-day period, or if the application rate exceeds three mm per hour on land with a thickness of less than one metre. These areas are primarily to the north of the contributing catchment, with smaller portions in the south in the vicinity of the BMPA.

Considering the 2020 Agriculture Census, c. 73.3% of the contributing catchment is farmed. As there are no refined spatial data available for the Census, Corine mapping has been used to calculate areas of higher groundwater vulnerability overlapping agricultural land. Approximately 32.1% (c. 536 km2) of agricultural land overlaps areas classified as having "extreme" or "rock-at-surface" groundwater vulnerability (GSI, 2021). These areas of overlap are particularly prevalent to the north of the contributing catchment. However small areas bordering the coastline are present in the Inner Harbour (near Inflow 11). Areas of agriculture overlapping areas of elevated groundwater are not prevalent in the Outer Harbour, except for a small portion to the south of Wexford Town in the vicinity of Inflow 3, 5 and 6. Additionally, all EPA-mapped Inflows to the BMPA flow through agricultural land *(Figure* 2-1*).* The majority of agricultural land ultimately drains to Inflow 11 at the Inner Harbour.

Therefore, considering the agricultural land use and groundwater vulnerability, in addition to all riverine inputs, the Inner Harbour is the most likely locations for pollution discharges from spreading of slurry and soiled water. Considering the regulatory restrictions in place, this risk is likely to be greatest from mid-January to September inclusive.

2.5.3.2 Urban Areas and Human Populations

Human populations contribute to contamination from sewerage, as previously discussed in *Section 2.5.1*. However, examining urban areas and population dynamics can provide further insight into pollution sources and the seasonality of contamination.

A total of 35 urban areas are present within the contributing catchment (Tailte Éireann, 2023)[5]. The largest of these by area is Enniscorthy (c. 15 km north of the BMPA) followed by Wexford (bordering the BMPA). The Castlebridge Urban Area is also in close proximity to the BMPA, separated by c. 250m from the north of the Inner Harbour. Rosslare Urban Area is also situated c. 250m from the south of the Outer Harbour. The highest population density is recorded in Small Area A247045027 (Enniscorthy Rural). an area of housing estates to the north of Enniscorthy *(Figure* 2-10*).* This density is 9157 persons/km², which is above the national average of 73 persons/km² (CSO, 2023b). Similar areas of high population density exist in other areas surrounding Enniscorthy, and in the vicinity of Wexford and Tullow (in the northwest of the contributing catchment). During the most recent census (3rd April

5 The CSO classifies urban areas based on the following "Buildings in Urban Areas are within a group of at least 100 buildings and buildings need to be within 65 meters of another building. Building groups of 100 buildings or more must be within 500 meters of each other." (Tailte Éireann, 2023).

2022), 3% of houses within the contributing catchment were identified as unoccupied holiday homes (CSO, 2023a). This represents a low proportion of holiday properties. For further information refer to *Section 2.5.1.2* relating to septic tanks. However, as discussed below, a number of camping/caravan facilities are present, which may give rise to population influxes during the summer.

In addition to domestic and urban wastewater treatment, facilities such as nursing homes, schools, hospitals, and other large developments can be sources of pollution. A search of the Environmental Impact Assessment (EIA) database identified 58 developments requiring EIA in the contributing catchment since 2017 (Department of Housing, 2024). The majority relate to renewable energy developments, infrastructure, quarries, and import of inert material to agricultural land. A total of four large scale developments were granted that may cause faecal contamination:

- Case Number ABP-308002-20, c. 150m east of BMPA, to the south of the Inner Harbour. This development relates to 413 no. residential units and childcare facility.
- Wexford County Council Application Number: 20181654, c. 33km north of the BMPA with ultimate connectivity via Inflow 11. Permission to erect a finishing house for pig rearing.
- Wexford County Council Application Number: 20230557, c. 18 km north of the BMPA with ultimate connectivity via Inflow 11. Permission for development Material Recovery Facility.
- Case Number ABP-303726-19, c. 80m east of BMPA in the Outer Harbour at Wexford Town. This development relates to a mixed-use development which includes a six-storey hotel, six-storey car park, five-storey residential building, three five-storey office buildings, two-storey cultural/performance centre, two-storey mixed-use restaurant/café/specialist retail building, new sea wall around the existing Trinity Wharf site, 64 berth floating marina and all other site infrastructure works and ancillary works.

Considering the large contributing catchment, a search of Google Maps for relevant facilities (e.g. schools, universities, nursing homes, hospitals, barracks, and prisons) was not conducted for the entire area. However, a search of Google Maps (02/04/2025) was conducted within 250m of the shoreline to identify any relevant facilities in close proximity of the BMPA. This search yielded the following facilities of note:

- St John of God Primary School, located approx. 220m southeast of the southern coast of the Outer Harbour in Wexford Town (WGS 84 Coordinates: 52.3314, -6.4536)
- Wexford Military Barracks, located approx. 140m east of the innermost portion of the Outer Harbour in Wexford Town (WGS 84 Coordinates: 52.3348, -6.4578)
- Ely Hospital located approx. 80m east of the BMPA on the northern shore, at the junction of the Inner and Outer Harbour (WGS 84 Coordinates: 52.3459, -6.4549)

Tourist facilities can contribute to organic pollution, particularly in peak seasons. The contributing catchment lies within medium density, medium-low density, and low-density areas of accommodation providers, including hotels, B&Bs, and campsites (Fáilte Ireland, 2018). The medium density area is focused around the BMPA. While hotels and B&Bs typically use domestic or urban wastewater treatment, campsites and caravan parks may pose additional pollution risks.

A Google Maps search found 18 camping/caravan sites within the contributing catchment *(Figure* 2-15*).* The majority of these facilities are located along the coast, primarily south of the Outer Harbour near Rosslare, with five additional sites to the north, near Curracloe, which may enter the harbour via

Inflow 24. To the south, four facilities have the potential to introduce contaminants via Inflow 1. An additional two near Rosslare are adjacent to open sea and are unlikely to contribute to pollution. However, the remaining two facilities on the Rosslare Point Peninsula, Forthview Camp (c. 60m from the BMPA shoreline) and Burrow Holiday Park (c. 180m from the shore), may pose a direct risk of discharge into the BMPA.

In summary, human populations and tourism are likely to further contribute to pollution entering the BMPA via Inflow 11. Additional sources, including Wexford Town and camping sites to the north and south of the Outer Harbour, may also introduce contaminants. While holiday homes are limited in the area, seasonal population increases at camping and caravan sites could lead to higher pollution levels during the summer months.

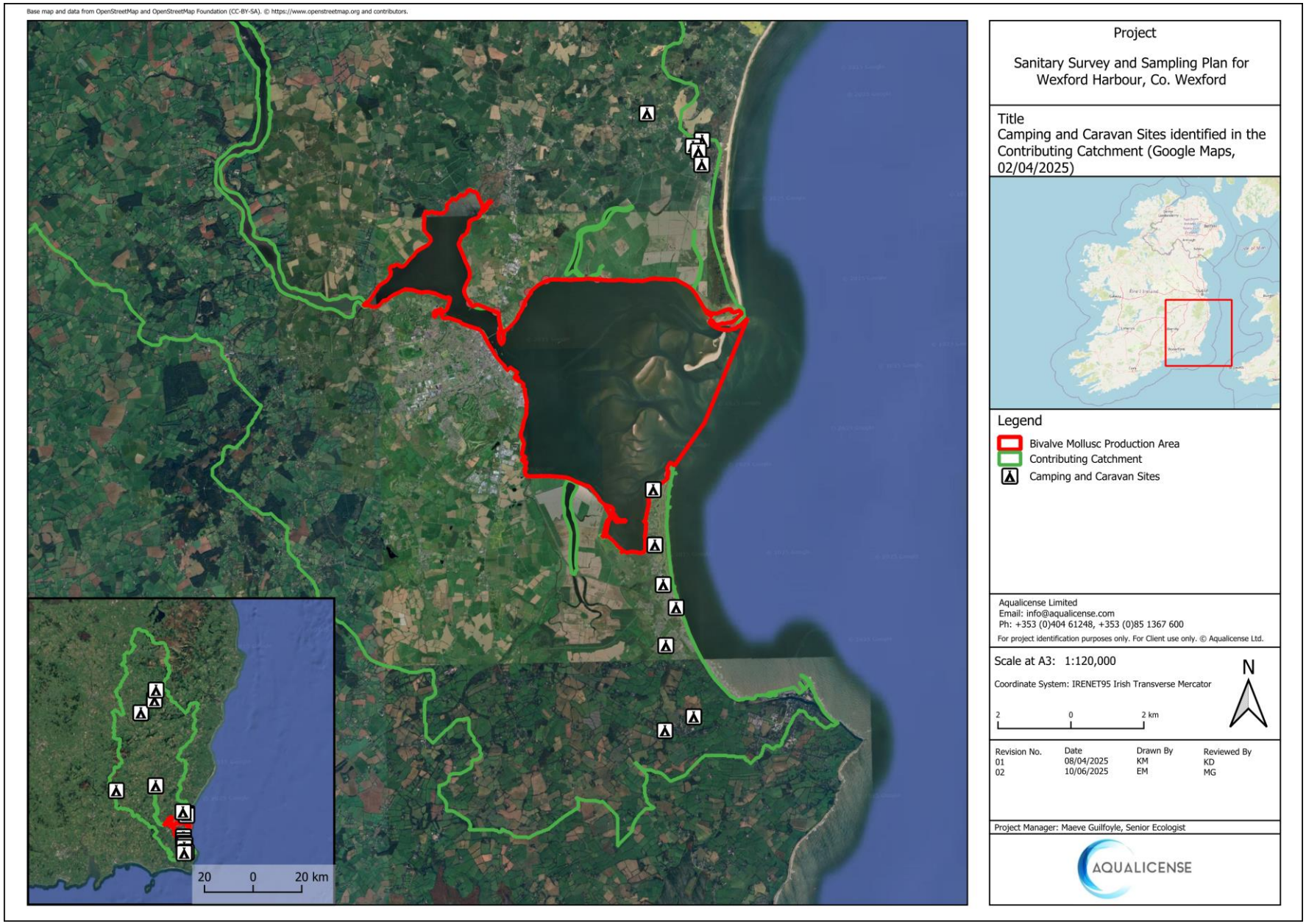

Figure 2-15. Camping and caravan sites identified in the contributing catchment using Google Maps (02/04/2025).

2.5.4 Other Pollution Sources

2.5.4.1 Marine Vessels

Marine vessels, including ferries, cargo ships, fishing boats, and recreational craft, may contribute to faecal contamination, depending on passenger volume, waste management practices, onboard treatment, and regulatory compliance. Under S.I. No. 492/2012 (which transposes Annex IV of the MARPOL Annex IV), treated sewage can be discharged at a minimum of 3 nautical miles from shore, while untreated sewage must be released no closer than 12 nautical miles. Since sewage is typically discharged at sea or stored onboard for disposal, vessels are unlikely to be a major source of organic contamination. However, for this desk-based study, the greatest risk is in areas where vessels converge, given the potential for accidental spillages and compliance variations.

No commercial or ferry ports are present within the BMPA (Marine Institute, 2010; MaREI, 2016). A fishing port (Port of Wexford) handling both large (>15 m) and small vessels (<15 m) in the Inner Harbour, approaching the narrow channel that adjoins to the Outer Harbour. Anchorage for leisure craft is available in the innermost portion of the Outer Harbour between Ballast Bank and Wexford Bridge (Figure 2-6). A review of Google satellite imagery was conducted on 02/04/2025 to identify additional slips, piers, or jetties within the contributing catchment. Inclusive of the aforementioned ports, 12 areas with slips/piers/quays and jetties were identified. The majority of these are centred around Wexford Town, on both the northern and southern shore (Figure 2-16). However, given the expected compliance with S.I. No. 492/2012, the risk of contamination from vessels is relatively low. Instead, discharges from land are more likely to pose a more significant source of contamination.

2.5.4.2 Swimming, Bathing and Recreation

The recreational use of beaches and shorelines acts as a source of faecal contamination. Bathers are a non-point source of faecal bacteria, including *E. coli,* due to the shedding of microbes from skin (Elmir *et al.*, 2007). Dog walking is also a contamination source in recreational waters (An *et al.*, 2020), and may contribute up to 20% of faecal indicator bacteria in urban Irish areas (Martin *et al.*, 2024). Such contamination is expected to peak during the summer months in association with warmer weather.

Google satellite imagery (Search Date: 03/04/2025) was used to identify accessible beaches (that may potentially be publicly accessible) and coastal walks within the BMPA. Several named beaches are present around the BMPA, particularly along the northern shores of the Outer Harbour, and northern shore of the Inner Harbour near Wexford Bridge (Figure 2-16). Areas that may also be used recreationally exist along the Rosslare Point Peninsula, in proximity of the camping sites. No Blue Flag-listed beaches or designated bathing waters are present; therefore, no data are available regarding swimmer numbers or bacteriological quality. Considering the relatively large populations in the area, swimming numbers may increase during the summertime, giving rise to contamination along northern shores, and in proximity of Rosslare Point.

2.5.4.1 Wildlife

Wildlife, including birds and aquatic animals, has been shown to act as a source of faecal contamination in the marine environment (Alderisio and Deluca, 1999; Godino Sanchez et al., 2024). To identify key areas of wildlife-related faecal contamination, a search was conducted for locations with potentially high densities of animals in proximity to the BMPA (Figure 2-17, Table 2-7). This search included Special Protection Areas (SPAs), Special Areas of Conservation (SACs), and Irish Wetland Bird

Survey (I-WeBS) sites (Birdwatch Ireland, 2025; NPWS, 2025). Only SACs where fauna are listed as a qualifying interest were examined further, therefore Raven Point Nature Reserve SAC has been excluded. In addition to the sites identified in Table 2-7, three additional sites (I-WeBS Rosslare (Outer Bay), I-WeBS Wexford Harbour, and Seas off Wexford SPA) exist bounding the Outer Harbour, however as they are outside the BMPA in the open sea they have has not been further considered in the assessment. Considering the high quantities of wildlife, in particular wintering birds, there is potential for faecal contamination BMPA, especially during the winter months.

Table 2-7. Wildlife areas within or bordering the BMPA.

TYPE	NAME (CODE)	SPECIES	LOCATION
SPA	Wexford Harbour and Slobs SPA (004076)	Grebes, divers, herons, cormorants, swans, geese, ducks, raptors, coots, waders, gulls, terns.	Overlapping the entire BMPA
SPA	The Raven SPA (004019)	Divers, cormorants, ducks, geese, waders.	Northern boundary of the Outer Harbour as it meets the open sea.
SAC	Slaney River Valley SAC (000781)	Otter, harbour seal.	Overlapping the majority of the BMPA
I-WeBS	Wexford Harbour and Slobs (0O401)	Swans, geese, ducks, divers, grebes, herons, rails, waders, gulls and terns. Mean peaks typically occur in winter, from November to January. This site is considered to be of international importance as it regularly supports more than 20,000 waterbirds.	Subsites overlap all coastal/intertidal areas along the BMPA with the exception of Wexford Town.

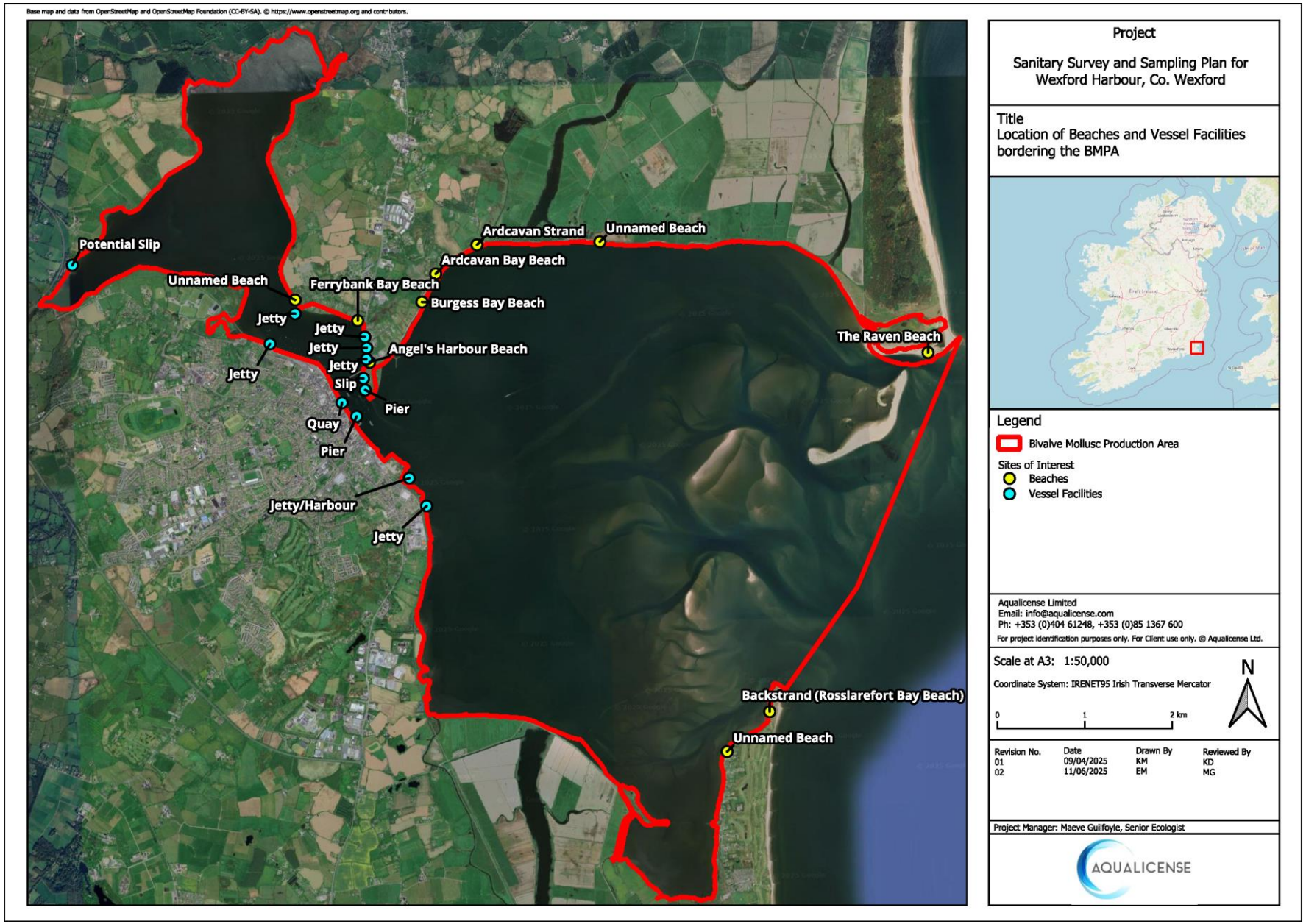

Figure 2-16. Location of beaches, and vessel facilities bordering the BMPA.

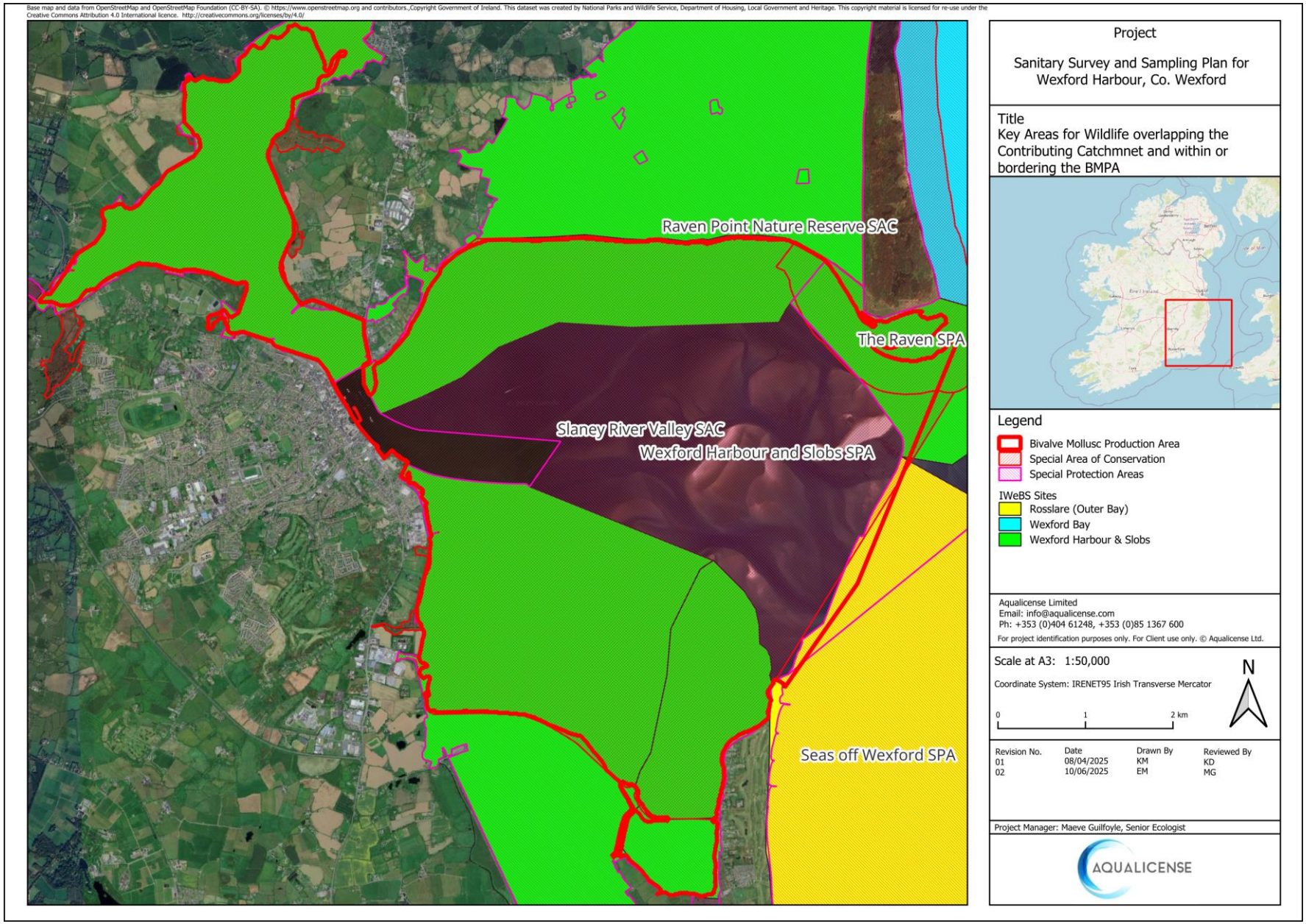

Figure 2-17. Key areas for wildlife within contributing catchment and within or bordering the BMPA.

2.5.4.2 SUMMARY OF POLLUTION SOURCES AND RELATIVE RISK

Considering the details in the above section, the S-P-R model was used to assess the relative risk of faecal contamination in Wexford Harbour by identifying potential contamination sources and transport pathways to the receiving environment *(Table* 2-8*).* The model evaluates each source based on its likelihood of contributing to contamination, potential contamination volumes, and entry pathways into the production area.

The assessment also considers seasonal variations, such as increased agricultural runoff in winter and higher human activity in summer. This risk is assigned qualitatively considering potential volumes of pollution and the existence of pathways to the production area and licensed sites.

Table 2-8. Source-Pathway-Receptor Model and Relative Risk to the Production Area and Licensed Sites

SOURCE	SOURCE DESCRIPTION	PATHWAY TO PRODUCTION AREA	PATHWAY TO LICENSED SITE	DETAILS	IMPACT
UWWTPs	There are 33 UWWTPs in the contributing catchment.	• The primary pathway is via Inflow 11. • There is also a direct discharge to the BMPA in the Outer Harbour. • Additional pathways to the production area are via Inflow 18 and Inflow 1.	<u>Inner Harbour</u> Site T03-049D is the closest licensed site to Inflow 11 (c. 1.9km). This is also the closest site to Inflow 18. Circulation patterns are likely to transport contaminants towards this site. <u>Outer Harbour</u> In the Outer Harbour, the closest site to Inflow 11 is T03-049A (c. 4.4 km). The site T03-035B2, while a greater distance (c. 6 km) is likely to be in a more direct pathway due to current flow. The closest site to the direct discharge is T03-046C (c. 750m). The closest site to Inflow 1 is T03-080A (c. 1.1km).	• Considering the size of the contributing catchment, UWWTPs are considered a significant risk to the BMPA. • Discharges from UWWTPs are expected to be highest in the Inner Harbour, and in the innermost portion of the Outer Harbour. • In the Inner Harbour, contamination is likely to be greatest at Site T03-049D, considering its proximity to inflows and subsequent current patterns particularly on the ebb tide. • In the Outer Harbour, contamination from Inflow 11 is likely to be most significant at Site T03-035B, given its location near the main channel at Wexford Bridge where currents facilitate contaminant transport. • Site T03-046C is expected to be most affected by direct discharges from the UWWTP, due to its close proximity and localised current dynamics. • Contamination from Inflow 1 is likely to be greatest at Site T03-080A. Reduced current velocities in this area may contribute to elevated contamination levels. • Contamination from UWWTPs is likely to be consistent year-round.	**Yes,** Presence of discharge points, known surface water run-off and higher population densities all contribute to a significant possibility of risk. The variable seasonal rain levels and reduced current velocities in the area would indicate a high level of risk.
Septic Tanks and Other Sewerage Types	DWWTSs, primarily septic tanks, are a considerable sources of human sewage discharges. High risk areas along the Sow and Assaly Watercourses.	• The primary pathway is via Inflow 11 (majority of contributing catchment). • Inflow 3 and 18 is also a considerable pathway, draining the Assaly and Sow Watercourses.	<u>Inner Harbour</u> Site T03-049D is the closest licensed site to Inflow 11 (c. 1.9km). This is also the closest site to Inflow 18. Circulation patterns are likely to transport contaminants towards this site. <u>Outer Harbour</u>	• Considering the size of the contributing catchment, septic tanks are considered a significant risk to the BMPA. • Sewage discharges are expected to be highest in the Inner Harbour, and in the innermost portion of the Outer Harbour. • In the Inner Harbour, contamination is likely to be greatest at Site T03-049D, considering its proximity to inflows and	**Yes,** Presence of discharge points, known surface water run-off and higher population

Source	Source Description	Pathway to Production Area	Pathway to Licensed Site	Details	Impact
		• Elevated groundwater vulnerability near Inflow 11 and Inflow 3 are an additional pathway.	In the Outer Harbour, the closest site to Inflow 11 is T03-049A (c. 4.4 km). The site T03-035B2, while a greater distance (c. 6 km) is likely to be in a more direct pathway due to current flow. The closest site to Inflow 3 is T03-49C1 (c. 800m).	subsequent current patterns particularly on the ebb tide. • In the Outer Harbour, contamination from Inflow 11 is likely to be most significant at Site T03-035B, given its location near the main channel at Wexford Bridge where currents facilitate contaminant transport. • Site T03-049C1 is expected to experience the highest contamination from Inflow 3, given its close proximity to the discharge point. Reduced current velocities in this area may limit circulation, increasing the risk of contamination. • Contamination risk is likely to remain consistent year-round.	densities all contribute to a significant possibility of risk. The variable seasonal rain levels and reduced current velocities in the area would indicate a high level of risk.
IE and IPC Licenses	There are eight relevant IE and IPC Licenses granted within the contributing catchment.	• The primary pathway is Inflow 11, in addition to Inflow 3. • Elevated groundwater vulnerability near Inflow 11 and Inflow 3 are an additional pathway.	<u>Inner Harbour</u> Site T03-049D is the closest licensed site to Inflow 11 (c. 1.9km). Circulation patterns are likely to transport contaminants towards this site. <u>Outer Harbour</u> In the Outer Harbour, the closest site to Inflow 11 is T03-049A (c. 4.4 km). The site T03-035B2, while a greater distance (c. 6 km) is likely to be in a more direct pathway due to current flow. The closest site to Inflow 3 is T03-49C1 (c. 800m).	• Discharges relating to IE/IPC licenses are expected to be highest in the Inner Harbour, and in the innermost portion of the Outer Harbour. • In the Inner Harbour, contamination is likely to be greatest at Site T03-049D, considering its proximity to inflows and subsequent current patterns particularly on the ebb tide. • In the Outer Harbour, contamination from Inflow 11 is likely to be most significant at Site T03-035B, given its location near the main channel at Wexford Bridge where currents facilitate contaminant transport. • Site T03-049C1 is expected to experience the highest contamination from Inflow 3, given its close proximity to the discharge point. Reduced current velocities in this area may limit circulation, increasing the risk of contamination.	**Yes,** Presence of discharge points, known surface water run-off and higher population densities all contribute to a significant possibility of risk. Due to the licence restrictions in place for IE and IPC licences, although there are variable

Source	Source Description	Pathway to Production Area	Pathway to Licensed Site	Details	Impact
				• Seasonal variations in contamination are unlikely as a result of IE and IPC licenses.	seasonal rain levels and reduced current velocities in the area there would be a moderate level of risk.
Section 4 Discharges	There are 39 Section 4 discharges within the contributing catchment.	• The primary pathway is Inflow 11, in addition to Inflow 3. • There are four inflows in the northern Inner Harbour. • Elevated groundwater vulnerability near Inflow 11 and along the northern shores of the Inner and Outer Harbour.	<u>Inner Harbour</u> Site T03-049D is the closest licensed site to Inflow 11 (c. 1.9km) and is in close proximity of the other inflows in the Inner Harbour. Circulation patterns are likely to transport contaminants towards this site. <u>Outer Harbour</u> In the Outer Harbour, the closest site to Inflow 11 is T03-049A (c. 4.4 km). The site T03-035B2, while a greater distance (c. 6 km) is likely to be in a more direct pathway due to current flow. The closest site to Inflow 3 is T03-49C1 (c. 800m).	• Discharges relating to Section 4 discharges are expected to be highest in the Inner Harbour, and in the innermost portion of the Outer Harbour. • In the Inner Harbour, contamination is likely to be greatest at Site T03-049D, considering its proximity to inflows and subsequent current patterns particularly on the ebb tide. • In the Outer Harbour, contamination from Inflow 11 is likely to be most significant at Site T03-035B, given its location near the main channel at Wexford Bridge where currents facilitate contaminant transport. • Site T03-049C1 is expected to experience the highest contamination from Inflow 3, given its close proximity to the discharge point. Reduced current velocities in this area may limit circulation, increasing the risk of contamination. • Seasonal variations in contamination are unlikely as a result of Section 4 discharges.	**Yes,** Presence of discharge points, known surface water run-off and higher population densities all contribute to a significant possibility of risk. Due to the licence restrictions in place for Section 4 discharges, although there are variable seasonal rain levels and reduced current velocities in the area there would

Source	Source Description	Pathway to Production Area	Pathway to Licensed Site	Details	Impact
					be a moderate level of risk.
Agriculture	Sheep, which have the highest *E. coli* loading of assessed grazing animals, are the dominant livestock in in the contributing catchment. Cattle are also widely distributed.	• The primary pathway is Inflow 11. • Elevated groundwater vulnerability near Inflow 11.	<u>Inner Harbour</u> Site T03-049D is the closest licensed site to Inflow 11 (c. 1.9km). Circulation patterns are likely to transport contaminants towards this site. <u>Outer Harbour</u> In the Outer Harbour, the closest site to Inflow 11 is T03-049A (c. 4.4 km). The site T03-035B2, while a greater distance (c. 6 km) is likely to be in a more direct pathway due to current flow.	• Given the rural nature of the of a large portion of the contributing catchment, agriculture is significant potential contamination source. • In the Inner Harbour, contamination is likely to be greatest at Site T03-049D, considering its proximity to inflows and subsequent current patterns particularly on the ebb tide. • In the Outer Harbour, contamination from Inflow 11 is likely to be most significant at Site T03-035B, given its location near the main channel at Wexford Bridge where currents facilitate contaminant transport. • Risk increases in summer and following heavy rainfall.	**Yes,** Presence of discharge points, known surface water run-off and higher population densities all contribute to a significant possibility of risk. The variable seasonal rain levels, higher rate of runoff in summer post heavy rainfall, and reduced current velocities in the area would indicate a high level of risk.
Urban Areas and Human Populations	There are 35 urban areas in the contributing catchment. The largest is Enniscorthy, followed by Wexford town (which borders the BMPA). A total	• The primary pathway is Inflow 11. • Additional surface water pathways via Inflow 1 and Inflow 24.	<u>Inner Harbour</u> Site T03-049D is the closest licensed site to Inflow 11 (c. 1.9km). Circulation patterns are likely to transport contaminants towards this site.	• In the Inner Harbour, contamination is likely to be greatest at Site T03-049D, considering its proximity to inflows and subsequent current patterns particularly on the ebb tide.	**Yes:** the mix of rural and urban areas within the contributing catchment,

Source	Source Description	Pathway to Production Area	Pathway to Licensed Site	Details	Impact
	of 18 camping/caravan sites in the contributing catchment.	• Potential direct contamination in the vicinity of Rosslare Point and Wexford Town.	<u>Outer Harbour</u> In the Outer Harbour, the closest site to Inflow 11 is T03-049A (c. 4.4 km). The site T03-035B2, while a greater distance (c. 6 km) is likely to be in a more direct pathway due to current flow. The closest site to Inflow 1 is T03-080A (c. 1.1km). The closest site to Inflow 24 is T03-052B (c. 290m)	• In the Outer Harbour, contamination from Inflow 11 is likely to be most significant at Site T03-035B, given its location near the main channel at Wexford Bridge where currents facilitate contaminant transport. • Contamination from Inflow 1 is likely to be greatest at Site T03-080A. Reduced current velocities in this area may contribute to elevated contamination levels. • Seasonal increases in contamination may occur as a result of camping/caravan sites may occur through Inflow 11, and in the vicinity of Rosslare Point.	ground water run-off, flushing cycles and bathymetry of the bay would indicate that this is a medium level of risk (see sections 2.4.1.3 and 2.4.1.4)
Marine Vessels	A total of 12 areas with slips, quays, piers and jetties, primarily situated around Wexford Town.	Ship sewage entering the Harbour, particularly in the area surrounding Wexford Town.	<u>Inner Harbour</u> Site T03-055E is the closest licensed site the Wexford Port (c. 1.3km). Contaminants may reach this site on the flood tide. <u>Outer Harbour</u> In the Outer Harbour, the closest site to Inflow 11 is T03-049A is the closest site to a number of marine vessel facilities. However, considering current flow, Site T03-35B2 may be in a more direct pathway.	• A number of marine vessel facilities are present in the outer portion of the Inner Harbour, and contaminants may be directed to Site T03-055E on the flood tide. However, considering dilution on the flood tide, impacts are likely to be minimised. • In the Outer Harbour, contamination from Inflow 11 is likely to be most significant at Site T03-035B, given its location near the main channel at Wexford Bridge where currents facilitate contaminant transport. • Given the scale of operations and regulatory controls and MARPOL which all dictates that no blackwater or greywater discharges may be allowed within 3nm of the shore..	**No**, Given the scale of operations and regulatory controls, there is considered to be no potential impact from this source.
Swimming, Bathing and Recreation	Several beaches along the coast, but no Blue Flag-listed or designated bathing waters.	Contamination from beach users along the bay, particularly on the northern shores of the Outer Harbour.	A number of sites in the Outer Harbour are in close proximity of beaches, namely: • T03-080A (270m) • T03-049B (180m) • T03-046A (300m)	• Considering the close proximity to beaches, contaminants may reach sites including T03-080A, T03-049B, T03-046A.	**No** potential impact from this source would be negligible

Source	Source Description	Pathway to Production Area	Pathway to Licensed Site	Details	Impact
				• However, in comparison with the other contamination sources, the risk from recreational activities is assumed to be minimal. • Risk increases during summer.	This is in combination with the hydrodynamics of the bay and availability of public sanitation.
Wildlife	Wexford Harbour and Slobs SPA (004076) The Raven SPA (004019) Slaney River Valley SAC (000781) Wexford Harbour and Slobs (0O401) Species include otter, harbour seal, swans, geese, ducks, herons, cormorants, waders, raptors, gulls, terns, and divers.	Direct input from wildlife into harbour waters, particularly in intertidal areas.	All licensed sites directly overlap wildlife areas.	• Considering the ephemeral nature of marine life, contamination may directly be input in vicinity of all sites. • Considering the large aggregations of birds during the winter period, seasonal increases in contamination are likely across all intertidal areas.	**Yes**: However, these levels are likely to be very low (see section 2.5.4.1)

*The pathway to the licensed site is considered based on the outflow of greatest risk, following from the "Pathway to Production Area Cell".

2.6 CONCLUSIONS OF THE DESK-BASED STUDY

This desk-based study component of the sanitary survey has assessed key sources of faecal contamination, their pathways, and the circulation of these contaminants within the production area. Based on this study, in the Inner Harbour at Inflow 11 (River Slaney). Additional contributions from small streams and discharges, including Inflow 1, Inflow 3 and Inflow 18 are also identified, in addition to other minor inflows around both the Inner and Outer Harbour.

The primary sources of pollutants are linked to a reliance on urban and domestic wastewater treatment systems, in addition to agriculture in the contributing catchment. Seasonal variations are anticipated to play a significant role in terms of agriculture, particularly during the summer months when increased stocking densities may lead to higher faecal loads. Furthermore, extended dry periods followed by rainfall events may exacerbate pollutant runoff through the "first flush" effect.

Hydrodynamic modelling and existing data suggest that the bay experiences regular tidal flushing, which influences contaminant dispersion and dilution patterns. These physical processes were factored into the refinement of the BMPA boundary to ensure that designated shellfish harvesting areas are appropriately positioned relative to contaminant pathways and dilution zones. Specifically, the BMPA boundary was adjusted to exclude areas most vulnerable to faecal contamination based on the convergence of S-P-R analysis, bacteriological data, and predicted contaminant transport patterns.

Further validation and refinement of these findings will be undertaken upon completion of the shoreline survey, which will provide ground-truthed data on the presence and severity of faecal pollution sources, thereby enhancing the resolution and accuracy of the overall risk assessment and BMPA delineation.

3 SHORELINE SURVEY

This section of the sanitary survey relates to the shoreline survey, which has been undertaken by the SFPA. The SFPA assessed contamination inputs into the BMPA, along with a shoreline survey to validate the findings, prior to Aqualicense being contracted to carry out the wider Sanitary Survey Desktop Review. Aqualicense is satisfied that the shoreline survey adequately validated all findings presented in the subsequent Desktop Review

3.1 SHORELINE SURVEY METHODOLOGY

The SFPA Code of Practice for the Classification and Microbiological Monitoring of Bivalve Mollusc Production Areas identifies the methodology for carrying out shoreline surveys under Appendix 9.1 (SFPA, 2020). Any identified pollution risks were clearly documented, including GPS coordinates, photographs, and detailed descriptions. Photographs were also obtained for all identified risk locations.

In the course of the shoreline survey there were a total of 36 features identified (see Appendix 3: Shoreline Survey Photographs).

Evidence of faecal contamination, such as odours, discolouration, or algae growth, were documented. Surveyors recorded observations even in situations where there was uncertainty regarding potential contamination. Where faecal contamination of an inflow, waterbody, or discharge location was suspected, bacteriological samples were obtained in accordance with the COP. Details of bacteriological sampling are provided in *Section 4.*

3.2 SHORELINE SURVEY RESULTS

The entire shoreline of the BMPA was surveyed by SFPA personnel over a three-day period, 29th January 2025 (11:00-17:00), 30th January 2025 (11:00-17:00) and 6th February 2025 (11:00-17:00). Weather conditions during the survey were dry, with no recorded precipitation on the survey days or in the two days prior, though there had been storms in during the week prior to January 29th.

Table 3-1 and *Figure* 3-1 present all observations recorded during the shoreline survey. Photographs for each observation have been provided in *Appendix 4* , with the numbering of the photographs corresponding to the ID number in *Table* 3-1.

Table 3-1. Locations and details of observations made during the Shoreline Survey for Wexford Harbour in January and February 2025.

Date	High		Low		ID	Latitude*	Longitude*	Observation	Comment
	Time	Height (m)	Time	Height (m)		(WGS 84)	(WGS 84)		
06/02/2025	11:48	16.5m	18:37	0.73m	1	52.28748	-6.40128	Mudflats	Salt marsh/mudflats-cattle and birds grazing.
					2	52.29263	-6.41642	Stream	Evidence of contamination with strong odour.
					3	52.30614	-6.42891	Stream	Shore side of the slob. Barrier present, water may not be entering BMPA.
					4	52.30741	-6.44595	River	Flowing into the slob land. Piggery nearby.
30/01/2025	19:59	1.84	14:28	0.61m	5	52.31328	-6.4485	Stream	Stream from WWTP. Strong odour.
					6	52.31499	-6.45092	WWTP	Strong odour
					7	52.31632	-6.44796	Stream	North of WWTP, steam flowing under the bridge.
29/01/2025	19:13	1.82m	13:27	0.65m	8	52.3317	-6.43727	WWTP Discharge Point	Outfall protected by rock armour.
30/01/2025	19:59	1.84	14:28	0.61m	9	52.34244	-6.45673	Outfall	Outfall from urban area.
					10	52.33969	-6.45967	Quay	Active quay for mussel dredgers.
					11	52.34476	-6.4522	Groyne	Concrete groyne structure.
					12	52.35234	-6.44427	Stream	Run off from saltmarsh.

Date	High		Low		ID	Latitude*	Longitude*	Observation	Comment
	Time	Height (m)	Time	Height (m)		(WGS 84)	(WGS 84)		
30/01/2025	19:59	1.84	14:28	0.61m	13	52.3561	-6.43699	Sluice	Sluice gate from slobs/wetlands. Lots of geese feeding
					14	52.35626	-6.42286	Stream	No stream observed from shore.
					15	52.35561	-6.42147	Pump House	Inactive pump house.
					16	52.35556	-6.40355	Stream	Stream not observed from here, could not get closer due to depth.
					17	52.35291	-6.37843	Stream	Stream not observed from here, could not get closer due to depth.
					18	52.34821	-6.45589	SWO	SWO from WWTP
					19	52.3735	-6.46985	Stream/Marsh	Streams from marsh. Grazing cattle. Could not get closer due to depth, coordinates and image from a distance.
06/02/2025	11:48	16.5m	18:37	0.73m	20	52.38274	6.460075	Stream/Marsh	Stream from marsh. Coordinates and image taken from inside marsh as could not get closer to the shoreline here.
29/01/2025	19:13	1.82m	13:27	0.65m	21	52.35841	-6.49601	Marsh	Marsh with oystercatchers feeding. 2 streams fed by agricultural land. Could not get closer due to depth, coordinates and image from a distance.
29/01/2025	19:13	1.82m	13:27	0.65m	22	52.35447	-6.5021	Marsh	Next to hotel, wading birds present.
					23	52.3538	-6.5056	Hotel	Ferrycarrig Hotel.

Date	High		Low		ID	Latitude*	Longitude*	Observation	Comment
	Time	Height (m)	Time	Height (m)		(WGS 84)	(WGS 84)		
					24	52.35123	-6.51008	River	Bridge over the River Slaney with SWO.
					25	52.35057	-6.50521	Stream	Stream under road.
					26	52.34745	-6.50521	River	River under bridge (anoxic mud).
					27	52.34427	-6.45626	Old unused jetty	Angel monument.
					28	52.34559	-6.45604	Jetty	Large brick unused jetty.
					29	52.34595	-6.47205	Yacht club	Active yacht club.
					30	52.35	-6.5071	Slip way	Ferrycarrig Rowing Club
30/01/2025	19:59	1.84	14:28	0.61m	31	52.35503	-6.40944	Sandbank	Seal haul-out and bird habitat.
					32	52.34127	-6.45638	Ferry bank quay & slip	No comment.
					33	52.35525	-6.43968	Runoff	Runoff from agricultural land.
30/01/2025	19:59	1.84	14:28	0.61m	34	52.35417	-6.44224	Runoff	Runoff from house.
					35	52.30829	-6.44716	Outfall pipe	Evidence of heavy industrial contamination.
					36	52.307765	-6.447009	Outfall pipe	Looked inactive.

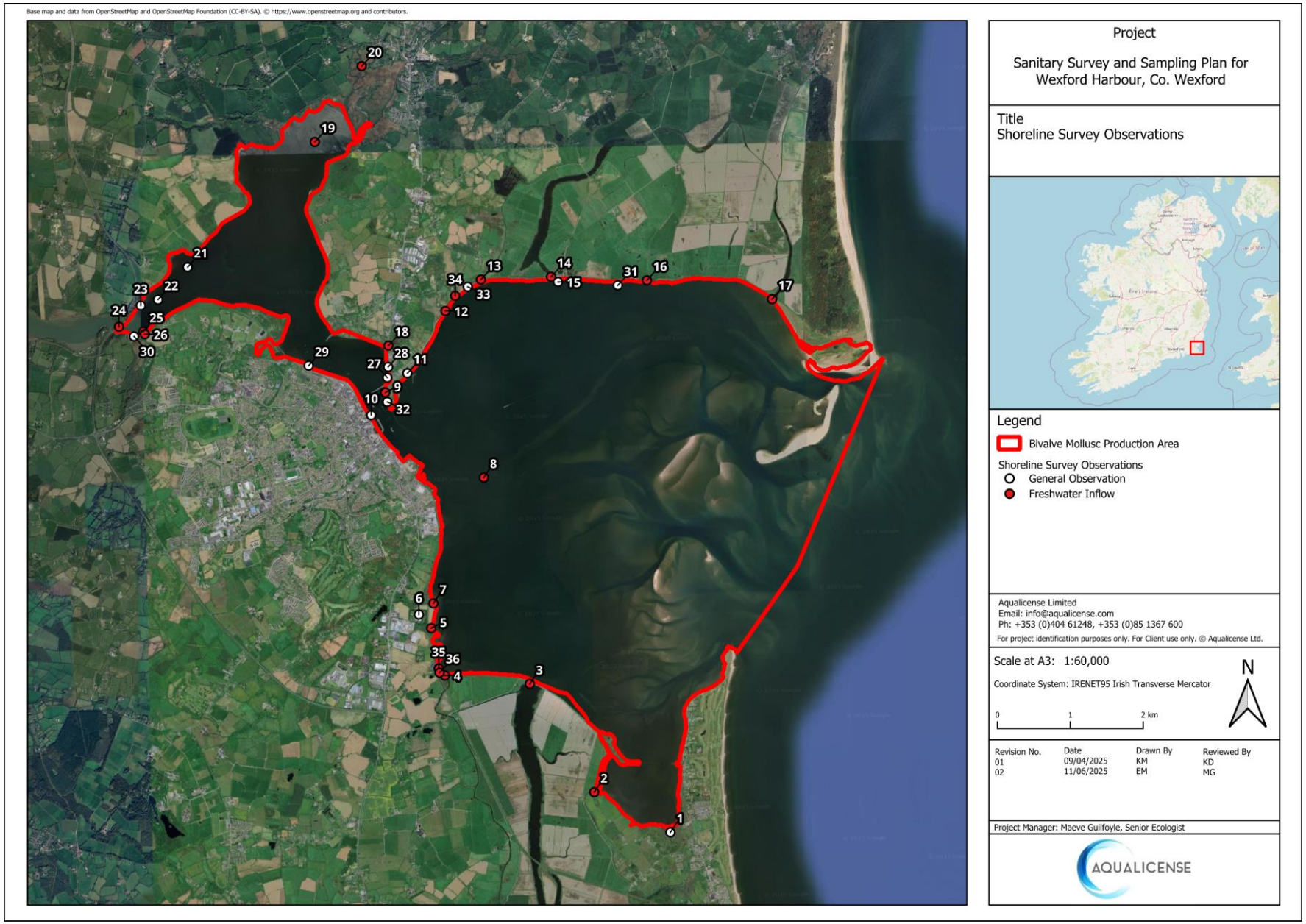

Figure 3-1. Location of observations made during the shoreline survey for Wexford Harbour in January and February 2025.

A total of 36 observations were made during the shoreline survey. These included areas of freshwater input, a hotel, coastal structures, areas with agriculture and wildlife, and facilities for vessels.

Discharge points around the bay generally corresponded with EPA-mapped rivers *(Figure* 2-4*).* Inflows 1, 2, 3, 4, 5, 11, 22, 25, and 27 matched shoreline survey IDs 2, 3, 4, 5, 7, 24, 18, 14, and 17 respectively. Inflow 10 likely corresponds to streams at ID 25 and 26, while ID 21 identified two streams aligned with Inflows 14 and 15 *(Figure* 3-1*).* Access limitations at ID 19 prevented verification of nearby shoreline inflows, but it is assumed Inflows 16–21 discharge to this area of the Inner Harbour. Survey access was possible further inshore along the Sow River (Inflow 18). ID 12 lies c. 100m from EPA-mapped Inflow 23 but is likely the same inflow. Evidence of contamination was recorded at Inflow 2 (ID 3) and Inflow 4 (ID 5).

Inflows 6, 7, 8, 9, and 26 could not be accessed during the shoreline survey due to low water levels and inaccessible terrain by foot, but their presence is assumed as a precaution. An additional unmapped stream was recorded at ID 16. All areas of freshwater (e.g. run off, rivers) with inputs to the bay identified during the shoreline survey have been indicated in red within *Figure 3-1*.

Two additional surface runoff sources were identified on the northern shore of the Outer Harbour, associated with residential and agricultural land, with potential for contamination. Additional outfall pipes, not identified in the desk-based review, were observed near Wexford Bridge (ID 9) and near Inflow 3 in the Outer Harbour (ID 35 and 36). ID 35 showed heavy industrial contamination; ID 36 appeared inactive. ID 9 is an urban outfall, and ID 8 confirmed direct discharge from the WWTP. An additional SWO was recorded north of Wexford Bridge (ID 18) and at the River Slaney (ID 24, Inflow 11). These outfalls and discharges are also potential sources of contamination.

Marine infrastructure largely matched desk-based records, including a yacht club, quays at Wexford Town, and a quay and slip opposite the town. The quay at ID 27 is unused, and a slipway at ID 30 was recorded that was not previously identified. A potential slip near Inflow 13 and two jetties near Crosstown were identified in desk-based mapping but not confirmed during the survey.

Beaches noted in the desk-based survey were not confirmed in the shoreline survey due to inaccessibility. Birds and seals were frequently recorded, particularly in intertidal and marsh areas of the eastern Inner Harbour (ID 21 and 22) and along the northern coast of the Outer Harbour (ID 13 and 31).

Potential sources of contamination, and pathways for the transfer of contamination, were identified along all shorelines of both the Inner and Outer Harbour. While several features highlighted in the desk-based survey were not confirmed during the shoreline survey, for the purposes of a precautionary, worst-case assessment, it has been assumed that these sources are present. Where access allowed, potential contamination sources were sampled for bacteriological analysis, the results of which are presented in *Section 4.*

A summary of each observation, its contamination risk level, and sampling location is included in *Table* 3-2*.* These findings informed both the delineation of the BMPA and the selection of the most appropriate Representative Monitoring Point (RMP). Observations from the high-risk inflow area particularly supported the inclusion of runoff areas and within the designated production area.

Table 3-2 Summary of observations, contamination levels and proposed bacteriological sampling locations

ID	LATITUDE (WGS84)	LONGITUDE (WGS84)	OBSERVATION	COMMENT	BACTERIOLOGICAL SAMPLE TAKEN (Y/N)
1	52.28748	-6.40128	Mudflats	Salt marsh/mudflats-cattle and birds grazing.	Y
2	52.29263	-6.41642	Stream	Evidence of contamination with strong odour.	Y
3	52.30614	-6.42891	Stream	Shore side of the slob. Barrier present, water may not be entering BMPA.	Y
4	52.30741	-6.44595	River	Flowing into the slob land. Piggery nearby.	Y
5	52.31328	-6.4485	Stream	Stream from WWTP. Strong odour.	Y
6	52.31499	-6.45092	WWTP	Strong odour	Y
7	52.31632	-6.44796	Stream	North of WWTP, steam flowing under the bridge.	Y
8	52.3317	-6.43727	WWTP Discharge Point	Outfall protected by rock armour.	Y
9	52.34244	-6.45673	Outfall	Outfall from urban area.	Y
10	52.33969	-6.45967	Quay	Active quay for mussel dredgers.	N
11	52.34476	-6.4522	Groyne	Concrete groyne structure.	N
12	52.35234	-6.44427	Stream	Run off from saltmarsh.	Y
13	52.3561	-6.43699	Sluice	Sluice gate from slobs/wetlands. Lots of geese feeding	Y
14	52.35626	-6.42286	Stream	No stream observed from shore.	N
15	52.35561	-6.42147	Pump House	Inactive pump house.	Y

ID	LATITUDE (WGS84)	LONGITUDE (WGS84)	OBSERVATION	COMMENT	BACTERIOLOGICAL SAMPLE TAKEN (Y/N)
16	52.35556	-6.40355	Stream	Stream not observed from here, could not get closer due to depth.	N
17	52.35291	-6.37843	Stream	Stream not observed from here, could not get closer due to depth.	N
18	52.34821	-6.45589	SWO	SWO from WWTP	Y
19	52.3735	-6.46985	Stream/Marsh	Streams from marsh. Grazing cattle. Could not get closer due to depth, coordinates and image from a distance.	Y
20	52.38274	6.460075	Stream/Marsh	Stream from marsh. Coordinates and image taken from inside marsh as could not get closer to the shoreline here.	Y
21	52.35841	-6.49601	Marsh	Marsh with oystercatchers feeding. 2 streams fed by agricultural land. Could not get closer due to depth, coordinates and image from a distance.	Y
22	52.35447	-6.5021	Marsh	Next to hotel, wading birds present.	N
23	52.3538	-6.5056	Hotel	Ferrycarrig Hotel.	Y
24	52.35123	-6.51008	River	Bridge over the River Slaney with SWO.	Y
25	52.35057	-6.50521	Stream	Stream under road.	Y
26	52.34745	-6.50521	River	River under bridge (anoxic mud).	Y
27	52.34427	-6.45626	Old unused jetty	Angel monument.	N
28	52.34559	-6.45604	Jetty	Large brick unused jetty.	N
29	52.34595	-6.47205	Yacht club	Active yacht club.	N

ID	LATITUDE (WGS84)	LONGITUDE (WGS84)	OBSERVATION	COMMENT	BACTERIOLOGICAL SAMPLE TAKEN (Y/N)
30	52.35	-6.5071	Slip way	Ferrycarrig Rowing Club	N
31	52.35503	-6.40944	Sandbank	Seal haul-out and bird habitat.	Y
32	52.34127	-6.45638	Ferry bank quay & slip	No comment.	N
33	52.35525	-6.43968	Runoff	Runoff from agricultural land.	N
34	52.35417	-6.44224	Runoff	Runoff from house.	N
35	52.30829	-6.44716	Outfall pipe	Evidence of heavy industrial contamination.	N
36	52.307765	-6.447009	Outfall pipe	Looked inactive.	N

4 BACTERIOLOGICAL SURVEY

Where possible, the COP (SFPA, 2020) recommends that water samples for *E. coli* should be taken from inflows or watercourses discharging near the shellfish harvesting areas. Shellfish sampling may also be conducted if uncertainty regarding RMPs remains following the desk-based survey and shoreline survey. For the purposes of this sanitary survey, bacteriological surveys and analysis are the responsibility of the SFPA, with Aqualicense relaying the relevant results within the report.

4.1 BACTERIOLOGICAL SURVEY METHODOLOGY

To complement shoreline observations and better understand contamination risks under current conditions, a bacteriological survey was carried out by SFPA at 22 targeted locations where faecal contamination was suspected. The sampling was undertaken at low tide using protocols outlined in Appendix 9.2 of the SFPA Code of Practice (2020). The COP recommends collecting samples under worst-case conditions, such as after heavy rainfall, to provide a more representative assessment of contamination levels. Each sample is assigned a clear identification code, with location codes following the format SS1, SS2, etc., to designate them as sanitary survey shellfish samples.

Samples are gathered in sterile plastic bottles. All samples are transferred to the testing laboratory within 48 hours of collection and are maintained at a temperature below 15ºC during transport to ensure sample integrity.

4.2 BACTERIOLOGICAL SURVEY RESULTS

A total of 22 water samples were obtained at areas where faecal contamination was suspected. Samples were obtained at low tide. It is recommended within the COP to obtain samples under worst-case environmental conditions, and samples obtained on the 29th and 30th occurred 6 and 7 days respectively after Storm Eowyn. Samples obtained on 6th February were obtained during dry weather conditions for logistical reasons. Sampling results are presented in *Table* 4-1 and *Figure* 4-1.

Table 4-1. Results of water sampling for E. coli in Wexford Harbour. ID corresponds with observations from the shoreline survey (See Section 3, Figure 3-1 and Table 3-1 for observation ID details)

WATER SAMPLE	OBSERVATION	CFU/ 100ML*	DATE	LATITUDE (WGS 84) (DECIMAL)	LONGITUDE (WGS 84) (DECIMAL)
1	WWTP Discharge Point (ID_08)	18000	29/01/25	52.31632	-6.44796
2	River (ID_26)	0	29/01/25	52.34745	-6.50521
3	Marsh (ID_21)	800	29/01/25	52.35841	-6.49601
4	Hotel (ID_23)	1100	29/01/25	52.3538	-6.5056
5	Stream (ID_25)	0	29/01/25	52.35057	-6.50521
6	River (ID_24)	990	29/01/25	52.35123	-6.51008
7	Stream/Marsh (ID_19)	500	29/01/25	52.34821	-6.45589
8	Outfall (ID_09)	2000	30/01/25	52.3317	-6.43727
9	Pump House (ID_15)	0	30/01/25	52.3561	-6.43699
10	Sandbank (ID_31)	0	30/01/25	52.35503	-6.40944
11	Stream/Marsh (ID_19)	0	30/01/25	52.3735	-6.46985
12	SWO (ID_18)	340	30/01/25	52.35561	-6.42147
13	Sluice (ID_13)	15	30/01/25	52.35234	-6.44427
14	Stream (ID_23)	0	30/01/25	52.34244	-6.45673
15	Stream (ID_05)	57	30/01/25	52.31328	-6.4485
16	Stream (ID_07)	450	30/01/25	52.31499	-6.45092
17	Stream (ID_02)	100	06/02/25	52.29263	-6.41642
18	Stream (ID_03)	40	06/02/25	52.30614	-6.42891
19	Sandbank (ID_31)	0	06/02/25	52.35503	-6.40944
20	River (ID_04)	0	06/02/25	52.30741	-6.44595
21	Mudflats (ID_01)	0	06.02.25	52.28748	-6.40128
22	Stream/Marsh (ID_20)	0	06.02.25	52.38274	6.460075

*Colony forming units per 100ml of sample.

The bacteriological sampling results indicate varying levels of *E. coli* contamination across the BMPA. The highest *E. coli* concentration was recorded at Sample 1 (ID_08), corresponding to the Wexford Town Urban Waste Water Treatment Plant (UWWTP) discharge point. This sample recorded a concentration of 18,000 CFU/100ml, confirming this location as a significant point source of faecal contamination within the Outer Harbour. Elevated levels (2,000 CFU/100ml) were also recorded at Sample 8 (ID_09), representing an urban outfall located in the channel between the Inner and Outer Harbour, adjacent to Wexford Bridge.

High *E. coli* concentrations were also recorded near the inflow of the River Slaney (Inflow 11, *Figure* 4-1). Sample 4 (ID 23, adjacent to Ferrycarrig Hotel) and Sample 6 (ID 24, River Slaney) yielded results of 1,100 CFU/100ml and 990 CFU/100ml, respectively. These findings align with the results of the desk-

based survey, which had identified these areas as being at elevated risk due to the proximity of upstream discharges and potential urban and agricultural inputs.

Relatively lower but detectable levels of *E. coli* were recorded at a number of other locations along the shoreline, with concentrations ranging from 15 to 990 CFU/100ml. Several samples, including those taken near a pump house (Sample 09), sandbank locations (Samples 10 and 19), mudflats (Sample 21), and various river and stream locations (Samples 02, 05, 11, 14, 20, and 22), recorded zero *E. coli*, indicating an absence of detectable faecal contamination at the time of sampling.

Samples 07 and 11 were both collected at ID 19 (northern Inner Harbour) on consecutive days. These samples showed a reduction in *E. coli* concentration from 500 CFU/100ml to 0 CFU/100ml over the two-day period. This may reflect the passage of time since a recent storm event, minor variations in the precise sampling location (as these samples were collected from a vessel), or short-term variability in the circulation and dispersal of contaminants within the harbour. These results informed the final decision on the BMPA boundary and confirmed the location of the RMP.

These bacteriological results indicate that the primary sources of faecal contamination within the study area are associated with known point discharges, including the UWWTP, outfalls, and localised land-based sources such as marshes and urban drainage. The absence or low levels of *E. coli* detected at other locations, particularly within the streams and rivers, suggests limited contamination at the time of sampling. However, it is noted that seasonal factors, including variations in rainfall, river flow, and agricultural activity, may influence contamination patterns over time. Such seasonal variations in such sources should be considered when devising a suitable sampling plan.

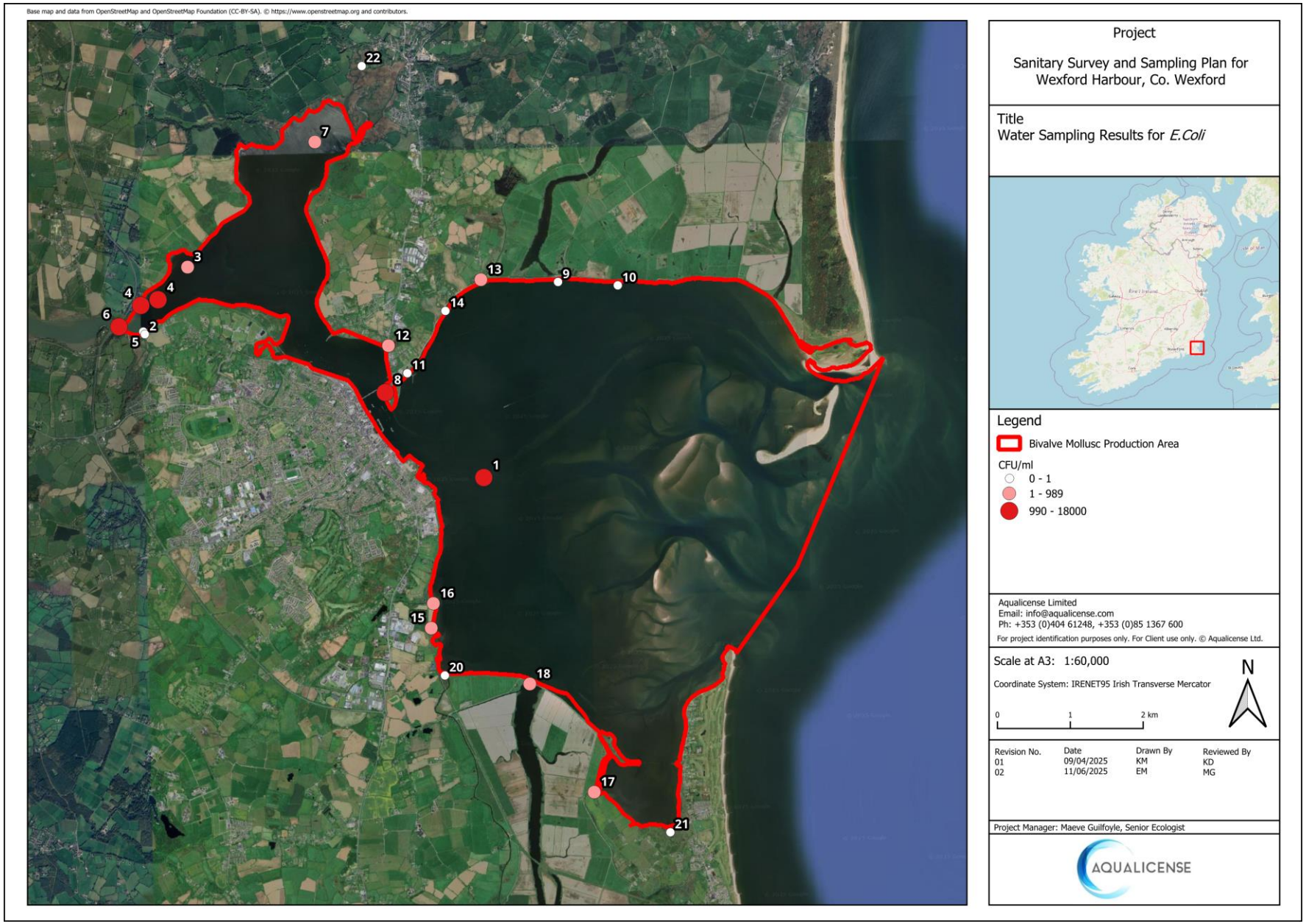

Figure 4-1. Water sampling results for E. coli.

5 SANITARY SURVEY CONCLUSION

Considering the findings of the desk-based survey, shoreline survey and bacteriological sampling, conclusions have been drawn regarding areas of greatest faecal contamination risk. The desk-based survey concluded that sewage discharges are likely to be highest in the Inner Harbour adjacent to the inflow from the River Slaney, and in the Outer Harbour near the channel from the Inner Harbour at Wexford Bridge, and adjacent to the UWWTP discharge point. The presence of faecal contamination at these areas was confirmed by both the shoreline survey and bacteriological sampling.

Agriculture was considered by the desk-based study to be another significant source of contamination to this BMPA. A number of run-offs with evidence of contamination were recorded during the shoreline survey, and evidence of cattle and sheep visible around the shores of the BMPA. While *E. coli* concentrations were not particularly high at the time of sampling from inflows associated with agricultural land, these concentrations may increase seasonally during the summer and following periods of extreme rainfall.

Hydrodynamic conditions within the BMPA are likely to influence the transport of contamination. In the Inner Harbour, pollutants from the River Slaney and local inflows are likely to disperse throughout the Inner Harbour. In the Outer Harbour, contamination from the Inner Harbour and the UWWTP discharge is primarily directed through the central channels. Smaller streams and inflows may contribute to localised contamination, particularly in more sheltered areas to the north of the Inner Harbour and the south of the Outer Harbour, where water movement is reduced.

These conditions strongly support merging the Inner and Outer BMPAs into a single BMPA, aligning clearly with EU regulation 2019/627 and the SFPA Code of Practice to ensure regulatory compliance and effective management of contamination risks.

These conclusions directly inform the subsequent sampling strategy, justifying targeted placement of the Recommended Monitoring Points (RMPs) in areas of the greatest identified risk, thus ensuring an effective monitoring and management framework.

6 AMENDMENTS TO BMPA BOUNDARY

Wexford Harbour is currently divided into two separate BMPAs: Inner Wexford Harbour and Outer Wexford Harbour. The boundaries of both of these BMPAs correspond with the Marine Institutes monitored Harmful Algal Blooms (HABs) Inshore shellfish production area.

Considering shared contributing catchment, demonstrated hydrodynamic connectivity and the shared contamination risks between these areas, the Inner and Outer BMPAs should be consolidated into a single BMPA for Wexford Harbour. This unified approach will better reflect the integrated nature of the catchment and provide a more coherent basis for managing contamination risks (see).

The shoreline survey results contributed to defining this boundary by identifying previously undocumented contamination sources, thereby refining the spatial coverage of the BMPA and confirming the locations of the Recommended Monitoring Points (RMPs). In collaboration with the SFPA, a boundary has been defined the existing bivalve production licences and any future bivalve production sites *(Table* 6-1*)*

Table 6-1: The outer bay coordinates of the BMPA in Wexford Harbour Latitude and longitude values are in coordinate reference system (CRS) WGS84, easting and northing values are in CRS Irish Transverse Mercator

CORNER	LATITUDE	LONGITUDE	LATITUDE (DMS)	LONGITUDE (DMS)	EASTING	NORTHING
NORTH	52.3454	-6.3563	52°20'43.46"	-6°21'22.65"	711991.73	622806.17
MID-WAY	52.3199	-6.3746	52°19'11.54"	-6°22'28.52"	710809	619937.58
SOUTH	52.3094	-6.3872	52°18'33.71"	-6°23'13.85"	709976.6	618749.52

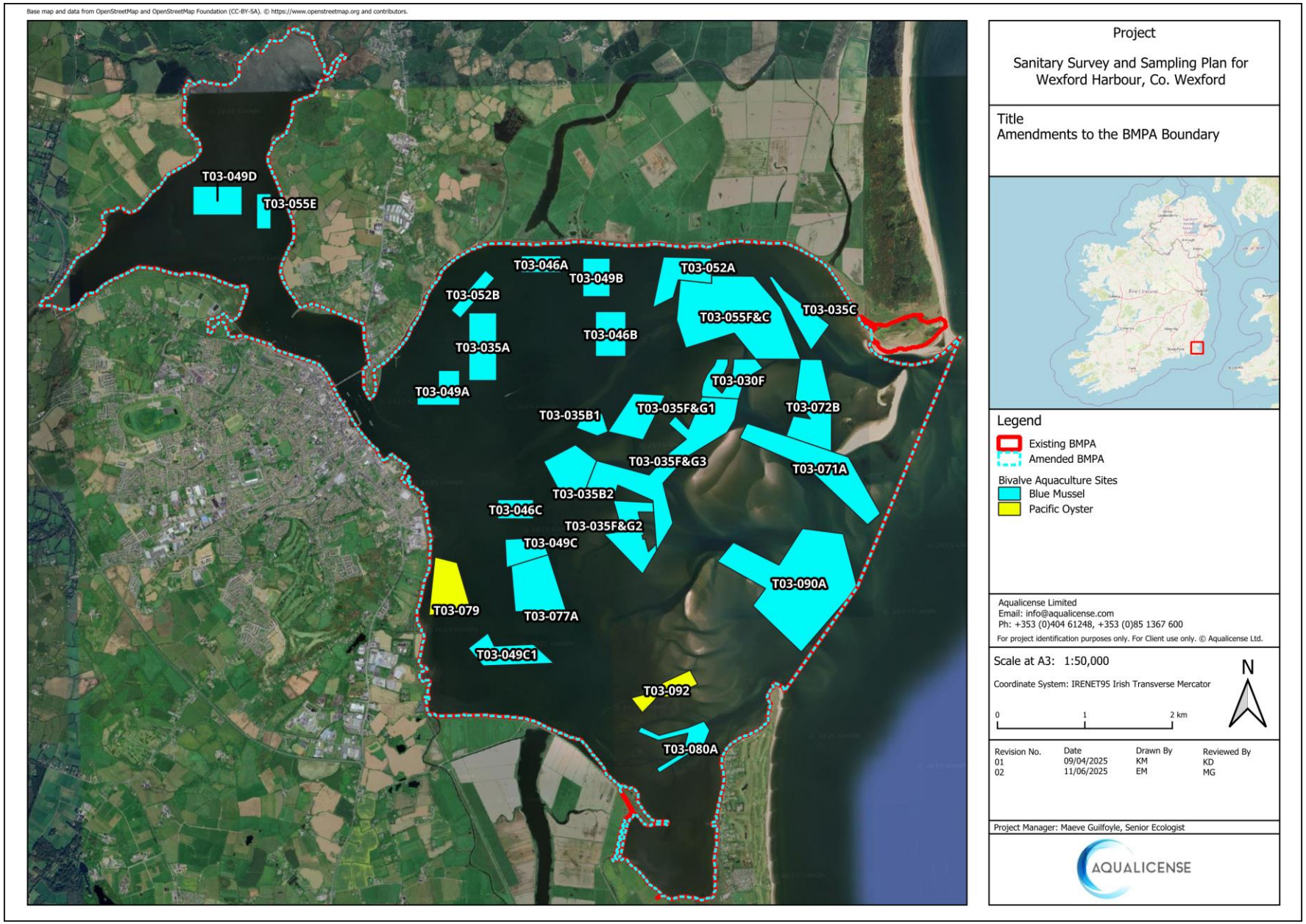

Figure 6-1. Amendments to the BMPA boundary.

7 SAMPLING PLAN FOR BLUE MUSSELS

Following on from the SFPA guidelines (SFPA, 2020) a Representative Monitoring Point (RMP) is a designated geographical location used for taking samples to assess the water quality and health of shellfish in a given area. RMPs are selected based upon a combination of desktop analysis, findings from the shoreline survey and the availability of shellfish stocks for ongoing shellfish sampling. The Representative Monitoring Point should be located where the highest levels of E. coli are expected, serving as a benchmark for food safety, since all other shellfish within the BMPA should theoretically contain lower concentrations of E. coli.

7.1 REPRESENTATIVE MONITORING POINTS (BLUE MUSSELS)

Previously, Wexford Harbour contained three Representative Monitoring Points (RMPs) for blue mussel, one within the Inner Harbour and two within the Outer Harbour. Considering the extent of the proposed BMPA, prevailing circulation patterns, and the distribution of licensed sites, it is considered that maintaining three RMPs is appropriate. However, the locations of the existing RMPs were originally selected without production of a sanitary survey. It is now recommended that these locations are revised, considering the findings of this sanitary survey (summarised in *Section 5*) and ensuring that the RMPs represent the area's most at risk of contamination under worst-case scenarios.

It is recommended that RMP 1 (within the Inner Harbour), is located within the centre of Site T03-049D (52°21'39.88"N, 6°28'49.19"W) *(Figure* 7-1*).* This location is likely to be influenced by contamination from the River Slaney inflow which drains the much of the contributing catchment, as well as from additional inflows located along the northern shoreline of the Inner Harbour. Mussel harvesting in the inner harbour is contingent upon the availability of stock. In the absence of mussel production, the RMP will remain inactive until harvesting activities resumes.

In the Outer Harbour, two RMPs are proposed. RMP 2 is in the centre of Site T03-035B2 (52°19'57.56"N, 6°25'19.25"W), situated within a key hydrodynamic pathway that is likely to transport contamination from the Inner Harbour (i.e. the majority of the contributing catchment). This site is also in close proximity to the discharge point of the Wexford Town UWWTP, where elevated *E. coli* levels were recorded during shoreline surveys and bacteriological monitoring.

RMP 3 is recommended within the centre of Site T03-077A (52°19'15.67"N, 6°25'42.04"W), in the southern Outer Harbour. Although *E. coli* levels recorded at this location during the survey were relatively low, this site is located near Inflow 3, which was identified as an inflow of concern during the desk-based study. Furthermore, this area is characterised by reduced water circulation, which has the potential to result in increased contaminant accumulation.

While specific RMPs have been identified for blue mussels, it is recognised that, due to the unpredictable nature of seed mussel supply, mussels may not always be available within 100 metres of the RMP. In such circumstances, the SFPA sample coordinator and local industry representatives should be informed, and an alternative sampling location agreed. This alternative location should be selected with reference to the findings of the sanitary survey and should continue to represent a worst-case scenario for contamination risk.

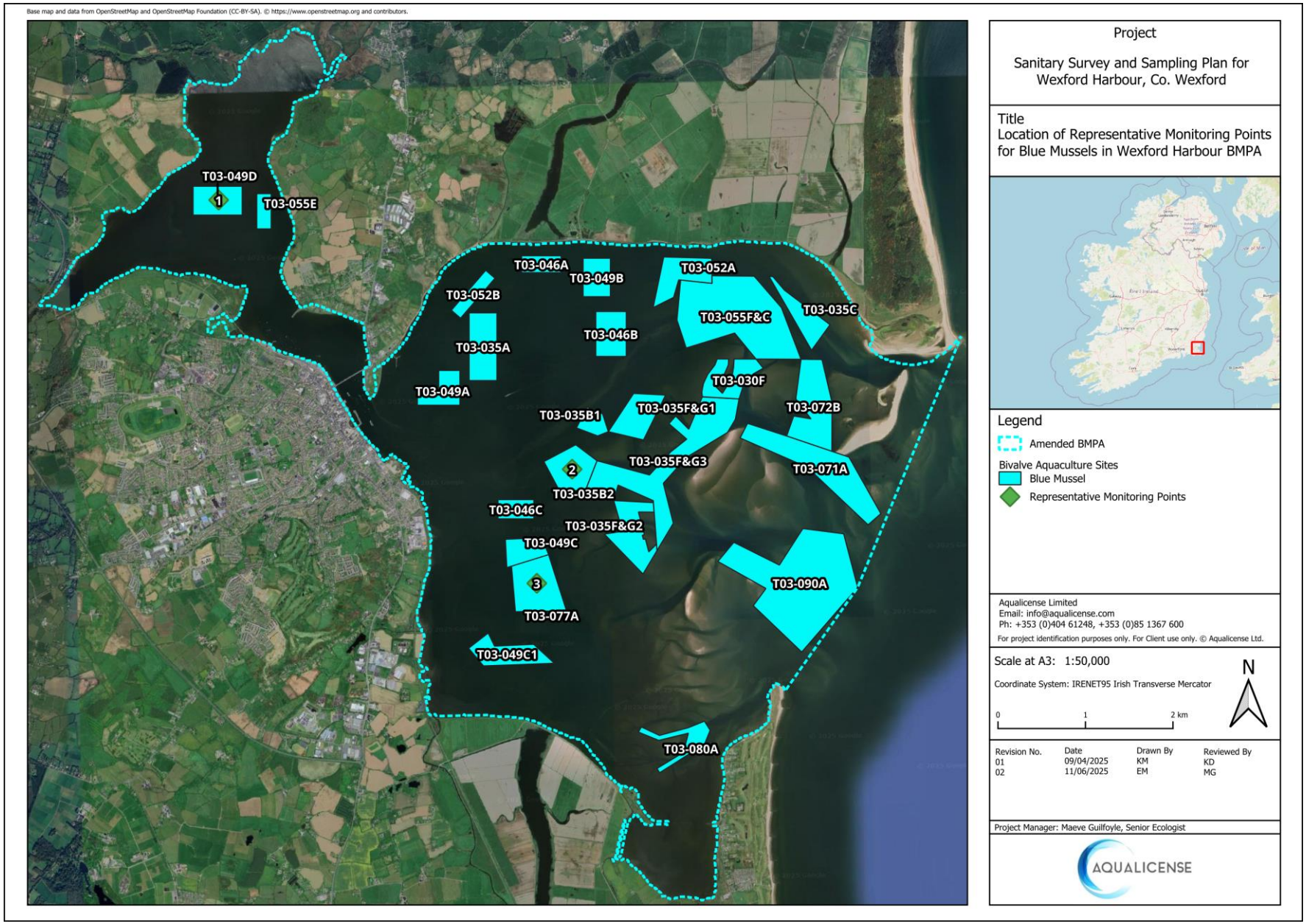

Figure 7-1. Location of Representative Monitoring Points for Blue Mussels in Wexford Harbour BMPA.

7.2 Sampling Plan for Blue Mussels

A species-specific sampling plan has been developed in line with EU Regulation 2019/627 and the SFPA Code of Practice (2020). Key features of the plan include:

Table 7-1. Sampling Plan for blue mussels in Wexford Harbour BMPA.

Species	*Mytilus edulis*
Site Name	Wexford Harbour
Sample Point Identifiers (RMPs)	1:WX-WH-KT 2: WX-WH-WT 3: WX-WH-KLs
Geographical location of RMP Sampling Points (WGS 84)	1: 52°21'39.88"N, 6°28'49.19"W 2: 52°19'57.56"N, 6°25'19.25"W 3: 52°19'15.67"N, 6°25'42.04"W
Sampling Frequency	Samples shall be taken monthly upon reviewed classification of Wexford Harbour BMPA. Sampling will occur throughout the year.
Sampling Depth	Samples are dredged from the seabed
Maximum Allowed Distance from Sampling Point	Samples are to be collected within 100m of the RMP. Where this is not possible, the SFPA sample coordinator and local industry shall be informed to agree an alternative sampling location.
Sampling Method	Sampling will be conducted in accordance with the SFPA Code of Practice for the Classification and Microbiological Monitoring of Bivalve Mollusc Production Areas (SFPA, 2020), specifically in accordance with Appendix 9.2.
Sample Size	A minimum of 15 mussels of market size (minimum length of 4 cm).
Authorised Samplers	It is the responsibility of the SFPA to arrange sampling, with designated sampling officers assigned to collect samples.

This plan ensures the data collected will be representative of contamination affecting the production area, supporting ongoing official controls.

8 SAMPLING PLAN FOR PACIFIC OYSTERS

8.1 REPRESENTATIVE MONITORING POINT (PACIFIC OYSTERS)

The recommended RMP is located at WGS 84 coordinates 52°19'14.87"N, 6°26'36.21"W within the licensed site T09/079 *(Figure* 8-1*).*

Based on the findings of the desk-based current pattern analysis *(Section 2.4 and Figure* 2-7*),* S-P-R outcome *(Table* 2-8*)* sanitary survey, summarised in *Section 5,* site T09/079 is identified as the most representative sampling location Considering the size of the BMPA, prevailing circulation patterns, and the presence of two licensed sites in the south of the Outer Harbour, a single Representative Monitoring Point (RMP) is recommended.

This licensed site is closest to the discharge of the Wexford Town UWWTP and lies centrally between the inflow from the Inner Harbour (which drains the majority of the contributing catchment) and Inflow 3, which was highlighted as an inflow of concern for sewage, Section 4 discharges and industrial emissions. Its proximity to the coast and Wexford Town further ensures its suitability as the most representative location for the Pacific oyster RMP.

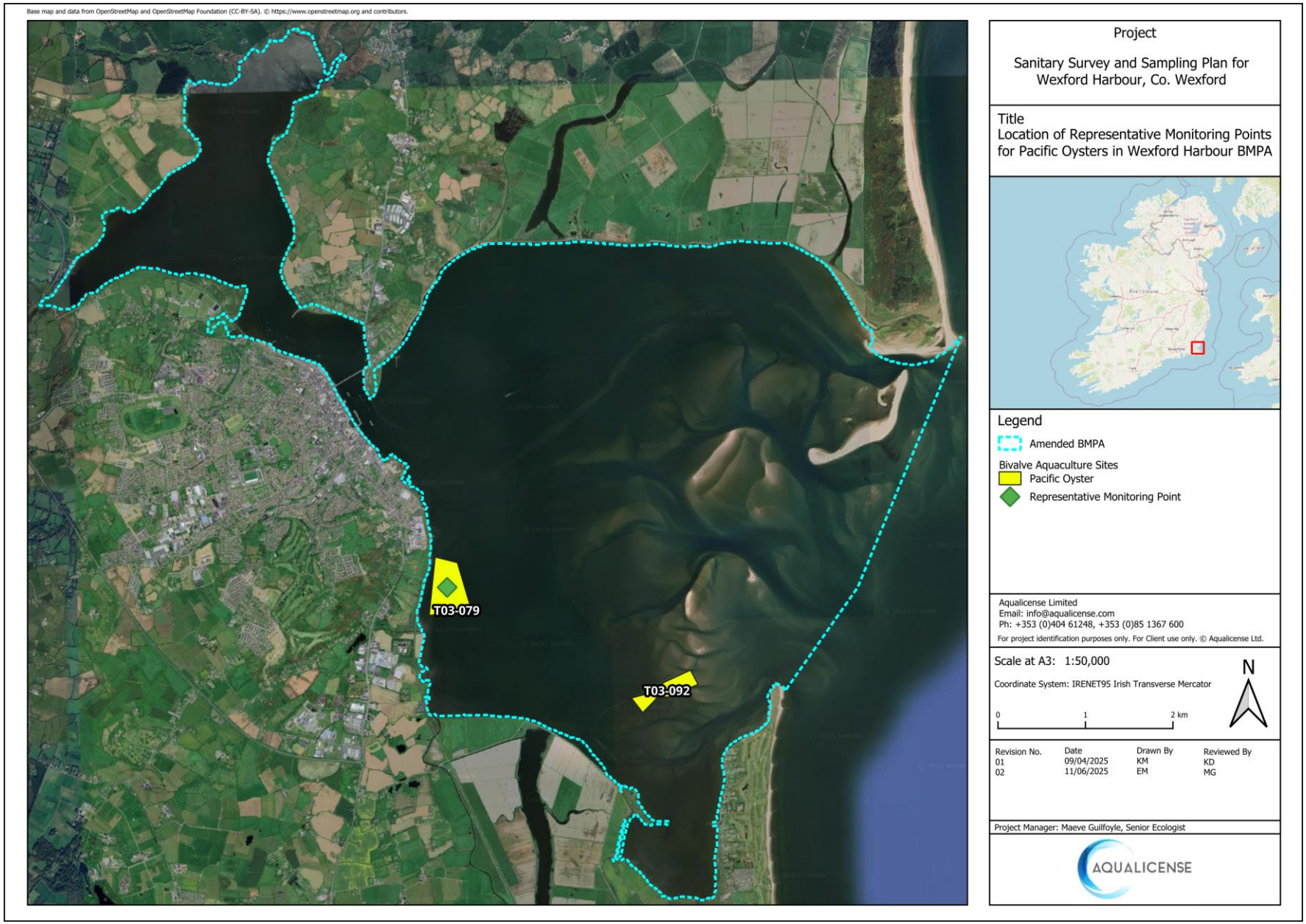

Figure 8-1. Location of Representative Monitoring Point for Pacific oysters in Wexford Harbour BMPA.

8.2 Sampling Plan for Pacific Oysters

A species-specific sampling plan has been developed in line with EU Regulation 2019/627 and the SFPA Code of Practice (2020).

Table 8-1. Sampling Plan for Pacific oysters in Wexford Harbour BMPA

Species	*Magallana gigas*
Site Name	Wexford Harbour
Sample Point Identifier	1. WX-WH-RL
Geographical location of sampling point (WGS 84)	52°19'14.87"N, 6°26'36.21"W
Sampling Frequency	Samples shall be taken monthly upon reviewed classification of Wexford Harbour BMPA. Sampling will occur throughout the year.
Sampling Depth	Samples should be taken as close to the surface as possible, within the top one metre of the water column.
Maximum Allowed Distance from Sampling Point	Samples are to be collected within 100m of the RMP. Where this is not possible, the SFPA sample coordinator and local industry shall be informed to agree an alternative sampling location.
Sampling Method	Sampling will be conducted in accordance with the SFPA Code of Practice for the Classification and Microbiological Monitoring of Bivalve Mollusc Production Areas (SFPA, 2020), specifically in accordance with Appendix 9.2.
Sample Size	A minimum of 10 Pacific oysters of market size (minimum length of 8 cm).
Authorised Samplers	It is the responsibility of the SFPA to arrange sampling, with designated sampling officers assigned to collect samples.

This plan ensures the data collected will be representative of contamination affecting the production area, supporting both initial classification and ongoing official controls.

9 Conclusions

A sanitary survey has been conducted in accordance with Article 56 of Regulation (EU) 2017/625 and Regulation (EU) 2019/627. The survey integrated a catchment-scale desk assessment, field-based shoreline verification, and bacteriological sampling to evaluate faecal contamination risks in Wexford Harbour.

The outputs of the survey are as follows:

- A geographically defined BMPA boundary of approximately 35.74 km²;
- Three representative sampling points located to capture the dominant contamination pressures for blue mussels; and
- A species-specific sampling plan for *Mytilus edulis*, in line with SFPA and EU regulatory requirements.
- A single representative sampling point located to capture the dominant contamination pressures for pacific oysters; and
- A species-specific sampling plan for *Magallana gigas*)., in line with SFPA and EU regulatory requirements.

These components provide the scientific basis for the classification and ongoing monitoring of Wexford Harbour as a shellfish production area.

10 REFERENCES

Alderisio, K.A. and Deluca, N. (1999) *Seasonal Enumeration of Faecal Coliform Bacteria from the Faeces of Ring-Billed Gulls (Larus delawarensis) and Canada Geese (Branta canadensis)*, *Applied and Environmental Microbiology*.

An, X.L. *et al.* (2020) 'High-throughput diagnosis of human pathogens and faecal contamination in marine recreational water', *Environmental Research*, 190. Available at: https://doi.org/10.1016/j.envres.2020.109982.

Aquaculture Licenses Appeals Board (2025) 'Appeals Archive'. Available at: https://alab.ie/activeappeals/ (Accessed: 7 April 2025).

Arévalo-Martínez, D.L. *et al.* (2023) 'Ideas and perspectives: Land-ocean connectivity through groundwater', *Biogeosciences*, 20(3), pp. 647–662. Available at: https://doi.org/10.5194/bg-20-647-2023.

Birdwatch Ireland (2025) 'The Irish Wetland Bird Survey (I-WeBS)'. Available at: https://c0amf055.caspio.com/dp/f4db30005dbe20614b404564be88 (Accessed: 7 April 2025).

Corine (2018) 'Corine Landcover 2018 - National (ITM)'. Available at: Corine Landcover 2018 - National (ITM) Available at: https://gis.epa.ie/GetData/Download (Accessed: 7 April 2025).

CSO (2020) 'Census of Agriculture'. Available at: https://data.cso.ie/product/COA (Accessed: 7 April 2025).

CSO (2023a) 'Occupancy Status of Permanent Dwellings on Census Night: SAP2022T6T8SA'. Available at: https://data.cso.ie/table/SAP2022T6T8SA (Accessed: 7 April 2025).

CSO (2023b) 'Population Density and Area Size'. Available at: https://data.cso.ie/table/F1011 (Accessed: 7 April 2025).

CSO (2023c) 'SAPMAP 2022/Theme 6: Housing/Permanent Private Households'. Available at: https://data.cso.ie/table/SAP2022T6T7SA (Accessed: 7 April 2025).

Department of Housing, L.G. and H. (2024) *EIA Portal*. Available at: https://housinggovie.maps.arcgis.com/apps/webappviewer/index.html?id=d7d5a3d48f104ecbb206e7e5f84b71f1 (Accessed: 7 April 2025).

Elmir, S.M. *et al.* (2007) 'Quantitative evaluation of bacteria released by bathers in a marine water', *Water Research*, 41(1), pp. 3–10. Available at: https://doi.org/10.1016/j.watres.2006.10.005.

EPA (2021) 'National Inspection Plan: Domestic Waste Water Treatment Systems 2022-2026'. Available at: https://www.epa.ie/publications/compliance--enforcement/waste-water/2022-2026-NIP---Final.pdf (Accessed: 7 April 2025).

EPA (2022) 'Data Download: Catchments Data Package - June 2022'. Available at: https://gis.epa.ie/GetData/Download (Accessed: 7 April 2025).

EPA (2023) *Data Download: WFD Status Geodatabase (All Waterbodies) 2016-2021 - May 2023*.

EPA (2024a) *EPA Licensed Facilities (IPC, IEL and Waste) - 13/09/2024*. Available at: https://gis.epa.ie/GetData/Download (Accessed: 7 April 2025).

EPA (2024b) 'WFD Section 4 Discharges - 19/11/2024'. Available at: https://gis.epa.ie/GetData/Download (Accessed: 7 April 2025).

EPA (2025a) 'catchments.ie'. Available at: https://www.catchments.ie/ (Accessed: 7 April 2025).

EPA (2025b) 'EPA Licensed UWWT Plants and 2018 Status - 20/02/2020'. Available at: https://gis.epa.ie/GetData/Download (Accessed: 7 April 2025).

EPA (2025c) 'Licence and Enforcement Access Portal'. Available at: https://leap.epa.ie/ (Accessed: 7 April 2025).

European Union (Good Agricultural Practice for Protection of Waters) Regulations 2022 (no date). Available at: https://www.irishstatutebook.ie/eli/2022/si/113/made/en/print (Accessed: 7 April 2025).

Fáilte Ireland (2018) 'Overnight Accommodation Density'. Available at: https://data.marine.ie/geonetwork/srv/eng/catalog.search#/metadata/ie.marine.data:dataset.3989 (Accessed: 7 April 2025).

Godino Sanchez, A. *et al.* (2024) 'Grey and harbour seals in France (mainland and Saint-Pierre et Miquelon): microbial communities and identification of a microbial source tracking seal marker', *Frontiers in Microbiology*, 15. Available at: https://doi.org/10.3389/fmicb.2024.1484094.

Government of Ireland (2022) 'Fifth Nitrates Action Programme 2022-2025'. Available at: https://www.gov.ie/en/publication/f1d01-fifth-nitrates-action-programme-2022-2025/ (Accessed: 7 April 2025).

Green, M.O. and Coco, G. (2014) 'Review of wave-driven sediment resuspension and transport in estuaries', *Reviews of Geophysics*. American Geophysical Union, pp. 77–117. Available at: https://doi.org/10.1002/2013RG000437.

GSI (2021) 'Groundwater Vulnerability 1:40,000 Ireland (ROI) ITM'. Available at: https://data.gov.ie/dataset/groundwater-vulnerability-140000-ireland-roi-itm (Accessed: 7 April 2025).

GSI (2023) 'IE GSI Aquifers Ireland (ROI) ITM'. Available at: https://dcenr.maps.arcgis.com/home/item.html?id=3dc543ff975941118c56263bd0e03d03 (Accessed: 7 April 2025).

Hartnett, M. and Nash, S. (2004) 'Modelling nutrient and chlorophyll_a dynamics in an Irish brackish waterbody', *Environmental Modelling and Software*, 19(1), pp. 47–56. Available at: https://doi.org/10.1016/S1364-8152(03)00109-9.

Hunter, C. *et al.* (1999) 'Agricultural land-use effects on the indicator bacterial quality of an upland stream in the Derbyshire Peak District in the UK', *Water Research*, 33(17), pp. 3577–3586.

Hydro Environmental Ltd (2016) *Hydrodynamic Dispersion Modelling of Proposed Glanbia Trade Effluent Discharge in Wexford Harbour*. Available at: https://leap.epa.ie/docs/413b75ab-7c5a-4c4d-8d0b-255059c1d3b5.pdf (Accessed: 7 April 2025).

Hydro Environmental Ltd (2017) *Hydrodynamic Dispersion Modelling of the Glanbia Outfall Discharge to Wexford Harbour: Addendum Report*. Available at: https://leap.epa.ie/docs/8a86f83d-dfe6-466a-ab59-7fb6eb6a14fc.pdf (Accessed: 7 April 2025).

MaREI (2016) *Ferry Port*. Available at: https://data.gov.ie/dataset/ferry-port (Accessed: 7 April 2025).

Marine Institute (2010) 'Commercial Port'. Available at: https://data.gov.ie/dataset/commercial-port (Accessed: 7 April 2025).

Marine Institute (2025) 'Irelands Marine Atlas'. Available at: https://atlas.marine.ie/#?c=53.9108:-15.9192:6 (Accessed: 7 April 2025).

Martin, N.A. *et al.* (2024) 'Quantitative source apportionment of faecal indicator bacteria from anthropogenic and zoogenic sources of faecal contamination', *Marine Pollution Bulletin*, 205. Available at: https://doi.org/10.1016/j.marpolbul.2024.116591.

Met Éireann (2025a) *Johnstown Castle Daily Data*. Available at: https://data.gov.ie/dataset/johnstownii-daily-data (Accessed: 7 April 2025).

Met Éireann (2025b) 'Johnstown Castle Monthly Data'. Available at: https://data.gov.ie/dataset/johnstownii-monthly-data (Accessed: 7 April 2025).

NPWS (2025) 'Protected Sites in Ireland'. Available at: https://www.npws.ie/protected-sites (Accessed: 7 April 2025).

Qiu, J. *et al.* (2021) 'Synergistic effect of drought and rainfall events of different patterns on watershed systems', *Scientific Reports*, 11(1). Available at: https://doi.org/10.1038/s41598-021-97574-z.

RPS (2021) *Wexford and Burrow Coastal Wave and Water Level Modelling Study 2020*. Available at: https://s3-eu-west-1.amazonaws.com/docs.floodinfo.opw/floodinfo_docs/CWWS/IBE1729_CWWS_Rp01_Wexford_F02.pdf (Accessed: 7 April 2025).

SFPA (2020) *COP SH01: Code of Practice for the Classification and Microbiological Monitoring of Bivalve Mollusc Production Areas in Ireland*.

SFPA (2024) *Sanitary Survey & Sampling Plan for Roaringwater Bay*. Available at: https://www.sfpa.ie/LinkClick.aspx?fileticket=O-s473795Vc%3d&portalid=0 (Accessed: 7 April 2025).

Tailte Éireann (2023) 'CSO Urban Areas - National Statistical Boundaries - 2022 - Ungeneralised'. Available at: https://data-osi.opendata.arcgis.com/datasets/osi::cso-urban-areas-national-statistical-boundaries-2022-ungeneralised/about (Accessed: 7 April 2025).

Taylor, H. (2003) 'Surface Waters', in D. Mara and N. Horan (eds) *Handbook of water and wastewater microbiology*. Academic Press, pp. 611–626.

Uisce Eireann (2023) *Annual Environmental Reports*. Available at: *https://www.water.ie/help/wastewater/compliance/annual-environmental-repo* (Accessed: 7 April 2025).

UK Hydrographic Office (2025) 'Admiralty Chart 1772: Rosslare Europort and Wexford Harbour'.

Young, I.R. (1999) *Wind Generated Ocean Waves*. Elsevier.

Appendix 1 Summary Statistics For Weather

Appendix 1A. Summary statistics for wind derived from Johnstown Castle weather station March 2015 to February inclusive 2025)

Direction	Frequency (%)	Max. Mean Wind Speed (m/s)	Mean Wind Speed (m/s)
W	14.7	23.5	9.2
SW	26.8	22.7	9.3
S	17.8	21.5	9.4
E	3.1	14.8	6.1
NW	12.2	16.4	7.3
SE	8.5	21.4	9.0
N	5.5	16	7.0
NE	11.5	17.3	7.7

Appendix 1B. Summary statistics for daily rainfall derived from Johnstown Castle weather station March 2015 to February inclusive 2025)

Month	Max. Daily Rain (mm)	Mean Daily Rain (mm)
Jan	29	3.18
Feb	36.4	3.30
Mar	41.5	3.05
Apr	37.1	2.10
May	33.4	2.16
Jun	30.2	2.09
Jul	35.8	2.20
Aug	30	2.30
Sep	32.4	3.40
Oct	57.6	4.22
Nov	36.3	3.65
Dec	58.9	4.70

Appendix 2 Statistics for Small Areas overlapping the contributing catchment and corresponding population density (CSO, 2023c)

Small Area Code	Population Density (People per km^2)	Contributing Catchment Overlap
A017007001	16	<1%
A017020001	17	<1%
A247025001	27	<1%
A247093001	64	<1%
A017039001	6	<1%
A257055001	5	<1%
A257053001	4	<1%
A247104003/ A247104014	28	1.6
A247115002	34	1.8
A017015001	14	2
A087021002	28	2.3
A247020003	76	2.8
A017021001	24	4.4
A247106002/ A247106003/ A247106004	18	4.5
A247081004	51	4.6
A247064001	29	5.9
A247052001	25	6.1
A247050001	40	7
A247104011/ A247104016	1035	7.5
A247052016	77	7.9
A257070001	26	8.3
A247033004	52	8.4
A257003003	13	9.3
A247104013	702	10.1
A017028001	36	10.6
A247084002	34	12.9
A247119001	31	14.5
A247116001	36	14.6
A257052001	15	14.7
A257066001	19	15.3
A257040001	19	16.3
A247086001	46	16.8
A257023002	8	16.9
A247087002	28	16.9
A247021002	25	19.4
A247060001	32	20.9
A017041002	27	22.4

Small Area Code	Population Density (People per km^2)	Contributing Catchment Overlap
A247037002	33	23.3
A247115001	30	23.9
A247104008	2257	26
A257041001	21	26.5
A017052002	28	28.9
A257013001	12	30.4
A247020001	56	30.5
A247097003	82	32.8
A247026001/ A247026003	26	35
A247039002	29	35.7
A247033002	26	37.3
A247021001	25	39.3
A247024001	8	40
A247004005	55	41.3
A247104002/ A247104004	59	41.9
A247019002	32	43.7
A017044001	28	45.5
A247025002	42	49.8
A257072001	25	51.6
A017035001	16	51.8
A257068002/ 02/ A257068001	27	55.6
A017021002	112	59.1
A247071003	42	59.6
A247026002	45	60.4
A247084001	41	61.2
A247097005	97	61.4
A247104015	1132	61.7
A257033001/ 02	30	61.7
A247033003	50	61.9
A247104012	3410	62.5
A247122001	17	62.6
A017029001	21	63.2
A247106001	45	66.9
A247119002	25	68.3
A247087001	40	71.7
A247046008	2601	72.5
A257023001	1007	74.5

Small Area Code	Population Density (People per km^2)	Contributing Catchment Overlap
A247050002	95	74.8
A247001001	25	75.4
A247003002/ 01	510	75.5
A247004004	11	75.5
A247082001	32	75.8
A017038003	21	77.7
A017041001/ 01	28	79.7
A017026001	39	81.7
A247081003	37	84.5
A247101001	24	84.7
A247046007	1432	86.3
A247104009/ A247104007	681	87.1
A257015007	23	89.3
A257071001	28	89.4
A247124014	4345	90.3
A247031001/ 01	46	90.7
A247052007	25	91
A247078001	51	91.6
A247015003/ 02	26	91.7
A247051001	51	92.9
A247118008/ A247118009	2428	93.2
A247104001	3193	93.4
A247057001	30	93.7
A247045005	932	94
A247044003/ 01/ A247044002	29	94.2
A247071001	55	94.3
A247038001	26	94.4
A247123001/ A247123002	4007	94.5
A247102014/ A247102015	19	94.5
A247044006	42	94.6
A247071002	45	95.5
A247124012	3633	95.8
A247027005	50	95.8
A247003011	37	96.2
A247051002	63	96.4
A247078002	33	96.7
A247108001	25	96.9

Small Area Code	Population Density (People per km^2)	Contributing Catchment Overlap
A257064001	20	97.1
A247015004/ 01	22	97.2
A247102006	1191	97.6
A247073002	40	98
A247102017/ A247102009	738	98.1
A247026004	1565	98.2
A247102007/ A247102008	541	98.5
A247117045	2136	98.5
A247045004/ 01/ A247045001/ A247045003	39	98.6
A247041003	24	98.6
A257029002	18	98.7
A247117044/ 01	36	98.7
A247102012/ A247102013	1322	99
A257071003	11	99
A247122003	30	99.1
A247101002	13	99.1
A247044005	49	99.3
A247003001	45	99.3
A247124013	1718	99.3
A257076001	27	99.3
A247045018	39	99.5
A017017001	16	99.5
A247067004	11	99.5
A247097002	1233	99.6
A257043001	5	99.6
A247045019	396	99.7
A247102003	249	99.7
A247045004/ 02/ A247045002	249	99.8
A257011001	6	99.8
A247005002	39	99.9
A247117033/ 01	164	99.9
A247062003	38	99.9
A017013004	1131	100
A017051006	496	100
A017051012	2154	100
A017051008	953	100

Small Area Code	Population Density (People per km^2)	Contributing Catchment Overlap
A017051001	553	100
A017051011	1101	100
A017051004	2689	100
A017051009	537	100
A017051003	5241	100
A017051005	2214	100
A017051010	5694	100
A017051002	2521	100
A017051014	2265	100
A017051013	8074	100
A017050004	29	100
A017050002	43	100
A017013003	22	100
A017013001	34	100
A017051007	1083	100
A017022002	28	100
A017022001	25	100
A247104006	2258	100
A247104010	2286	100
A017052001	1002	100
A017050001	640	100
A017050003	2938	100
A017022003	1776	100
A017022004	1611	100
A017013002	1136	100
A247104005	1197	100
A247046002	4771	100
A247046001	2666	100
A247046011	2312	100
A247046010	1819	100
A247046006	995	100
A247046013	2574	100
A247046009	2647	100
A247046004	4875	100
A247046012	2988	100
A247046003	8103	100
A247046005	3344	100
A247045030	510	100
A247045010	1373	100
A247045036	318	100
A247045037	841	100
A247045040	922	100

Small Area Code	Population Density (People per km^2)	Contributing Catchment Overlap
A247045008	2714	100
A247045014	1536	100
A247045022	2309	100
A247045011	2013	100
A247045038	5715	100
A247045023	2026	100
A247045034	3171	100
A247045009	6264	100
A247045016	1711	100
A247045013	2373	100
A247045012	838	100
A247045021	4604	100
A247045015	2802	100
A247045025	4219	100
A247045029	4568	100
A247045026	1788	100
A247045033	3759	100
A247045024	5550	100
A247045039	5222	100
A247045006	4775	100
A247045007	8271	100
A247045028	6593	100
A247045027	9157	100
A247045031	4415	100
A247045032	5684	100
A247045017	2924	100
A247044003/ 02	904	100
A247047004	2201	100
A247047003	2786	100
A247047005/ 01	1843	100
A247047001/ 01	3542	100
A247047005/ 02	2288	100
A247081001	1369	100
A247081002	969	100
A247045035	30	100
A247045020	73	100
A247044004	40	100
A247044001	48	100
A247047001/ 02/ A247047006/	29	100

Small Area Code	Population Density (People per km^2)	Contributing Catchment Overlap
A247047002		
A247047005/ 03	3237	100
A247045041	435	100
A247038002	1949	100
A247003003	1508	100
A247003010	1441	100
A247003009	3159	100
A247003005	4040	100
A247003008	1229	100
A247038005	26	100
A247038004	73	100
A247038003	26	100
A247097004	39	100
A247097001	70	100
A247097006	114	100
A247005001	728	100
A247003004	74	100
A247003006	60	100
A247003007	3839	100
A247061003	977	100
A257021004	3961	100
A257021005	3229	100
A257021002	5400	100
A257021007	1231	100
A257021008	655	100
A257021006	672	100
A247061002/ 01/ A247061004	22	100
A247061001	32	100
A247061002/ 02	36	100
A257021003	23	100
A257021001	31	100
A257024001/ 01/ A257024002	21	100
A257024001/ 02	1430	100
A017035002/ 01	913	100
A017042004	5511	100
A017017004	656	100
A017042002/ A017042003	26	100

Small Area Code	Population Density (People per km^2)	Contributing Catchment Overlap
A017042001	636	100
A017017003	27	100
A017004002	21	100
A017038002	1134	100
A247041004	117	100
A247041002	1664	100
A247074002	1324	100
A247094002	1364	100
A247094001	878	100
A247094009	1795	100
A247094005	546	100
A247094004	4227	100
A247102005	1247	100
A247102010/ A247102016	732	100
A247123005	1979	100
A247123004	773	100
A247123003	4829	100
A247123007	3601	100
A247123008	8858	100
A247123006	8058	100
A247118005	2031	100
A247118007	2190	100
A247118006	5071	100
A247118004	5212	100
A247118002	4549	100
A247118003	1871	100
A247118001	5380	100
A247117025	4259	100
A247117046	1351	100
A247117009	1812	100
A247117019	2408	100
A247117018	2967	100
A247117016	4187	100
A247117023	2743	100
A247117010	325	100
A247117007	2943	100
A247117037	8950	100
A247117038	4109	100
A247117024	5047	100
A247117015	1411	100
A247117012	7058	100
A247117001	5256	100

Small Area Code	Population Density (People per km^2)	Contributing Catchment Overlap
A247117003	5206	100
A247117034	4656	100
A247117043	2492	100
A247117017	1574	100
A247117004	5846	100
A247117006	4557	100
A247117036	6043	100
A247117042	2418	100
A247117040	7446	100
A247117002	5692	100
A247117021	4033	100
A247117022	5955	100
A247117041	3840	100
A247117030	5935	100
A247117013	3411	100
A247117008	6320	100
A247117011	2982	100
A247117027	5736	100
A247117005	6876	100
A247117029	5826	100
A247041001	78	100
A247074004	33	100
A247074001	41	100
A247074003	3161	100
A247094003	67	100
A247094007	37	100
A247094006/ A247094008	30	100
A247102001	41	100
A247031003	81	100
A247031006	154	100
A247031004	103	100
A247031005	474	100
A247015001	41	100
A247124008	3319	100
A247124011	4691	100
A247124017	4441	100
A247124018	2059	100
A247124020	4931	100
A247124004	5311	100
A247124016	4832	100
A247124010	6629	100
A247124002	8230	100

Small Area Code	Population Density (People per km^2)	Contributing Catchment Overlap
A247124009	6703	100
A247124001	5528	100
A247124003	3430	100
A247124019	3629	100
A247124006	6067	100
A247124015	5657	100
A247124007	3862	100
A247124005	3372	100
A257071005	903	100
A257071002	796	100
A257071004	608	100
A257071006	608	100
A257068002/01	1366	100
A247112003	26	100
A247112002	29	100
A247016003	45	100
A247016006	56	100
A247016005	27	100
A247016002	40	100
A247016001	75	100
A247016004	989	100
A257015010	1211	100
A257015009	2837	100
A257015002	4575	100
A257015005	1030	100
A257015006	1073	100
A257015003	2735	100
A257015004/ A257015001	1481	100
A257067002/ 01	1028	100
A257067001	985	100
A257067002/ 02	16	100
A257015008	2194	100
A017004003	814	100
A017004001	3630	100
A247112001	1178	100
A247031002	337	100
A017017002	3177	100
A247015003/01	1109	100
A017038001	1093	100
A247102002/ A247102004/ A247102011	470	100

Small Area Code	Population Density (People per km^2)	Contributing Catchment Overlap
A017044002	28	100
A017035002/02	27	100
A247027003	70	100
A247027004	55	100
A247027001/01	34	100
A247027002	35	100
A247089001	15	100
A247089002	28	100
A247059001	33	100
A247085002	31	100
A247085004	61	100
A247085003	31	100
A247085001	82	100
A247015002	41	100
A257022001	18	100
A247103001	34	100
A247103002	48	100
A247004002	66	100
A247062001	23	100
A247012002	42	100
A247088001	29	100
A247072002	32	100
A247072001	43	100
A247105001	28	100
A247079002	21	100
A257009001	19	100
A017003001	16	100
A257056001	11	100
A257028001	26	100
A247034004	39	100
A247111003	28	100
A247114001	28	100
A247062002	35	100
A247110001	45	100
A247110002	26	100
A247080001	23	100
A247009001	25	100
A247009002	28	100
A247088002	38	100
A247077001	31	100
A257026001	13	100

Small Area Code	Population Density (People per km^2)	Contributing Catchment Overlap
A247071004	68	100
A247067001	35	100
A247034001	31	100
A247067003	47	100
A247067002	25	100
A247082002	26	100
A247007001	43	100
A247007002	48	100
A257069001	31	100
A257042001	20	100
A257034001	13	100
A017026002	26	100
A017003002	27	100
A247111004	81	100
A247111001	57	100
A257044001	12	100
A257001001	16	100
A257063001	18	100
A257049001	21	100
A017046001	29	100
A017053001	21	100
A017014001	17	100
A017014002	22	100
A247122002	85	100
A247004001	80	100
A247004003	120	100
A247080002	20	100
A247007003	21	100
A247079001	46	100
A247011001	28	100
A247105002	38	100
A247114002	40	100
A247011002	42	100
A247019001	31	100
A017023001	27	100
A017048001	32	100
A247012001	29	100
A247034003	35	100
A247034002	39	100
A247111002	29	100
A257029001	1156	100
A017041001/02	1736	100

Small Area Code	Population Density (People per km^2)	Contributing Catchment Overlap
A247015004/02	653	100
A247027001/02	999	100
A247117044/02	1800	100
A247117044/03	447	100
A247117026/01	1665	100
A247117020	2963	100
A247117026/02	8136	100
A247117028	7517	100
A247117039/01	1427	100
A247117014	2227	100
A247117039/02	2374	100
A247031001/02	2108	100
A247117031/02	2173	100
A247117031/01	4227	100
A247117031/03	2198	100
A247117035	1589	100
A247117033/02	426	100
A247117032	5859	100
A247003002/02	774	100
A247073001	505	100

Appendix 3 Statistics from the Census of Agriculture 2020 relating to agriculture within the Electoral Divisions overlapping the contributing catchment.

Electoral Division	Percentage Overlap of Contributing Catchment	Total (Corrected) Dairy Cows	Total (Corrected) Livestock	Total (Corrected) Other Cows	Total (Corrected) Cattle	Total (Corrected) Sheep	Total (Corrected) No. Holdings	Average Size of Holdings	Total (Corrected) Area Farmed (Hectares)	Total (Corrected) Cereals (Hectares)	Total (Corrected) Grassland (Hectares)
Newcastle	1	0 (0)	425.3 (4.3)	166 (2)	548 (6)	No data	31.1 (1)	31.1	466.2 (4.7)	No data	407 (4.1)
Knockrath	1	0 (0)	1567.1 (15.7)	261 (3)	809 (9)	10514 (106)	99.6 (1)	99.6	2688 (26.9)	0 (0)	2686.3 (26.9)
Lugglass	1	0 (0)	1010.8 (10.2)	277 (3)	648 (7)	5855 (59)	61.7 (1)	61.7	1109.8 (11.1)	0 (0)	1106.6 (11.1)
Carrigeen	1	1120 (12)	3839.3 (38.4)	383 (4)	4353 (44)	4831 (49)	41.4 (1)	41.4	2689 (26.9)	406.5 (4.1)	2154.5 (21.6)
Ballymurphy	1	561 (6)	2325.5 (23.3)	419 (5)	2547 (26)	5291 (53)	34.9 (1)	34.9	1219.9 (12.2)	No data	1199.6 (12)
Rathanna	1	No data	2013.6 (20.2)	423 (5)	1914 (20)	7630 (77)	33.6 (1)	33.6	1309.8 (13.1)	No data	1270.4 (12.8)
Coonogue	2	0 (0)	1150.7 (23.1)	295 (6)	995 (20)	4825 (97)	23.3 (1)	23.3	930.3 (18.7)	No data	917 (18.4)
Wells	3	664 (20)	2328.6 (69.9)	279 (9)	3080 (93)	1710 (52)	38.5 (2)	38.5	1827.5 (54.9)	458.5 (13.8)	1238.5 (37.2)
Arklow Rural	3	3232 (97)	8620 (258.6)	1008 (31)	11354 (341)	8259 (248)	51.5 (4)	51.5	5197.8 (156)	622.9 (18.7)	4336.1 (130.1)
Kilgarvan	5	No data	1213.7 (60.7)	134 (7)	1522 (77)	1521 (77)	27.2 (2)	27.2	815.5 (40.8)	84.6 (4.3)	687.9 (34.4)
Tomhaggard	7	548 (39)	2027.6 (142)	112 (8)	1932 (136)	No data	43.8 (3)	43.8	1312.7 (91.9)	313.5 (22)	905.3 (63.4)
The Grange	8	1258 (101)	2353.6 (188.3)	194 (16)	2590 (208)	2739 (220)	53 (3)	53	1712.3 (137)	323.6 (25.9)	1356.6 (108.6)
Ballynestragh	8	880 (71)	2751.1 (220.1)	594 (48)	3703 (297)	1358 (109)	36.7 (4)	36.7	1397.1 (111.8)	44.8 (3.6)	1330.3 (106.5)
Clonleigh	9	910 (82)	2144.6 (193.1)	222 (20)	2914 (263)	508 (46)	41.1 (3)	41.1	1313.9 (118.3)	258.9 (23.4)	986.1 (88.8)
Mayglass	10	No data	950.6 (95.1)	140 (14)	1299 (130)	589 (59)	52 (3)	52	1454.8 (145.5)	619.4 (62)	755.5 (75.6)
Killerrig	10	No data	1550.4 (155.1)	236 (24)	2243 (225)	678 (68)	59.7 (3)	59.7	1670.4 (167.1)	735.3 (73.6)	653.6 (65.4)
Grangeford	15	No data	965.1 (144.8)	155 (24)	925 (139)	2963 (445)	59.4 (4)	59.4	1555.8 (233.4)	792 (118.8)	578.3 (86.8)
Rathsallagh	15	473 (71)	1734.8 (260.3)	373 (56)	2145 (322)	1713 (257)	66.8 (3)	66.8	1202.5 (180.4)	No data	1108 (166.2)
Kilpipe	15	654 (99)	3103.6 (465.6)	635 (96)	3673 (551)	5256 (789)	47 (8)	47	2209.7 (331.5)	207.1 (31.1)	1930.1 (289.6)
Hartstown	16	No data	1963.8 (314.3)	310 (50)	2298 (368)	3431 (549)	47.7 (5)	47.7	1239.3 (198.3)	103 (16.5)	1091.7 (174.7)
Coolballintaggart	17	No data	1769 (300.8)	471 (81)	1554 (265)	7198 (1224)	27.6 (11)	27.6	1712.9 (291.2)	No data	1703.9 (289.7)
Hollywood	18	No data	2128.4 (383.2)	301 (55)	1683 (303)	9007 (1622)	38.5 (9)	38.5	1850.3 (333.1)	No data	1827.5 (329)
Barronstown	22	953 (210)	2953.9 (649.9)	117 (26)	3895 (857)	1941 (428)	40.4 (11)	40.4	1864.7 (410.3)	411 (90.5)	1326.1 (291.8)

Electoral Division	Percentage Overlap of Contributing Catchment	Total (Corrected) Dairy Cows	Total (Corrected) Livestock	Total (Corrected) Other Cows	Total (Corrected) Cattle	Total (Corrected) Sheep	Total (Corrected) No. Holdings	Average Size of Holdings	Total (Corrected) Area Farmed (Hectares)	Total (Corrected) Cereals (Hectares)	Total (Corrected) Grassland (Hectares)
Kilbride	22	No data	1122 (246.9)	220 (49)	1538 (339)	410 (91)	32.6 (6)	32.6	781.6 (172)	No data	689.8 (151.8)
Coolgreany	24	1005 (242)	2287.3 (549)	282 (68)	2691 (646)	2173 (522)	34.9 (12)	34.9	1605.5 (385.4)	149.4 (35.9)	1311.1 (314.7)
Forth	27	375 (102)	1115.1 (301.1)	144 (39)	1146 (310)	No data	40.4 (7)	40.4	928.4 (250.7)	263.5 (71.2)	631.7 (170.6)
Tacumshin	27	627 (170)	1643.6 (443.8)	168 (46)	2206 (596)	No data	63.2 (7)	63.2	1525.9 (412)	519.6 (140.3)	844.6 (228.1)
St. Helen's	28	No data	846.1 (237)	49 (14)	1038 (291)	No data	54.1 (5)	54.1	918.9 (257.3)	231.5 (64.9)	519.9 (145.6)
Balloughter	28	1365 (383)	3078.5 (862)	248 (70)	3617 (1013)	3302 (925)	45.8 (12)	45.8	1879.5 (526.3)	353.5 (99)	1433.6 (401.5)
Gorey Rural	29	707 (206)	2499.6 (724.9)	222 (65)	2982 (865)	2066 (600)	37.3 (15)	37.3	1827.3 (530)	427 (123.9)	1276 (370.1)
Tullowbeg	30	No data	959 (287.7)	104 (32)	958 (288)	3492 (1048)	56 (7)	56	1289.1 (386.8)	531 (159.3)	595.7 (178.8)
Ballybeg	30	No data	1266.2 (379.9)	253 (76)	1348 (405)	2923 (877)	33.5 (11)	33.5	1140 (342)	No data	1106.4 (332)
Castle Ellis	30	683 (205)	2368.2 (710.5)	536 (161)	3352 (1006)	881 (265)	42.2 (14)	42.2	1897.7 (569.4)	499.2 (149.8)	1276.3 (382.9)
Dunlavin	35	349 (123)	1954.4 (684.1)	495 (174)	2475 (867)	2001 (701)	38.2 (16)	38.2	1678.7 (587.6)	560.7 (196.3)	1095 (383.3)
Barrack Village	40	517 (207)	1353 (541.2)	68 (28)	1645 (658)	1141 (457)	38.3 (7)	38.3	651.9 (260.8)	No data	600.2 (240.1)
Limerick	40	1484 (594)	3462.7 (1385.1)	287 (115)	4402 (1761)	2317 (927)	33.1 (25)	33.1	2054.9 (822)	418.3 (167.4)	1546 (618.4)
Monamolin	42	2250 (945)	3699.4 (1553.8)	282 (119)	4395 (1846)	1636 (688)	60.2 (16)	60.2	2165.4 (909.5)	499.3 (209.8)	1554.5 (652.9)
Bolaboy	43	No data	1673.4 (719.6)	456 (197)	2175 (936)	1712 (737)	42.9 (16)	42.9	1500.2 (645.1)	306 (131.6)	1074.3 (462)
Rathrush	45	950 (428)	2724.9 (1226.3)	397 (179)	3336 (1502)	3199 (1440)	55 (18)	55	2199.1 (989.6)	565.5 (254.5)	1496.9 (673.7)
Whitechurch	46	1448 (667)	3343.2 (1537.9)	200 (92)	4380 (2015)	1436 (661)	53.5 (17)	53.5	1871.8 (861.1)	212.2 (97.7)	1628.6 (749.2)
Tober	51	620 (317)	2753.3 (1404.2)	534 (273)	3151 (1608)	5281 (2694)	38.5 (22)	38.5	1654.5 (843.8)	No data	1571.3 (801.4)
Stratford	56	1437 (805)	2314.8 (1296.3)	92 (52)	2843 (1593)	No data	77.1 (8)	77.1	1079.9 (604.8)	No data	995.6 (557.6)
Kilscoran	61	No data	735.8 (448.9)	146 (90)	968 (591)	No data	39.8 (10)	39.8	636.1 (388.1)	85.4 (52.1)	515.2 (314.3)
Myshall	63	No data	1762.5 (1110.4)	296 (187)	1912 (1205)	4877 (3073)	29 (26)	29	1187.6 (748.2)	No data	1126.7 (709.9)
Kineagh	63	No data	2053.4 (1293.7)	373 (235)	2428 (1530)	2917 (1838)	57.7 (24)	57.7	2214.5 (1395.2)	827.6 (521.4)	1248.9 (786.9)
Ballymore	67	637 (427)	1546.9 (1036.5)	158 (106)	2002 (1342)	No data	43.7 (14)	43.7	873.7 (585.4)	112.6 (75.5)	691.9 (463.6)
Shangarry	73	No data	4016.5 (2932.1)	522 (382)	4544 (3318)	6208 (4532)	44.7 (36)	44.7	2141.9 (1563.6)	346.3 (252.8)	1703.9 (1243.9)
Adamstown	75	931 (699)	2096.3 (1572.3)	177 (133)	2854 (2141)	796 (597)	61.1 (25)	61.1	2014.9 (1511.2)	772 (579)	1018.5 (763.9)
Rahill	78	579 (452)	1947.1 (1518.8)	309 (242)	2684 (2094)	1458 (1138)	68.2 (23)	68.2	1978.9 (1543.6)	380 (296.4)	1379 (1075.7)

Electoral Division	Percentage Overlap of Contributing Catchment	Total (Corrected) Dairy Cows	Total (Corrected) Livestock	Total (Corrected) Other Cows	Total (Corrected) Cattle	Total (Corrected) Sheep	Total (Corrected) No. Holdings	Average Size of Holdings	Total (Corrected) Area Farmed (Hectares)	Total (Corrected) Cereals (Hectares)	Total (Corrected) Grassland (Hectares)
Wingfield	78	1006 (785)	3849.5 (3002.7)	788 (615)	4809 (3752)	4379 (3416)	49.9 (45)	49.9	2841.9 (2216.7)	379.5 (296.1)	2337.7 (1823.5)
Ardcolm	79	No data	1207.5 (954)	132 (105)	1505 (1189)	No data	77.4 (14)	77.4	1315.9 (1039.6)	No data	948.9 (749.7)
Rathaspick	80	860 (688)	2496.5 (1997.2)	146 (117)	3455 (2764)	223 (179)	42.8 (26)	42.8	1370.3 (1096.3)	86.9 (69.6)	1245.5 (996.4)
Killinick	85	544 (463)	1671.6 (1420.9)	330 (281)	2276 (1935)	No data	51.1 (31)	51.1	1839.1 (1563.3)	480.2 (408.2)	1147.8 (975.7)
Kiltealy	88	No data	1564.9 (1377.2)	272 (240)	1653 (1455)	3831 (3372)	30.7 (32)	30.7	1106.1 (973.4)	174.4 (153.5)	891 (784.1)
Baltinglass	90	No data	1640.9 (1476.9)	121 (109)	1860 (1674)	4326 (3894)	30.1 (32)	30.1	1054.8 (949.4)	No data	969.5 (872.6)
Wexford No. 2 Urban	93	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	No data	No data	0 (0)	0 (0)	0 (0)
Kilpatrick	93	331 (308)	3851.5 (3581.9)	128 (120)	1311 (1220)	No data	31.4 (29)	31.4	974.7 (906.5)	222.3 (206.8)	614.7 (571.7)
Kilbride	93	307 (286)	1798.7 (1672.8)	156 (146)	1976 (1838)	3946 (3670)	45.9 (30)	45.9	1469.7 (1366.9)	438.8 (408.1)	852.8 (793.2)
Wexford No. 1 Urban	94	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	No data	No data	0 (0)	0 (0)	0 (0)
Huntingtown	94	701 (659)	2071.9 (1947.6)	240 (226)	2777 (2611)	No data	44.9 (25)	44.9	1168.1 (1098.1)	181.6 (170.8)	954.5 (897.3)
Rossard	94	No data	2250.5 (2115.5)	538 (506)	2038 (1916)	9288 (8731)	29.4 (47)	29.4	1472.3 (1384)	211.4 (198.8)	1212.8 (1140.1)
Enniscorthy Urban	96	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	No data	No data	0 (0)	0 (0)	0 (0)
Glynn	96	No data	1773.9 (1703)	123 (119)	899 (864)	No data	32.8 (13)	32.8	425.8 (408.8)	No data	413.5 (397)
Tinahely	96	819 (787)	4130.4 (3965.2)	933 (896)	4508 (4328)	9919 (9523)	31.1 (77)	31.1	2491.5 (2391.9)	139.7 (134.2)	2288.6 (2197.1)
Carrick	97	No data	928.8 (901)	155 (151)	1316 (1277)	No data	31.7 (24)	31.7	761.2 (738.4)	No data	684 (663.5)
Templeludigan	97	1284 (1246)	3121.5 (3027.9)	239 (232)	3907 (3790)	2318 (2249)	51.1 (36)	51.1	1890.9 (1834.2)	424.1 (411.4)	1335.4 (1295.4)
Rosslare	97	No data	1488.3 (1443.7)	244 (237)	1383 (1342)	No data	60 (26)	60	1575.3 (1528.1)	418.2 (405.7)	891.3 (864.6)
Rathdangan	97	940 (912)	3042.3 (2951.1)	312 (303)	2998 (2909)	2358 (2288)	36.9 (42)	36.9	1570.3 (1523.2)	No data	1476.2 (1432)
Ballyhoge	97	1925 (1868)	5126.7 (4972.9)	501 (486)	6430 (6238)	1874 (1818)	47.3 (57)	47.3	2758.7 (2676)	453.7 (440.1)	2054 (1992.4)
Wexford No. 3 Urban	98	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	No data	No data	0 (0)	0 (0)	0 (0)
Killurin	98	1454 (1425)	3228.1 (3163.6)	180 (177)	3078 (3017)	982 (963)	54.1 (29)	54.1	1568.7 (1537.4)	284.2 (278.6)	1220.9 (1196.5)
Edermine	98	496 (487)	1911.5 (1873.3)	286 (281)	2634 (2582)	1002 (982)	37 (48)	37	1794.5 (1758.7)	399.7 (391.8)	1276.3 (1250.8)
Ardcavan	98	No data	965.9 (946.6)	422 (414)	1358 (1331)	702 (688)	41.9 (25)	41.9	1048 (1027.1)	271.3 (265.9)	700.8 (686.8)
Drinagh	99	No data	1170.4 (1158.7)	115 (114)	1385 (1372)	No data	61.3 (17)	61.3	1050.3 (1039.8)	281.4 (278.6)	708 (701)
Tuckmill	99	No data	1348.7 (1335.3)	179 (178)	1519 (1504)	2137 (2116)	45.7 (23)	45.7	1050.1 (1039.6)	0 (0)	1046.2 (1035.8)

Electoral Division	Percentage Overlap of Contributing Catchment	Total (Corrected) Dairy Cows	Total (Corrected) Livestock	Total (Corrected) Other Cows	Total (Corrected) Cattle	Total (Corrected) Sheep	Total (Corrected) No. Holdings	Average Size of Holdings	Total (Corrected) Area Farmed (Hectares)	Total (Corrected) Cereals (Hectares)	Total (Corrected) Grassland (Hectares)
Donard	99	No data	1577.2 (1561.5)	231 (229)	1605 (1589)	3718 (3681)	40 (30)	40	1201.2 (1189.2)	No data	1186 (1174.2)
Imael North	99	No data	1733.3 (1716)	249 (247)	1245 (1233)	8537 (8452)	35.4 (39)	35.4	1380.1 (1366.3)	0 (0)	1376.6 (1362.9)
Bree	99	1012 (1002)	2876.5 (2847.8)	465 (461)	3910 (3871)	900 (891)	49.3 (53)	49.3	2734.2 (2706.9)	842.7 (834.3)	1668.3 (1651.7)
Clonroche	99	910 (901)	3224.9 (3192.7)	556 (551)	3682 (3646)	2679 (2653)	32.6 (71)	32.6	2349.3 (2325.9)	699.7 (692.8)	1519.8 (1504.7)
Wexford Rural	99	No data	341.7 (338.3)	No data	No data	No data	34.9 (10)	34.9	349 (345.6)	No data	277.4 (274.7)
Tullow Urban	100	0 (0)	No data	0 (0)	No data	0 (0)	No data	No data	(0)	0 (0)	No data
Artramon	100	1121 (1121)	2008.3 (2008.3)	84 (84)	2541 (2541)	No data	56.1 (19)	56.1	1087.2 (1087.2)	155.3 (155.3)	867.1 (867.1)
Ferns	100	No data	930.9 (930.9)	93 (93)	1176 (1176)	634 (634)	35.3 (16)	35.3	564.8 (564.8)	144.3 (144.3)	397.8 (397.8)
Castledockrell	100	No data	812.6 (812.6)	99 (99)	738 (738)	2921 (2921)	42.6 (36)	42.6	1532 (1532)	944.8 (944.8)	472.5 (472.5)
Moyacomb	100	0 (0)	885.3 (885.3)	104 (104)	555 (555)	4943 (4943)	42 (36)	42	1512.6 (1512.6)	607.6 (607.6)	753.8 (753.8)
Kilcomb	100	427 (427)	1800.3 (1800.3)	140 (140)	1975 (1975)	3783 (3783)	36.2 (48)	36.2	1739.3 (1739.3)	595.5 (595.5)	1036.7 (1036.7)
Rath	100	1093 (1093)	5831 (5831)	150 (150)	2805 (2805)	1077 (1077)	45.2 (38)	45.2	1715.9 (1715.9)	622.7 (622.7)	1019.5 (1019.5)
Ballycarney	100	1158 (1158)	2267 (2267)	173 (173)	2894 (2894)	No data	54.4 (31)	54.4	1726.9 (1726.9)	553.2 (553.2)	980.5 (980.5)
Coolattin	100	No data	1441.7 (1441.7)	182 (182)	1623 (1623)	2771 (2771)	64.3 (20)	64.3	1285.1 (1285.1)	496.6 (496.6)	689.8 (689.8)
Ballyellis	100	No data	1342.5 (1342.5)	188 (188)	1762 (1762)	1428 (1428)	33.6 (31)	33.6	1041.4 (1041.4)	309 (309)	660.6 (660.6)
Ballinguile	100	No data	1221.2 (1221.2)	221 (221)	1143 (1143)	4310 (4310)	40.7 (25)	40.7	1018.7 (1018.7)	0 (0)	1008 (1008)
Haroldstown	100	No data	1591.6 (1591.6)	228 (228)	1764 (1764)	3072 (3072)	51.7 (19)	51.7	982.4 (982.4)	206.1 (206.1)	715.9 (715.9)
Tankardstown	100	398 (398)	2070 (2070)	231 (231)	2421 (2421)	3236 (3236)	41.6 (32)	41.6	1331.5 (1331.5)	306.5 (306.5)	973.4 (973.4)
Kilmallock	100	880 (880)	1939.9 (1939.9)	233 (233)	2430 (2430)	838 (838)	49.5 (36)	49.5	1782.8 (1782.8)	601.2 (601.2)	1028.9 (1028.9)
Coolboy	100	No data	1121.5 (1121.5)	237 (237)	1318 (1318)	1744 (1744)	34.5 (29)	34.5	1001.3 (1001.3)	No data	812.1 (812.1)
The Harrow	100	1146 (1146)	2146 (2146)	240 (240)	2587 (2587)	866 (866)	39.6 (31)	39.6	1227.6 (1227.6)	313 (313)	837.7 (837.7)
Humewood	100	947 (947)	2761.8 (2761.8)	250 (250)	2841 (2841)	2645 (2645)	48 (26)	48	1247.4 (1247.4)	0 (0)	1227.2 (1227.2)
Newtownbarry	100	0 (0)	3418.5 (3418.5)	251 (251)	1093 (1093)	4702 (4702)	28.1 (56)	28.1	1574 (1574)	673.5 (673.5)	797.6 (797.6)
Williamstown	100	No data	1102.3 (1102.3)	260 (260)	1386 (1386)	1464 (1464)	38.8 (31)	38.8	1202.3 (1202.3)	349.3 (349.3)	738.1 (738.1)
Rossminoge	100	421 (421)	1537 (1537)	260 (260)	1810 (1810)	2112 (2112)	32.1 (30)	32.1	961.6 (961.6)	200.6 (200.6)	692.8 (692.8)
Money	100	No data	1320.1 (1320.1)	266 (266)	1523 (1523)	2583 (2583)	55 (22)	55	1208.9 (1208.9)	360.1 (360.1)	783.9 (783.9)

Electoral Division	Percentage Overlap of Contributing Catchment	Total (Corrected) Dairy Cows	Total (Corrected) Livestock	Total (Corrected) Other Cows	Total (Corrected) Cattle	Total (Corrected) Sheep	Total (Corrected) No. Holdings	Average Size of Holdings	Total (Corrected) Area Farmed (Hectares)	Total (Corrected) Cereals (Hectares)	Total (Corrected) Grassland (Hectares)
Imael South	100	No data	1479.1 (1479.1)	266 (266)	1253 (1253)	6003 (6003)	42 (26)	42	1093 (1093)	0 (0)	1087.5 (1087.5)
Killoughrum	100	No data	1829 (1829)	266 (266)	2214 (2214)	2143 (2143)	40.7 (40)	40.7	1628.8 (1628.8)	593.8 (593.8)	917.9 (917.9)
Tinnacross	100	972 (972)	2399.1 (2399.1)	268 (268)	2856 (2856)	2034 (2034)	46.5 (39)	46.5	1814.4 (1814.4)	455.2 (455.2)	1266.4 (1266.4)
Ballindaggan	100	535 (535)	2215.7 (2215.7)	270 (270)	2617 (2617)	3823 (3823)	38.2 (58)	38.2	2240 (2240)	962.8 (962.8)	1147.1 (1147.1)
Marshalstown	100	1089 (1089)	2515.1 (2515.1)	272 (272)	3040 (3040)	2400 (2400)	55.7 (43)	55.7	2395.7 (2395.7)	1094.7 (1094.7)	1194 (1194)
Kilbora	100	No data	1346.9 (1346.9)	277 (277)	1590 (1590)	2233 (2233)	35.3 (30)	35.3	1058.1 (1058.1)	346 (346)	663.9 (663.9)
The Leap	100	962 (962)	2249.5 (2249.5)	279 (279)	2804 (2804)	1913 (1913)	43.5 (39)	43.5	1696.9 (1696.9)	485.9 (485.9)	1148 (1148)
Tullow Rural	100	No data	2454.7 (2454.7)	279 (279)	1931 (1931)	1208 (1208)	43.6 (25)	43.6	1100.9 (1100.9)	479.2 (479.2)	559.1 (559.1)
Kilnahue	100	842 (842)	2159.7 (2159.7)	299 (299)	2698 (2698)	1643 (1643)	53.1 (31)	53.1	1646.4 (1646.4)	443.7 (443.7)	1028.7 (1028.7)
Donaghmore	100	1193 (1193)	3110 (3110)	301 (301)	4010 (4010)	2660 (2660)	63.6 (27)	63.6	1717.9 (1717.9)	110.3 (110.3)	1586.3 (1586.3)
Kilcormick	100	883 (883)	2343.6 (2343.6)	302 (302)	3118 (3118)	1057 (1057)	39.7 (39)	39.7	1549.2 (1549.2)	355.3 (355.3)	1103.7 (1103.7)
Tiknock	100	No data	946.6 (946.6)	304 (304)	1245 (1245)	699 (699)	36.1 (19)	36.1	685.1 (685.1)	No data	531.4 (531.4)
Clonegall	100	No data	2746.3 (2746.3)	306 (306)	3244 (3244)	6129 (6129)	35.6 (45)	35.6	1600.2 (1600.2)	314.9 (314.9)	1195.8 (1195.8)
Rathvilly	100	No data	1573.5 (1573.5)	316 (316)	1790 (1790)	3086 (3086)	48.2 (27)	48.2	1302.6 (1302.6)	No data	892.2 (892.2)
Tombrack	100	No data	2097.5 (2097.5)	326 (326)	2836 (2836)	2008 (2008)	48.8 (45)	48.8	2197 (2197)	901.3 (901.3)	1055.7 (1055.7)
Ballyhuskard	100	1141 (1141)	2853.7 (2853.7)	330 (330)	3553 (3553)	2179 (2179)	37.7 (69)	37.7	2600.5 (2600.5)	914.1 (914.1)	1368.1 (1368.1)
Cronelea	100	No data	1458.7 (1458.7)	332 (332)	1577 (1577)	3751 (3751)	37.5 (30)	37.5	1124.2 (1124.2)	No data	1071.3 (1071.3)
Ballingate	100	No data	2486.8 (2486.8)	337 (337)	3251 (3251)	5298 (5298)	44 (43)	44	1893.9 (1893.9)	557.6 (557.6)	1158.6 (1158.6)
Killinure	100	No data	1629.4 (1629.4)	358 (358)	2143 (2143)	1781 (1781)	37 (32)	37	1193.6 (1193.6)	183.2 (183.2)	979.3 (979.3)
Shillelagh	100	0 (0)	1136 (1136)	371 (371)	1311 (1311)	2977 (2977)	40.4 (27)	40.4	1091.7 (1091.7)	212.1 (212.1)	843.1 (843.1)
Ballybeg	100	No data	2287.7 (2287.7)	376 (376)	2787 (2787)	4237 (4237)	38.7 (44)	38.7	1704.4 (1704.4)	571.6 (571.6)	1017 (1017)
Aghowle	100	No data	1511.3 (1511.3)	385 (385)	1625 (1625)	3284 (3284)	35.4 (33)	35.4	1167.4 (1167.4)	No data	1118.9 (1118.9)
Eadestown	100	No data	1621.6 (1621.6)	403 (403)	1647 (1647)	4767 (4767)	37.4 (32)	37.4	1195.5 (1195.5)	No data	1038.8 (1038.8)
Ballintemple	100	No data	2016.8 (2016.8)	409 (409)	2416 (2416)	3480 (3480)	39.6 (46)	39.6	1819.9 (1819.9)	541.9 (541.9)	1144.8 (1144.8)
Carnew	100	No data	2673.7 (2673.7)	434 (434)	3209 (3209)	5114 (5114)	33.2 (57)	33.2	1894.9 (1894.9)	516.7 (516.7)	1261.3 (1261.3)
St. Mary's	100	No data	2077.7 (2077.7)	455 (455)	1902 (1902)	8454 (8454)	29.5 (49)	29.5	1445.1 (1445.1)	225.9 (225.9)	1171.5 (1171.5)

Electoral Division	Percentage Overlap of Contributing Catchment	Total (Corrected) Dairy Cows	Total (Corrected) Livestock	Total (Corrected) Other Cows	Total (Corrected) Cattle	Total (Corrected) Sheep	Total (Corrected) No. Holdings	Average Size of Holdings	Total (Corrected) Area Farmed (Hectares)	Total (Corrected) Cereals (Hectares)	Total (Corrected) Grassland (Hectares)
Kilrush	100	No data	1534.1 (1534.1)	482 (482)	1745 (1745)	3753 (3753)	42.8 (41)	42.8	1755.3 (1755.3)	746 (746)	887.9 (887.9)
Castleboro	100	624 (624)	2424.1 (2424.1)	487 (487)	2942 (2942)	3395 (3395)	37.2 (51)	37.2	1936.8 (1936.8)	494.5 (494.5)	1354.3 (1354.3)
Talbotstown	100	No data	2001 (2001)	522 (522)	2442 (2442)	3087 (3087)	39.1 (27)	39.1	1056.3 (1056.3)	No data	1003.2 (1003.2)
Enniscorthy Rural	100	1013 (1013)	6218.1 (6218.1)	570 (570)	3290 (3290)	3071 (3071)	40.7 (66)	40.7	2687.3 (2687.3)	1020.7 (1020.7)	1446.8 (1446.8)
Monaseed	100	763 (763)	3001.4 (3001.4)	622 (622)	3922 (3922)	2621 (2621)	40.8 (42)	40.8	1714.5 (1714.5)	237.4 (237.4)	1435.5 (1435.5)
Killann	100	1204 (1204)	4351.4 (4351.4)	646 (646)	5036 (5036)	7480 (7480)	38.5 (70)	38.5	2694 (2694)	420.5 (420.5)	2179.5 (2179.5)
Clonmore	100	No data	2812.4 (2812.4)	656 (656)	3616 (3616)	3421 (3421)	37 (52)	37	1926.3 (1926.3)	No data	1825.1 (1825.1)
Hacketstown	100	790 (790)	3623.9 (3623.9)	727 (727)	4518 (4518)	4048 (4048)	35.9 (59)	35.9	2119.7 (2119.7)	No data	2030 (2030)
Cranemore	100	No data	3170.1 (3170.1)	872 (872)	3344 (3344)	10391 (10391)	32.1 (70)	32.1	2245.7 (2245.7)	256.3 (256.3)	1877 (1877)
Ballon	100	No data	1331.6 (1331.6)	No data	1769 (1769)	1988 (1988)	49 (19)	49	984.2 (984.2)	359.3 (359.3)	561.2 (561.2)

Appendix 4 COMPARATIVE COORDINATES

ID	EASTING (ITM)	NORTHING (ITM)	LATITUDE (WGS 84) (DECIMAL)	LONGITUDE (WGS 84) (DECIMAL)	LATITUDE (WGS 84) (DMS)	LONGITUDE (WGS 84) (DMS)
1	616293.5	709068.8	52.28748	-6.40128	52°17'14.92"	-6°24'4.62"
2	616844.6	708023.5	52.29263	-6.41642	52°17'33.49"	-6°24'59.12"
3	618328.5	707139.3	52.30614	-6.42891	52°18'22.11"	-6°25'44.07"
4	618444.8	705974.2	52.30741	-6.44595	52°18'26.68"	-6°26'45.42"
5	619093.8	705786.2	52.31328	-6.4485	52°18'47.81"	-6°26'54.60"
6	619280.3	705617.2	52.31499	-6.45092	52°18'53.96"	-6°27'3.31"
7	619432.8	705815.8	52.31632	-6.44796	52°18'58.75"	-6°26'52.66"
8	621159.4	706507.6	52.3317	-6.43727	52°19'54.12"	-6°26'14.17"
9	622325.7	705155.9	52.34244	-6.45673	52°20'32.78"	-6°27'24.23"
10	622015.3	704962.3	52.33969	-6.45967	52°20'22.88"	-6°27'34.80"
11	622590.3	705459.1	52.34476	-6.4522	52°20'41.14"	-6°27'7.92"
12	623445.2	705981.2	52.35234	-6.44427	52°21'8.42"	-6°26'39.37"
13	623874.1	706468.1	52.3561	-6.43699	52°21'21.96"	-6°26'13.16"
14	623912.7	707430.4	52.35626	-6.42286	52°21'22.53"	-6°25'22.28"
15	623842.6	707526.4	52.35561	-6.42147	52°21'20.20"	-6°25'17.29"
16	623864.3	708746.8	52.35556	-6.40355	52°21'20.03"	-6°24'12.79"
17	623606.6	710464.7	52.35291	-6.37843	52°21'10.46"	-6°22'42.35"
18	622968.5	705199.5	52.34821	-6.45589	52°20'53.55"	-6°27'21.20"
19	625762.4	704189.2	52.3735	-6.46985	52°22'24.61"	-6°28'11.45"
20	626803.7	704832.6	52.38274	6.460075	52°22'57.86"	6°27'36.27"
21	624045.9	702442.7	52.35841	-6.49601	52°21'30.28"	-6°29'45.64"
22	623599	702037	52.35447	-6.5021	52°21'16.09"	-6°30'7.56"
23	623519.5	701800.4	52.3538	-6.5056	52°21'13.68"	-6°30'20.14"
24	623227.6	701500.7	52.35123	-6.51008	52°21'4.44"	-6°30'36.30"
25	623160.7	701834.1	52.35057	-6.50521	52°21'2.05"	-6°30'18.76"
26	622813.7	701855.6	52.34745	-6.50521	52°20'50.82"	-6°30'18.76"
27	622530.1	705183.5	52.34427	-6.45626	52°20'39.38"	-6°27'22.54"
28	622676.5	705195.7	52.34559	-6.45604	52°20'44.11"	-6°27'21.73"
29	622694.3	704104.2	52.34595	-6.47205	52°20'45.43"	-6°28'19.36"
30	623095.1	701706.8	52.35	-6.5071	52°21'0.01"	-6°30'25.55"
31	623796	708347.2	52.35503	-6.40944	52°21'18.11"	-6°24'33.98"
32	622196.4	705182.7	52.34127	-6.45638	52°20'28.58"	-6°27'22.96"
33	623775.6	706286.9	52.35525	-6.43968	52°21'18.90"	-6°26'22.85"
34	623651.7	706115.1	52.35417	-6.44224	52°21'15.01"	-6°26'32.06"
35	618540.7	705889.5	52.30829	-6.44716	52°18'29.84"	-6°26'49.78"
36	716279.18	705901.081	52.307765	-6.447009	52°18'27.95"	6°26'49.23"

Appendix 5 SHORELINE SURVEY PHOTOGRAPHS

<table>
<tr><td>1
  </td><td>2. No Photo</td></tr>
<tr><td>3. No Photo</td><td>4. No Photo</td></tr>
<tr><td>5
  </td><td>6. No Photo</td></tr>
<tr><td>7
  </td><td>8
  </td></tr>
</table>

9

10

11

12

13

14. No Photo

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36