2025

Sanitary Survey and Sampling Plan for Inner Kenmare Bay Co. Kerry- June 2025

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

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Aqualicense Ltd
Arklow, Co. Wicklow, Ireland

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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 Inner Kenmare Bay was undertaken in 2025. The sanitary survey evaluates pollution sources and environmental factors so that the authorities can design a suitable hygiene-classification zoning and monitoring plan using the best available information and supporting evidence. Aqualicense Limited undertook the desktop component of this work on behalf of the SFPA; SFPA conducted the shoreline survey.

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Report Prepared By:

Aqualicense: Maeve Guilfoyle, Paul O'Reilly and Emily McElroy

SFPA: Niall O'Rahelly, Dingle SFPA Port Office & Castletownbere Port Office

REV NO.	CREATED BY	REVIEWED BY	DATE
0.1	MG	KD	27/06/2025
0.2	MG	KD	16/07/2025

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ABBREVIATIONS

BMPA	Bivalve Mollusc Production Area (i.e. "production area")
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
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
MPN	Most Probable Number
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
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 the regulation, Aqualicense was contracted by the Sea-Fisheries Protection Authority (SFPA) to carry out a sanitary survey for Inner Kenmare Bay, Kenmare Bay, Co. Kerry.

This survey supports the classification of Pacific oysters (*Magallana gigas*), Blue mussels (*Mytilus edulis*), Manila Clam (*Ruditapes philippinarum*) and European flat oyster (*Ostrea edulis*)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 Blue mussels, European flat oysters, Manila clam and a review (and update where necessary) for Pacific oysters.

The desk-based study employed a Source-Pathway-Receptor (S-P-R) model to assess contamination risks within Inner Kenmare Bay. This approach allowed for the identification of potential pollution sources, their transport pathways (the defined "Contributing Catchment" included 17 sub-basins and numerous river networks draining into the bay) and circulation patterns within the Bivalve Mollusc Production Area (BMPA), accounting for seasonality and microbial loads. Each key step and findings of the S-P-R model is outlined below.

1. The step in the desk-based study was to characterise the Bivalve Mollusc Production Area (BMPA), i.e. the receptor. The BMPA spans approximately 20.79 km² within Inner Kenmare Bay, Co. Kerry. It supports licensed trestle oyster plots along the Inner Kenmare Bay foreshore and mussel and oyster culture of Dromquinna, all four licences fall under SFPA classification for Pacific oyster European flat oyster, Blue mussel and Manilla clam.

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 Roughty River to the northeast. Areas of greatest groundwater vulnerability were identified along the Roughty – Sheen river sections and in the Banawn and Glanlee townlands where "Extreme" or "Rock-at-Surface" vulnerability coincides with intensive agriculture and septic tank clusters.

Hydrodynamically, the estuary is tidally dominated (spring range ~3.5-4m; neap ~1.5-2m) with peak channel currents of 0.4-0.6m s^{-1} and flushing times of 2-5 days; weaker flows (<0.1m s^{-1}) and longer residence times over intertidal flats, favouring pollutant retention during neap tides. 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 bay.

3. An Inventory of the potential pollutants was compiled, identifying key sources including municipal wastewater treatment (Kenmare UWWTP), widespread domestic septic tanks, diffuse agricultural activities (slurry spreading and livestock grazing- particularly sheep and cattle), industrial operations, tourism related facilities and wildlife. Seasonal peaks in agricultural contamination and tourism activities were noted as significant contributors.

The overall S-P-R model determined that the key area of concern for organic pollutants is the inner estuary between the Finnihy-Roughty confluence and the Inner Kenmare Bay shoreline where high-risk Zone 1 rivers, extreme groundwater vulnerability , dense septic -tank usage and the UWWTP outfall converge within 1km of shellfish trestles; secondary concern exists at smaller river mouths and nearshore campsites along the norther bay margin.

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 31 observations were recorded during the shoreline survey, including inflows, runoff sites, and previously unidentified discharge points from local businesses. Notable contamination indicators included visible algae growth and runoff evidence at several locations particularly near Inner Kenmare Bay outfall (ID7).

Bacteriological samples were collected from all 31 shoreline observation points, during dry weather conditions, and a neap tidal cycle. This may have influenced the concentration and detectability of contaminants. Sampling targeted known and suspected discharge points, freshwater inflows and areas with visible signs of potential contamination.

To assess the microbiological water quality and identify sources posing a risk to shellfish safety the analysis focused on *Escherichia coli (E. coli)* a key indicator of faecal contamination. The results yielded a range of *E. coli* concentrations, with elevated levels near major inflows, as well as sites proximal to septic tank clusters and stormwater discharges. The highest levels were observed at locations with visible algae growth and evidence of surface runoff, validating the observations made during the shoreline survey. Conversely the majority of sites showed low or undetectable levels, highlighting spatial variability and the influence of local hydrodynamics. These findings were instrumental in refining the BMPA boundary and determining the placement of the Representative Monitoring Points (RMPs) to ensure accurate and protective classification of shellfish waters.

Considering the findings of the desk-based study (Section 2.8), shoreline survey and bacteriological sampling, it is recommended that the BMPA boundary be refined to better represent contamination risks and hydrodynamic connectivity

Species-specific Representative Monitoring Points (RMPs) have been designated to effectively monitor and manage microbiological quality, reflecting the identified contamination risks, Sampling plans have been established for Pacific oyster, Blue mussels, Manila clam and European flat oysters.

In conclusion, a sanitary survey has been completed following EU Regulation 2019/627. Based on the desk-based study, shoreline survey, and bacteriological monitoring, species specific RMPs were identified. Species-specific sampling plans were developed for the Inner Kenmare Bay 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 governing the classification and monitoring of shellfish production and relaying areas. 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
4. Data assessment

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.

Inner Kenmare Bay BMPA, (which forms part of the Kenmare River classified production areas) has previously been classified as a Bivalve Mollusc Production Area (BMPA). However, a sanitary survey has not previously been produced. Therefore, this report will examine all potential sources of faecal contamination, pathways, circulation and seasonal variations, with consideration of the areas rural. context. 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

Inner Kenmare Bay BMPA is a sheltered inlet located within the Kenmare estuary on Irelands southwest coast covering approximately 20.79 km^2. The area has predominantly gently sloping bathymetry, being relatively shallow while gradually deepening toward the main channel of the estuary. The area is influenced by semi-diurnal tidal flows, with gentle to moderate tidal streams that follow the broader tidal exchange of the estuary. These conditions support diverse habitats including a mix of rocky shores, mudflats and saltmarsh habitats, contributing to the bay's ecological richness.

No other forms of aquaculture, aside from shellfish, are present within the sanitary survey area *(Figure 2-1).* This will be characterised in further detail in the subsequent section.

Commercial inshore fishing targets include lobster (*Homarus gammarus*), crab (*Cancer pagurus*), Nephrops (*Nephrops norvegicus*) and shrimp (Caridea sp.) (Marine Institute, 2025a).

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 within Inner Kenmare Bay, Co. Kerry. It covers an area of c. 20.79 km^2.
Licenced Bivalve species	Blue mussel (*Mytilus edulis*), European Oyster (*Ostrea edulis*), Pacific oyster (*Magallana gigas*).and Manila Clam (*Ruditapes philippinarum*)
Aquaculture or wild stocks	There are currently four active shellfish licenses in the area, T06/179B and T06/295A for Pacific Oyster (*Magallana gigas*), T06/201 for Pacific oysters and Manila clam (*Ruditapes philippinarum*), and T06/388A for Pacific oyster, European flat oyster (*Ostrea edulis*) and Blue Mussel (*Mytilus edulis*).
Seasonality of harvest	Shellfish may be harvested year-round in accordance with market demand.
Growth and harvesting techniques	<u>Pacific Oyster</u> Bags and trestles <u>Blue Mussels</u> Currently no mussel production however there are plans to produce mussels similarly to oysters in bags on trestles
Any conservation controls (e.g. closed season)	No conservation controls are employed.

CRITERIA	DESCRIPTION
Existing classification data	At the time of writing the annual classification is Class B for Pacific oysters
Marine Institute Norovirus data update	The available data indicates that the production area is impacted by a MODERATE level of norovirus contamination with a LOW degree of certainty. ***Moderate level of contamination***– Concentrations regularly above the limit of quantification of the method (100 norovirus genome copies per gram) and generally not exceeding 1000 norovirus genome copies per gram during the high-risk winter period.[1]

[1]Norovirus concentrations are measured in viral genome copies per gram of oyster digestive tissue (cpg). Moderate contamination ranges from 100-1000cpg, with outbreaks typically linked with levels above 1000cpg. Concentrations exceeding 2000cpg indicate substantial risk of illness. The risk between 200-1000cpg is uncertain. Concentrations of less than 150cpg are rarely associated with disease outbreaks. The low degree of certainty refers to current technical challenges which mean that detecting low levels of norovirus present a significant degree of uncertainty of measurement. 200cpg currently represents the limit of consistent reliable quantitative detection (FSAI, 2013).

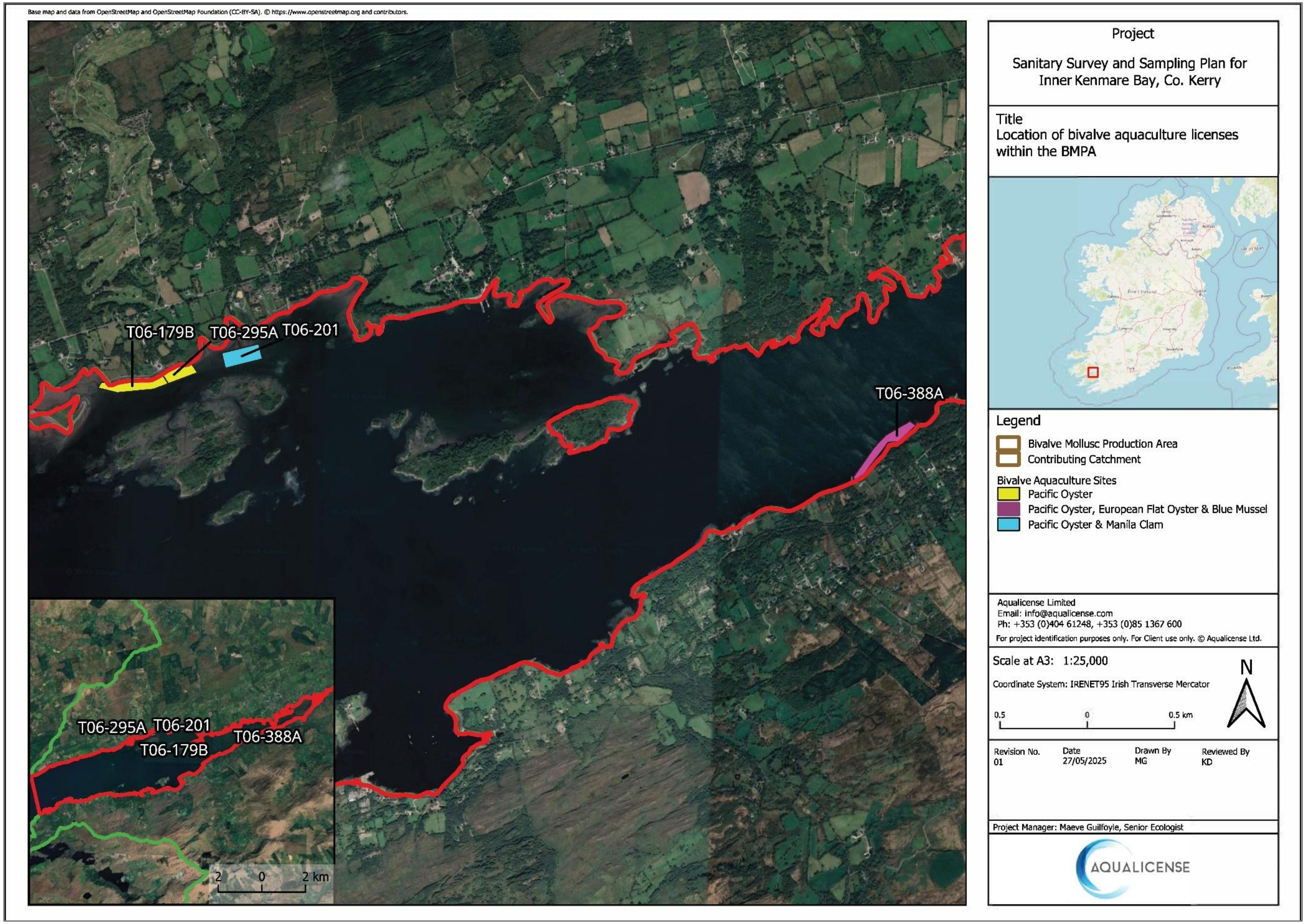


Figure 2-1 Location of aquaculture licences within the BMPA.

2.3 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 regarding the area that can be reliably represented by the designated Representative Monitoring Point(s) (RMPs).

2.4 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).

Using 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 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 2-2.*

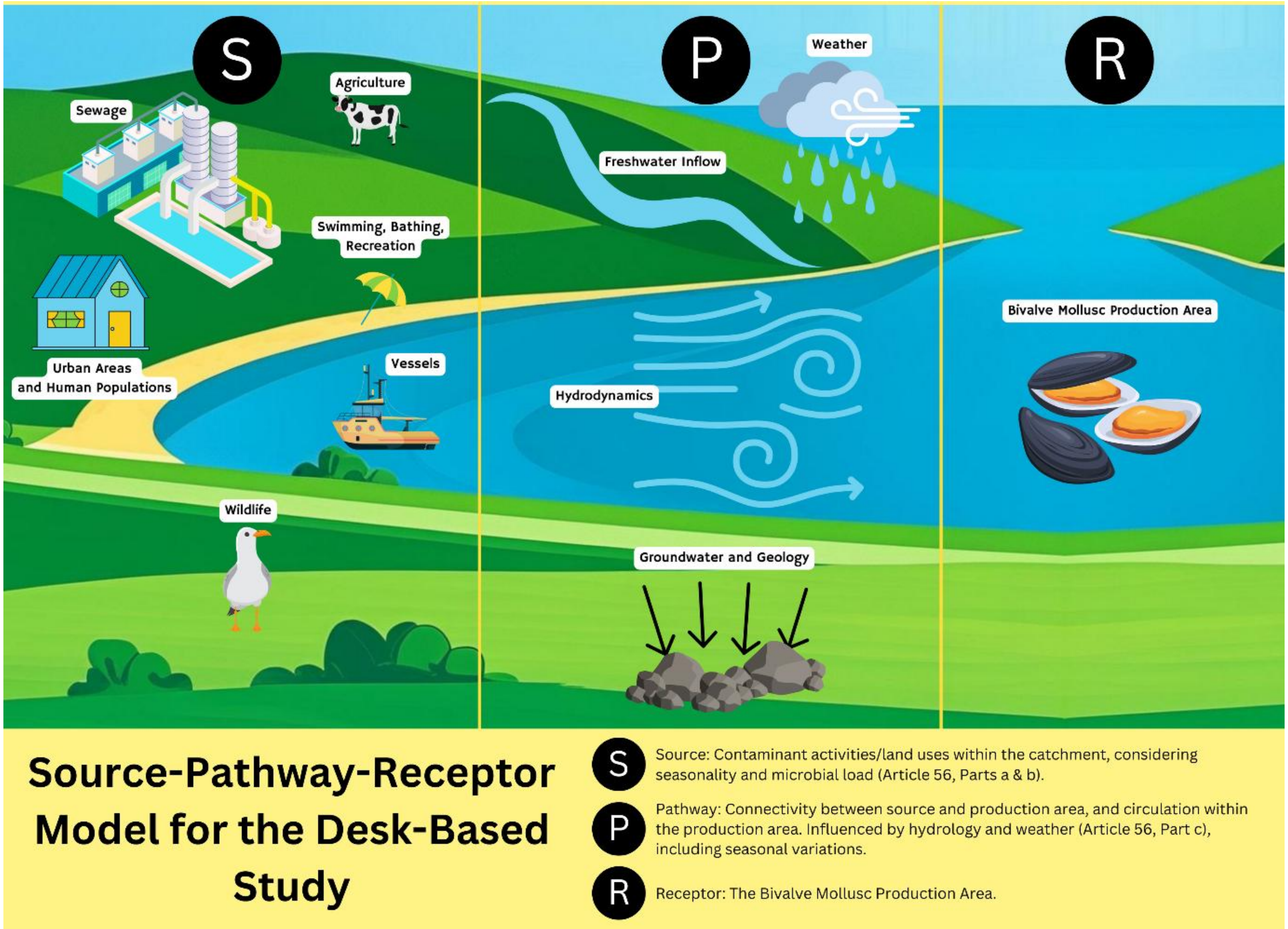


Figure 2-2 Key elements to be considered in this Desk-Based Study under the S-P-R Model.

2.4.1 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 sub-catchments for the purposes of Water Framework Directive (WFD) monitoring; however, these are at too large a 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 396.88 km^2 and contains 17 sub-basins. The defined contributing catchment is identified in Figure 2-3.

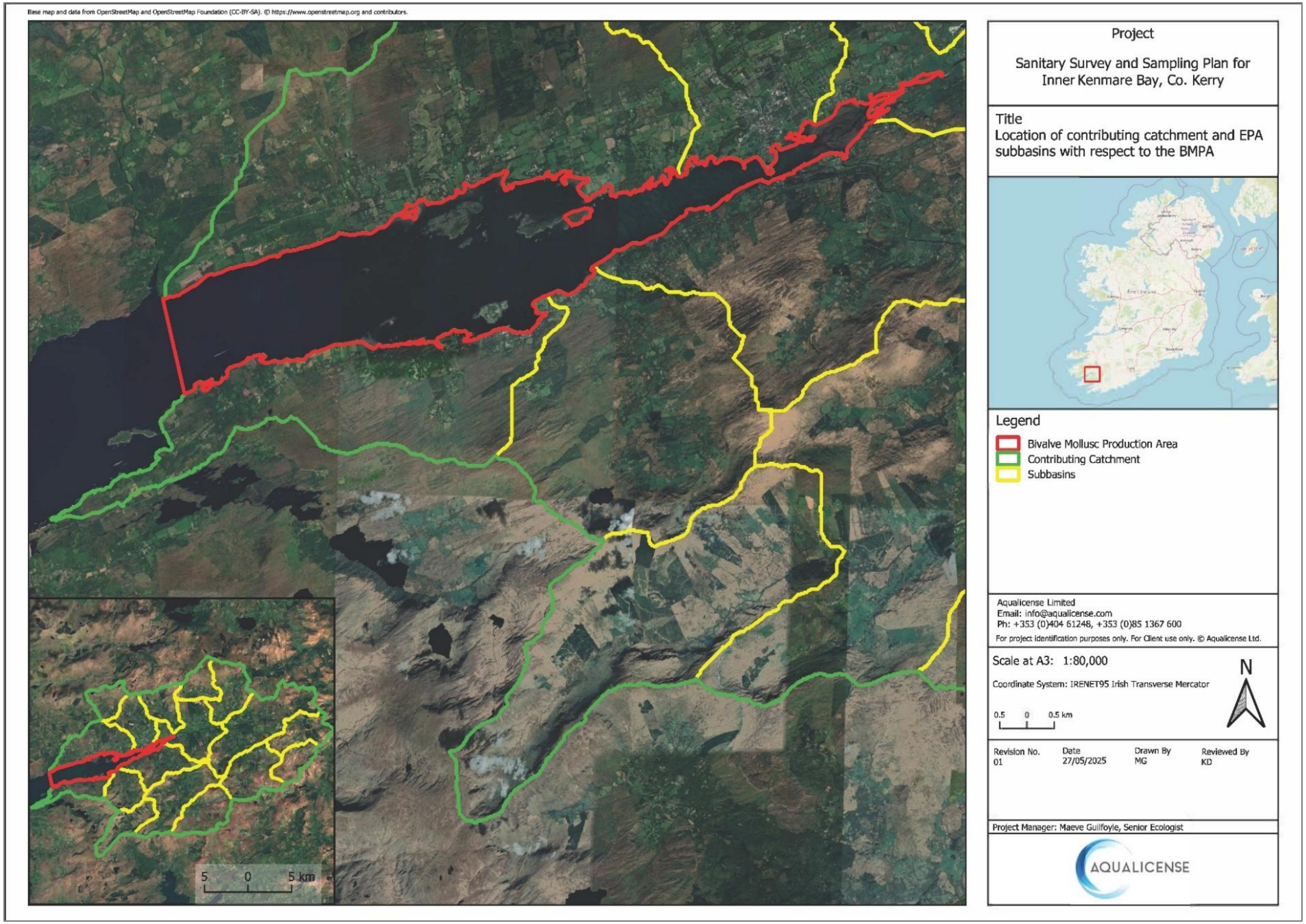


Figure 2-3 Location of contributing catchment and EPA mapped watercourses with respect to the BMPA.

2.5 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.

2.5.1 FRESHWATER INFLOWS

The contributing catchment consists of 17 sub-basins, 41 catchment inflow points, 31 BMPA inflow points and four primary watercourses including the Roughty, Sheen, Finnihy and Blackwater rivers. These watercourses have been categorised based on their points of inflow to the production area (*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.

Five hydrometric gauges are present within the contributing catchment including along the Roughty river, Sheen River, Finnihy River Dromoghty River and the smaller Kealnagower (Lissaniska) Stream. The Roughty River entering the estuary at the head of the Kenmare Bay, is the principal freshwater inflow due to its extensive sub-catchment, larger tributary network and consistent year- round discharge. While diurnal tidal influence is present throughout the estuarine system, the Roughty contributes a sustained volume of low-salinity freshwater, playing a significant role in the bays hydrodynamic and ecological conditions (EPA, 2024) *(Figure 2-4)*.

The Roughty River is the primary freshwater contributor to the BMPA, draining a large upland catchment of approximately 202 km^2 north of Kenmare (*Figure 2-4*). It receives input from several tributaries, including the Slaheny river and provides a consistent year-round flow, monitored by an EPA hydrometric station at Dromagorteen Bridge (Station 21011). The Sheen River is the second largest inflow, originating in the Caha mountains and entering the estuary at Sheen Falls to the east of Kenmare. It is a spate river with high flow variability and is monitored at Sheen Falls (Station 21010). The Finnihy river, which flows through Kenmare town and discharges just west of the Roughty has a smaller catchment and contributes a modest but steady base flow. The Blackwater River, though outside the immediate BMPA boundary, enters the estuary to the west and may influence water quality under certain tidal conditions; it has a significant upland catchment but is not currently monitored by a nearby EPA gauge.

The Water Framework Directive (WFD) aims to protect and enhance the quality of rivers, lakes, transitional waters, coastal waters, and groundwater. WFD monitoring assesses biological, physicochemical, and hydro-morphological 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 2.6* to assess their relevance as pollutant sources.

The WFD status of the River Roughty (2016- 2021) and the Sheen River is classified as “High”. Except for the Finnihy river which is classified as “Moderate”, the remaining water courses are classified as “Good”. This will be discussed in more detail in *Section 2.6* in respect of individual pollution sources.

Table 2-2. Locations of freshwater inflow to the production area.

Code	River Subbasin (EPA Code)	River Name (EPA Code)	WFD Status at Inflow Point
1	Feorus East 010 (IE_SW_21F160840)	Lohart 21 (21L68)	Good
2		Unnamed River	Good
3		Unnamed River	Good
4		Lohart 21 (21L48)	Good
5		Feoramore (21F18) 2 Unnamed Tributaries	Good
6		Unnamed River	Good
7		Unnamed River Unnamed Tributary	Good
8		Feorus East (21F16) Feorus West (21F23) Muckera (21M26) 3 Unnamed Rivers	Good
9		West Feorus (21W08)	Good
10		East Feorus (21E26) 2 Unnamed Rivers	Good
11	Drumoghty 010 (IE_SW_21D040400)	Drumoghty (21D04) All associated rivers within the Drumoghty 010 subbasin	Good
12	Sheen 030 (IE_SW_21S010700)	Unnamed River	High
13		Killaha East (21K39) Unnamed Tributary	High
14		Unnamed River Tributary Mucksna (21M32) 2 Unnamed Tributaries	High
15		Unnamed River	High
16		Unnamed River 3 Unnamed Tributaries	High
17	Sheen 010 (IE_SW_21S010100) Sheen 020 (IE_SW_21S010600) Sheen 030 (IE_SW_21S010700) Coomeelan Stream 010 (IE_SW_21C140200)	Sheen (21S01) All associated tributaries within the Sheen 010, 020 and 030 and the Coomeelan Stream 010 subbasins	High
18	Roughty 010 (IE_SW_21R010020) Roughty 020 (IE_SW_21R010070) Roughty 030 (IE_SW_21R010250) Roughty 040 (IE_SW_21R010350) Owbeg 010 (IE_SW_21O020200) Owbeg 020 (IE_SW_21O020500) Cleady 010 (IE_SW_21C020300) Slaheny 010 (IE_SW_21S020300)	Roughty () All associated rivers and tributaries within the 8 subbasins	High
19	Roughty 040 (IE_SW_21R010350)	Gortagass (21G64)	High
20		Gortalinny North (21G86)	High
21	Finnihy 010 (IE_SW_21F010200) Finnihy 020 (IE_SW_21F010510)	Finnihy (21F01) All associated Tributaries within the Finnihy 010 and 020 subbasins	Moderate
22	Rossacoosane 010 (IE_SW_21R130950)	Gortamullin (21G57) Tributary East Claddanure (21E13) Tributary Tubbrid (21T20)	Good
23		Letter 21 (21L28)	Good

Code	River Subbasin (EPA Code)	River Name (EPA Code)	WFD Status at Inflow Point
		Tributary Reen 21 (21R16) Tributary West Claddanure (21W04) Tributary Dunkerron (21D88)	
24		Assroe (21A46)	Good
25		Rossacoosane (21R13) Tributary Lacka 21 (21LL30) Tributary Greenane 21 (21G50) 5 Unnamed Tributaries	Good
26		Unnamed River	Good
27		Unnamed River	Good
28		Unnamed River	Good
29		Unnamed River	Good
30		East Cappanacush (21E11) 3 Unnamed Tributaries	Good
31		West Cappanacush (21W18)	Good
32		Holy Well Capparoe (21H07)	Good

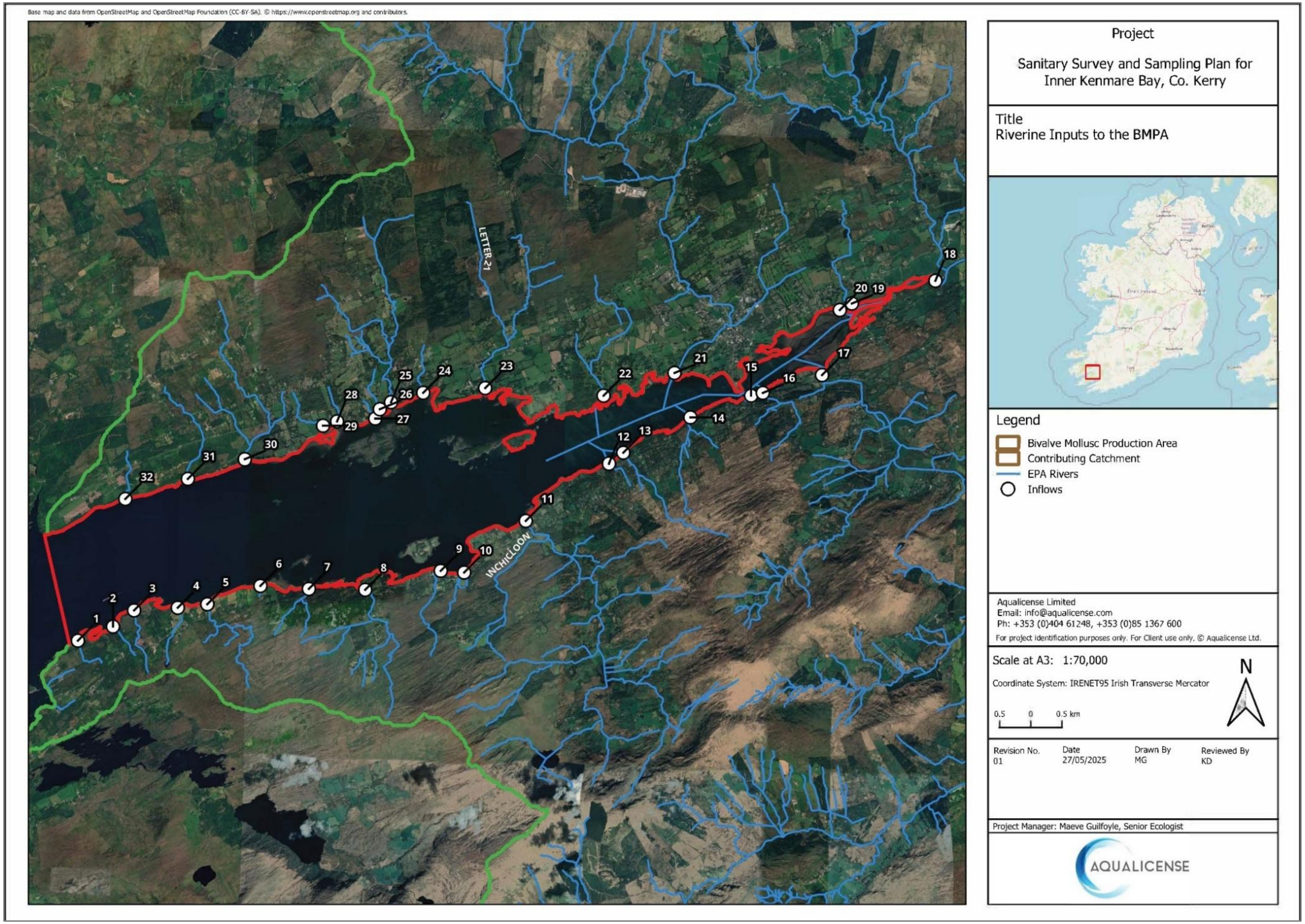


Figure 2-4.Riverine inputs to the production area.

2.5.1.1 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 2.6 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).

The contributing catchment overlies 4 groundwater bodies: "Ballinhassig West", "Beara Sneem", "Cahersiveen and "Kenmare". These groundwater bodies were all classified as having "Good" WFD status respectively from 2016-2021 (EPA, 2023).

An analysis of groundwater vulnerability (GSI, 2021) within the contributing catchment reveals that 94.79% and 69.98% of the contributing catchments as having “Rock at or near Surface or Karst” and “Extreme” vulnerability respectively *(Figure 2-5).* 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.

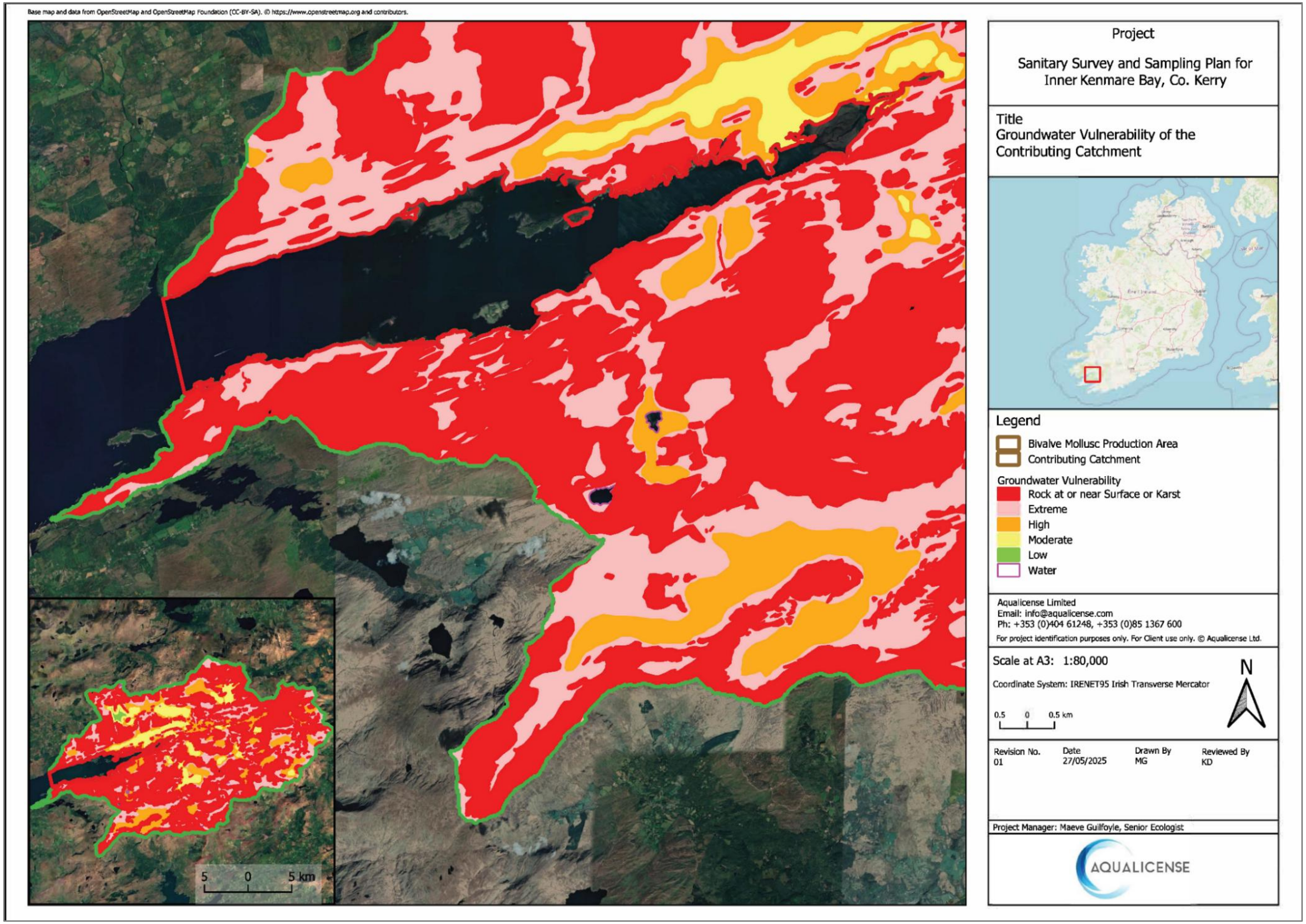


Figure 2-5. Groundwater vulnerability of the contributing catchment.

2.5.1.2 Hydrodynamics

Hydrodynamic modelling (Marine Institute ROMS model, MIKE 21, TELEMAC) characterises Inner Kenmare Bay BMPA (and upper Kenmare River) as tidally dominated, experiencing semi-diurnal tidal ranges of ~3-4m and peak surface currents of 0.4-0.6m s^{-1} (Marine Institute, 2024). Freshwater inputs from the Roughty and Sheen rivers periodically induce stratification, forming a seaward – flowing surface layer and weaker landward bottom currents, leading to flushing times of approximately 2-5 days, depending on tidal conditions (Marine Institute, 2024). Intertidal flats exhibit low current speeds (<0.1m s^{-1}), promoting particle retention while the Roughty Rive significantly influences salinity gradients during high discharge events (EPA, 2024c)

2.5.1.3 Bathymetry

Bathymetry was assessed through Admiralty Map 2495. The eastern section of BMPA (east of Kenmare village beyond the bridge) features a large intertidal mudflat zone *(Figure 2-6).* As the section extends out into Inner Kenmare Bay BMPA it remains relatively shallow gradually increasing in depth from 0.2-15.5m at River Blackwater estuary (westerly most boundary of the BMPA).

2.5.1.4 Tidal Influence

Hydrodynamic modelling (Marine Institute ROMS, MIKE 21, TELEMAC) indicates that the predicted tidal ranges in the Inner Kenmare Bay BMPA are approximately 3.5 - 4m during spring tides and ~1.5-2m during neap tides (Marine Institute, 2024). These large tidal ranges generate vigorous bi-directional tidal flows, predominantly aligned east-west along the main channel axis, enhancing water exchanges and flushing across the estuary, particularly during spring tides. Shallow intertidal and marginal areas, including mudflats and saltmarsh zones, experience substantial inundation during spring tides, facilitating periodic refreshing and reducing pollutant accumulation: however, during neap tides, limited water exchange may increase contaminant retention in peripheral areas (EPA, 2024c).

2.5.1.5 Temperature and Salinity

No data is available for temperature and salinity modelling within Inner Kenmare Bay BMPA. 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 Roughty River, salinity and temperature are expected to fluctuate throughout the tidal cycle, consistent with findings from other sanitary surveys that have reported consistently low variability in E. coli readings.

2.5.1.6 Current Patterns

Hydrodynamic modelling (Marine Institute ROMS, MIKE 21 and TELEMAC) indicates that the tidal circulation in the Inner Kenmare Bay BMPA area follows a clear east-west pattern during both flood and ebb tides. Flood tides predominantly move eastwards, pushing marine water into the estuary and inundating shallow intertidal areas, whilst ebb tides reverse this direction, transporting freshwater (from the various inputs) westwards to the Atlantic. Strongest tidal currents, reaching velocities of approximately 0.4-0.6 ms^{-1}, occur along the central, deeper channels, particularly where the estuary narrows, while the weaker currents (<0.1 ms^{-1}) occur in the sheltered intertidal flats and peripheral embayment's, promoting possible particle retention (EPA, 2024c, Marine Institute 2024). These currents closely follow the estuaries bathymetric contours and narrowing features, enhancing local velocity and scouring potential at constricted points, but leading to weaker flows and sediment accumulation in the broader, shallower zones.

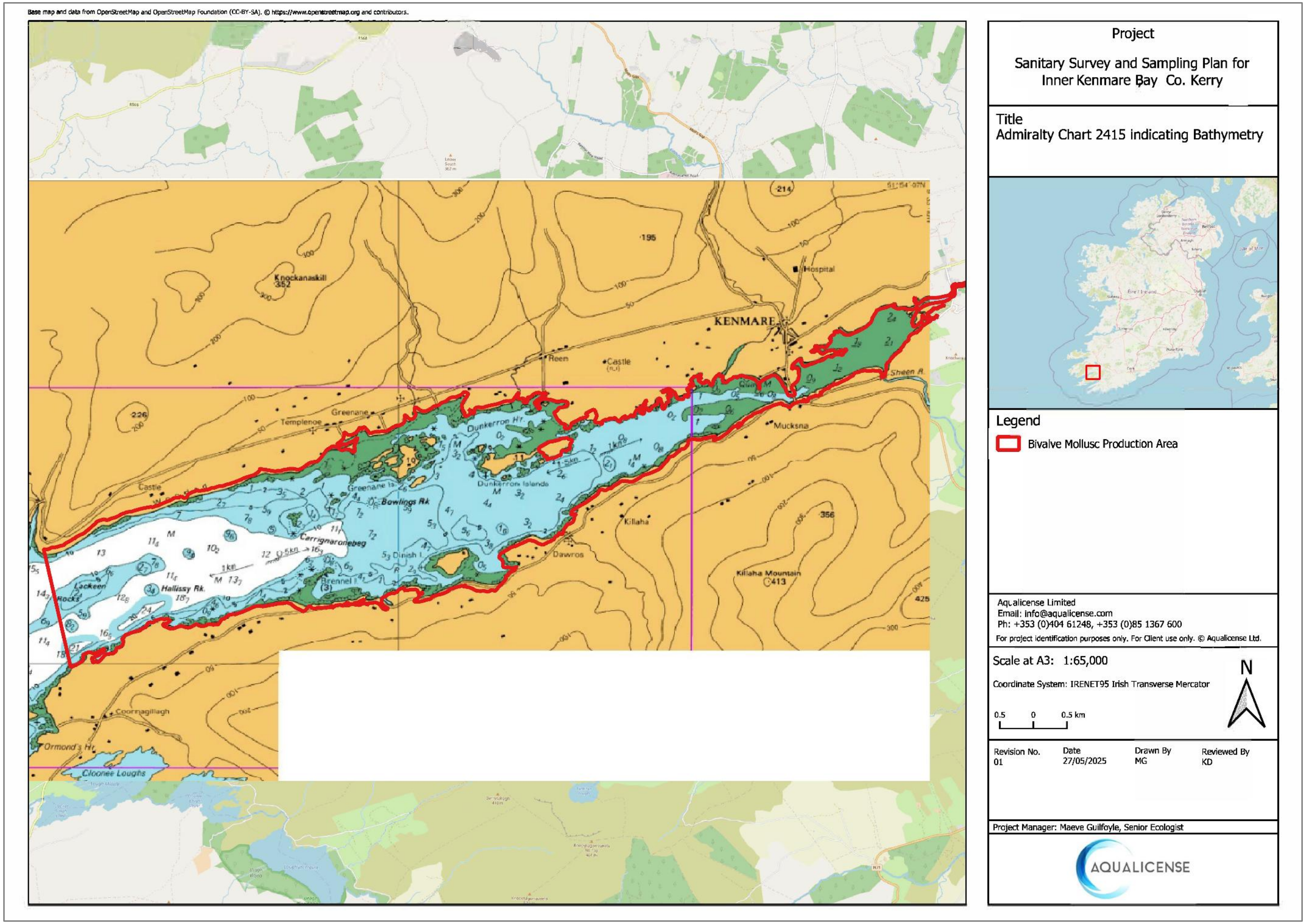


Figure 2-6. Admiralty Map [2495] indicating bathymetry.

2.5.2 WEATHER

Weather patterns significantly influence the transport of organic pollutants. The nearest synoptic weather station to the production area is Valentia observatory, located c. 35.70 km NW. Data from this station from April 2015 to April 2025 inclusive (Met Éireann, 2025a, 2025b) have been used to infer weather patterns and seasonality influencing pollutant circulation within the production area.

2.5.2.1 WIND AND WAVES

The prevailing wind direction is from the west (~15.8 ms^{-1}), accounting for25% of all winds (*Figure 2-7).* The next strongest sector is south-west (SW) with a maximum mean of ~15.5 ms^{-1}. There is a seasonal prevalence with winter having the strongest and most persistent flow, dominated by the W-SW winds and higher overall mean speed (~5.9 ms^{-1}). Spring and autumn retain a W-S bias but with slightly lower wind speed means (~4.6-4.8 ms^{-1}), with southerly blasts more common in autumn. Summer remains westerly-led yet is the gentlest wind speeds (~4.3 ms^{-1}) and displays a broader directional spread, including occasional easterlies. For further details refer to *Appendix 1*.

Waves and currents play a crucial role in hydrographic conditions. Of 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).

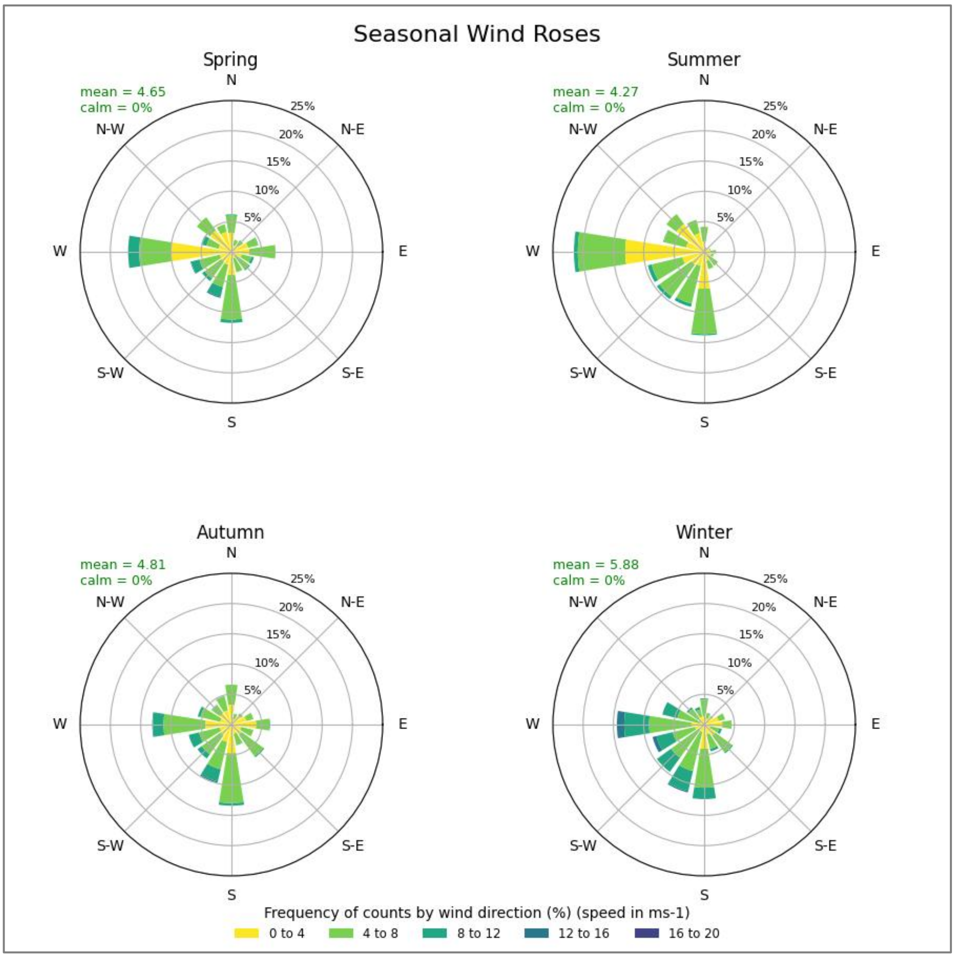


Figure 2-7. Seasonal wind roses for Valentia observatory (May 2015 to April 2025 inclusive).

Wave conditions in the upper Kenmare Estuary, including Inner Kenmare Bay BMPA are dominated by locally generated wind-sea as oceanic swell is greatly reduced by the inlets long (Kenmare Bay is a 50 km long inlet) and narrow geometry. SWAN modelling for the bay shows that significant wave heights inside Inner Kenmare Bay BMPA seldom exceed 0.5m even during storm events (Marine Institute 2023). Wave climate is therefore wind-sea driven winter W-SW winds- both the most frequent and fastest (mean peak ~15.8m/s) blowing parallel to the bays east-west orientation create short -period waves (Tp <4s) of 0.3-0.5m, capable of resuspending fine sediments from intertidal flats and delta regions during storm events.

Seasonally, wave induced sediment resuspension is highest from November to March, coinciding with stronger winds and larger tidal ranges. During the relatively calmer summer periods, reduced wind speeds and lower wave energy facilitate sediment settling, reducing microbial redistribution risks.

2.5.2.2 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 late spring (April) to the summer months (May to July), peaking in autumn through winter *(*

Figure 2-8*).*

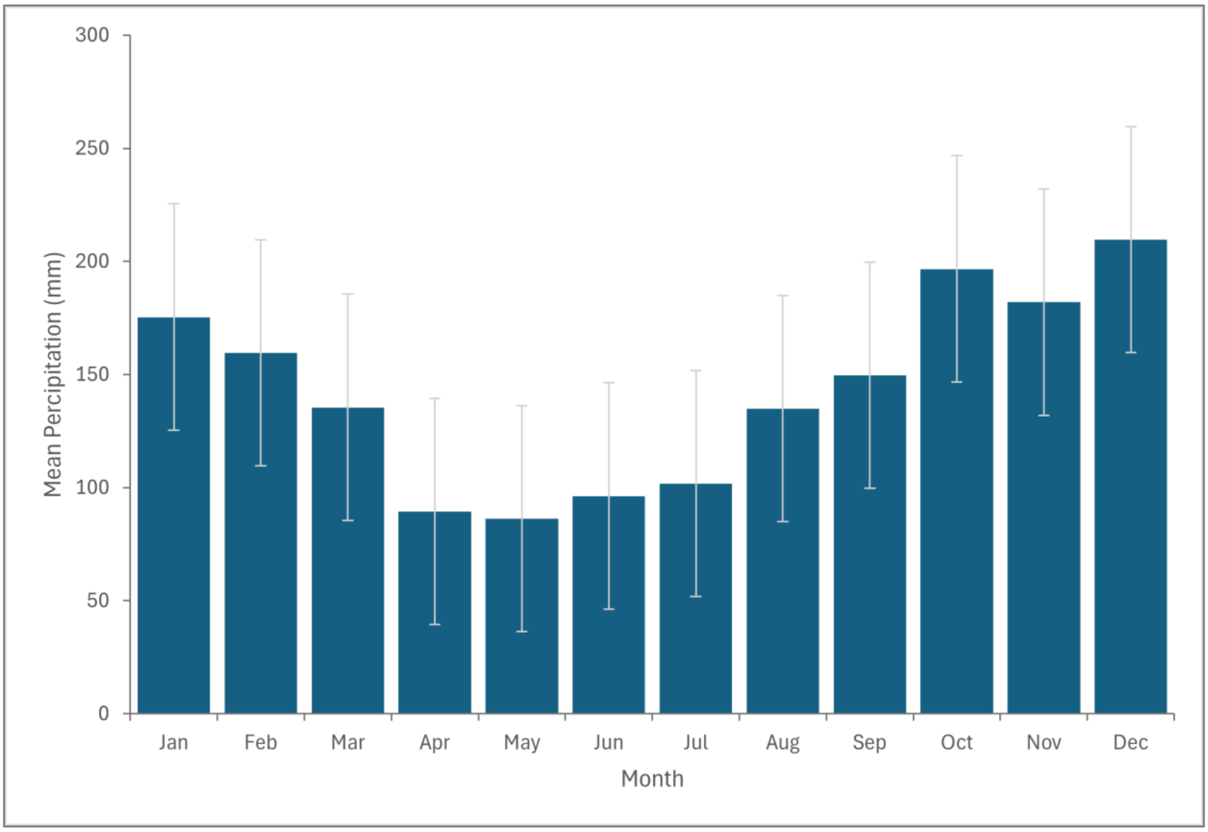


Figure 2-8. Mean monthly precipitation (± 1 standard deviation) at Valentia observatory (May 2015 to April 2025 inclusive)

Heavy rainfall during the spring and summer can result in increased faecal loadings, largely due to higher livestock stocking densities and the accumulation of faecal matter over the summer months..

Therefore, the influence of precipitation on circulation of pollutants will be further discussed in *Section 2.6* as relevant for each source of contamination.

2.5.3 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 Roughty River is the primary freshwater inflow source to Inner Kenmare Bay BMPA, with secondary inputs from the Sheen and Finnihy rivers, all three rivers run through Zone 1 high-risk strips before entering the bay, making them main conduits for land-derived pollutants.

- **Groundwater:** Areas mapped as "extreme" or "rock-at-surface" vulnerability- notably along the Roughty- Sheen riverbanks, eastern Glanlee and sections of the Banawn and Kilgaran- overlap farmed land and clusters of septic- tank- reliant dwellings, presenting the greatest risk of contaminant infiltration to groundwater and subsequent river baseflow.

- **Hydrodynamics:** Semi-diurnal tides of ~3.5 - 4m (spring) and 1.5 - 2m (neap) generate peak currents of 0.4-0.6 ms^{-1} in the main channel but <0.1 ms^{-1} over shallow intertidal flats, leading to localised retention of contaminants in sheltered areas in the northeasterly sections of the bay during neap conditions. Modelled flushing times vary from ~2 days (spring tides, high river flow) to ~5 days (neap tides) allowing episodic build-up of pollutants when exchange is weakest.

- **Weather:** Sediment resuspension and movement of contaminants (within surface waters) may occur during the stronger south easterly winds. Heavy rainfall may influence the seasonality of the 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

2.6 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 2-4) will be assessed using the S-P-R model, 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).

2.6.1 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.

2.6.1.1 Urban Wastewater Treatment Plants

Urban Waste Water 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.

Following examination of EPA data (EPA, 2025), there are two UWWTPs within the contributing catchment. A total of 1 UWWTPs exist serving a Population Equivalent (PE) of less than 500. A total of 1 UWWTPs serving a population equivalent of greater than 500 are present (Kenmare WWTP), and these are further elaborated on in *Table 2-3.* Of note the Kenmare WWTP is undergoing upgrade works for an outdated and previously overloaded system, which will increase capacity at the site, aid in improving water quality and ensure environmental compliance with National and EU regulations related to the treatment of wastewater.

2.6.1.2 Septic Tanks and Other Sewerage types

Ireland has nearly half a million Domestic Wastewater 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), *Table 2-3* and *Figure 2-9* present the percentage of each small area overlapping the contributing catchment and its population density. Therefore, this section relies on Census 2022 small-area statistics (CSO, 2023c). *Table 2-3* and *Figure 2-9* present the percentage of each small area overlapping the contributing catchment and its population density.

Table 2-3. Statistics for Small Areas overlapping the contributing catchment and corresponding population density (CSO, 2023c).

Small Area Code	Contributing Catchment Overlap	Population Density (People per km^2)
A047008001	<1%	5
A047047001	<1%	4
A047048001	<1%	7
A047160003	<1%	24
A047160004/A047160006	<1%	0
A047167001	1.8%	10
A047167002	<1%	15
A047187005	<1%	13
A047187006/A047187001	<1%	0
A047296002	<1%	9
A077026001	>99%	4
A077038001	>99%	7
A077038002	>99%	20
A077052001	<1%	2
A077053001	<1%	13
A077061001/A077061003	64.5%	0
A077061002/A077061006	61.7%	0

Small Area Code	Contributing Catchment Overlap	Population Density (People per km^2)
A077061004	58.9%	7
A077061005	>99%	89
A077070001	98.9%	32
A077070002/A077070003	24.2%	0
A077077001	11.4%	6
A077077002	<1%	10
A077079001	>99%	3
A077080001	>99%	4
A077081002	<1%	4
A077084001	46.7%	5
A077084002	98.2%	26
A077089001	>99%	9
A077089002	>99%	2149
A077089003	>99%	1197
A077089004	>99%	3234
A077089005/A077089007	>99%	0
A077089006	>99%	1351
A077089008	>99%	69
A077089009	>99%	1944
A077089010	82.2%	12
A077089011	>99%	2168
A077089012	>99%	2686
A077089013	>99%	1158
A077089014	>99%	1158
A077089015	>99%	608
A077089016	>99%	1895
A077089017	>99%	1415
A077089018	85.9%	26
A077097001	76.2%	5
A077097002/A077097004	98.0%	0
A077097003/A077097005	>99%	0
A077141001	<1%	2
A077149001/A077149002	77.9%	0

Sewerage type estimates were also obtained from Census 2022 data (CSO, 2023c). These figures are presented as percentages for entire small areas, as individual data for overlapping catchments would not be representative *(Figure 2-10),* (small areas do not directly align with the contributing catchment, see *(Table 2-3).*

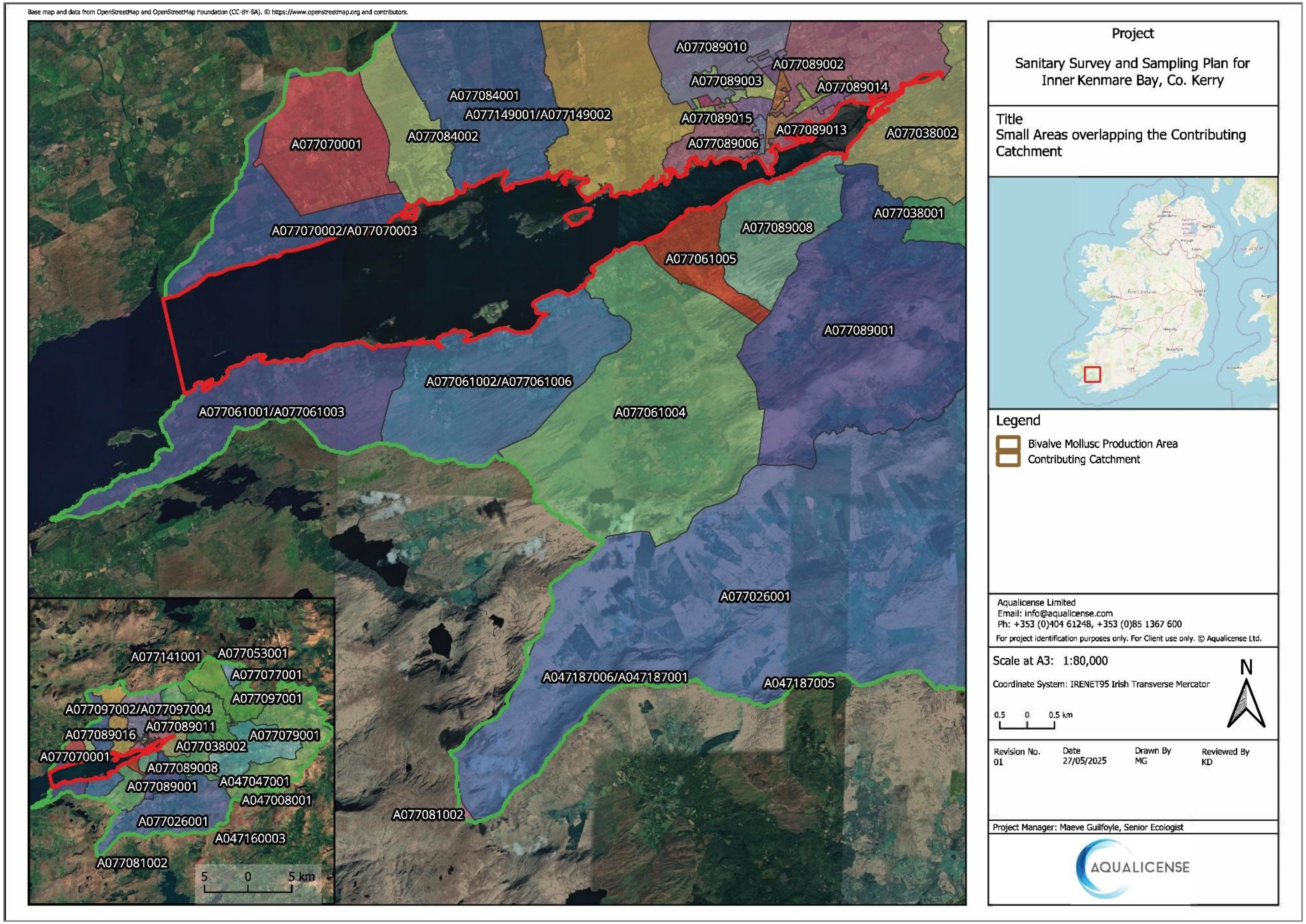


Figure 2-9. Small Areas overlapping the Contributing Catchment

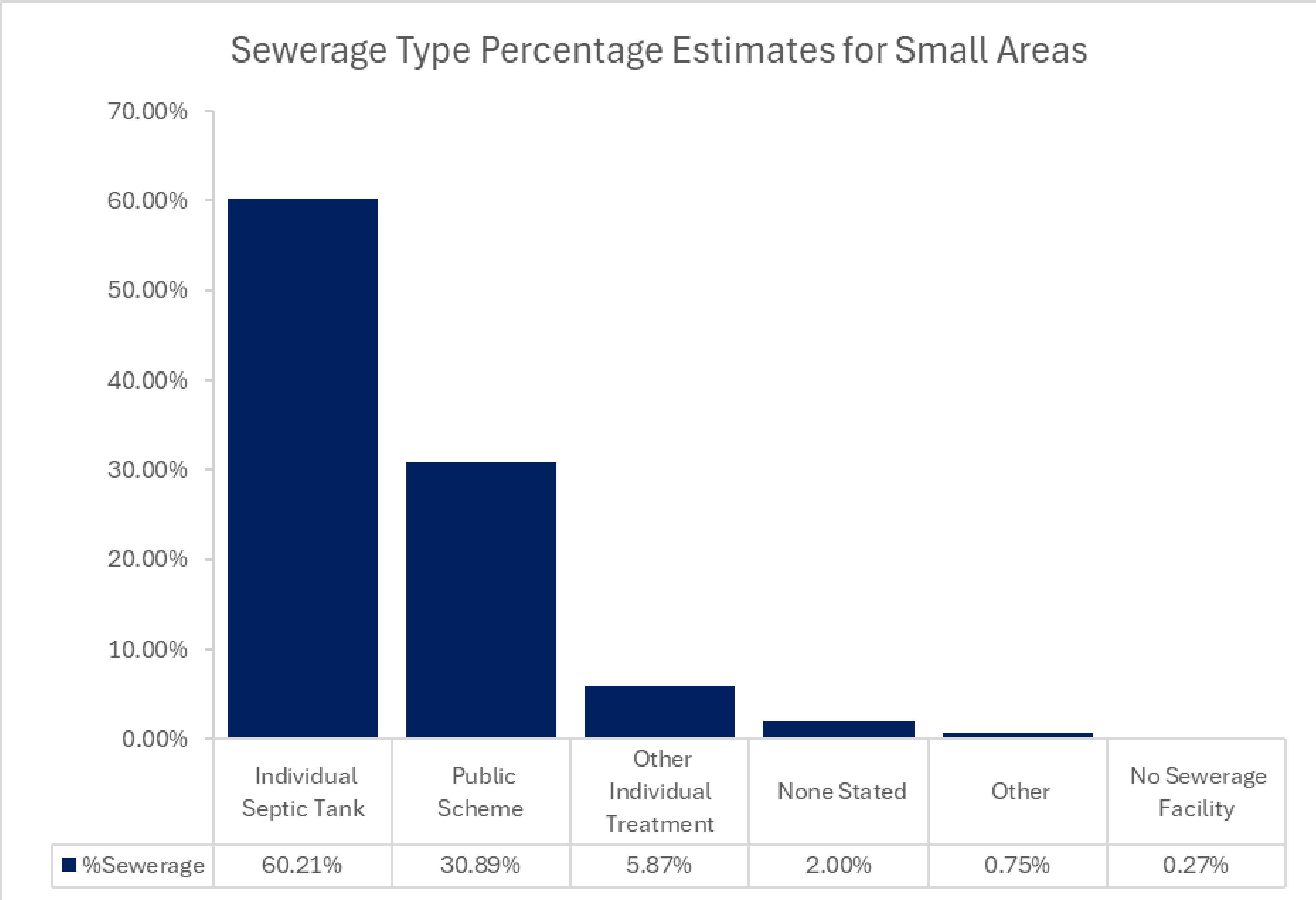


Figure 2-10. Percentage estimates of sewerage types for permanent private households according to the 2022 census

The majority of the contributing catchment falls within Zone 3 (Lower risk) (EPA, 2021). *(Figure 2-11)* shows that, aside from the extensive Zone 3 (lower risk) area that dominates the contributing catchment, two smaller belts of higher vulnerability are present: a continuous Zone 1 trip following the Rivers Roughty, Sheen and Finnihy valleys to Inner Kenmare Bay BMPA and several small Zone 2 polygons around he more densely populated areas on the fringes of Kenmare and Kilgarvan.

These higher- risk zones coincide with the only locations where population density exceeds 30 people per km^2 *(Table 2-3)* and where the Census 2022 data indicates that >70% of households rely on individual septic tanks or other domestic waste water treatment systems (CS 2023c: *Figure 2-11*).

As the catchment is largely rural and unsewered, Kenmare is the only area served by a municipal Urban Waste Water Treatment Plant (UWWTP)- the functioning of these on-site systems is the principal sanitary risk in Zones 1 and 2, whereas the remaining Zone 3 lands pose comparatively low risk (EPA, 2021).

Surface water hydrology also plays a crucial role in contamination risk. All three main river outflows Roughty, Sheen and Finnihy, drain directly through Zone 1 high risk areas before discharging into Inner Kenmare Bay BMPA so any failure of septic tanks or slurry- run off in these corridors can be rapidly conveyed to shellfish waters. Suring wet periods the rivers swift surface flows mobilise contaminants from the adjoining slopes and Zone 2 pockets near Kenmare and Kilgarvan, while spring- tide flushing then disperses from them across the bay. Conversely, the expansive Zone 3 hinterland contributes little risk because it lies outside the principal drainage axes and has low population density.

Therefore, considering groundwater vulnerability, surface water flows, and population density, the very narrow Zone 1 corridors along the river valleys – particularly the densely settled fringes just outside Kenmare represent the most likely location for sewage-contaminated discharges from DWWTSs.

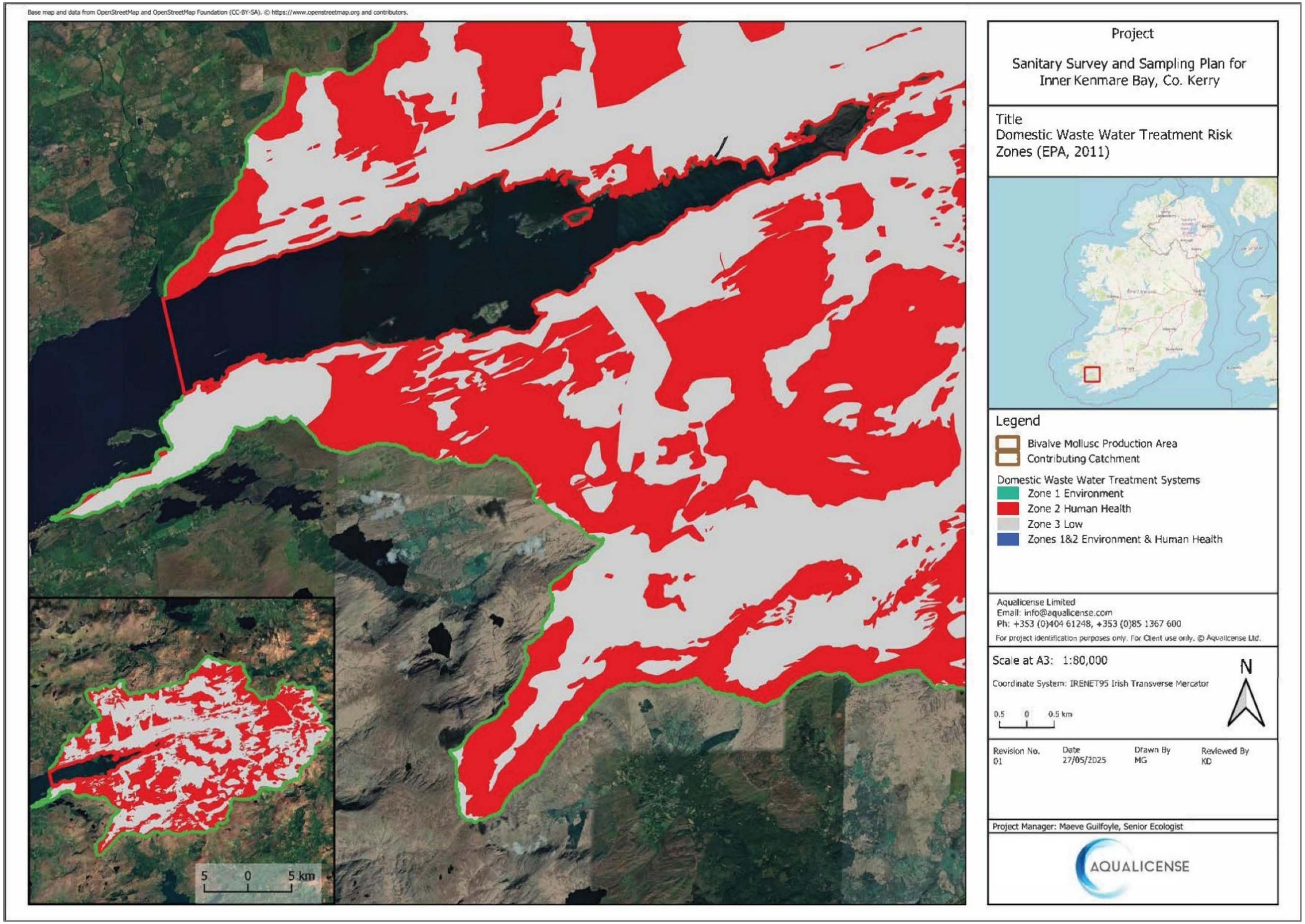


Figure 2-11. Domestic Waste Water Treatment System Risk Zones (EPA, 2021).

2.6.2 Industrial Emissions

2.6.2.1 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 one license has been granted within the contributing catchment (EPA, 2024), P0511-01-Kilgarvan Pig Unit Ltd, located >5 km northeast of Kenmare, upstream on a tributary of the Slaheny river which joins the Roughty River. This licence is under activity class 6.2 (a) intensive agriculture >3000 production pigs *(Figure 2-12)* .

2.6.2.2 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 five Section 4 discharges are listed within the contributing catchment (EPA, 2024b) *(Figure 2-12)*, though following consultation with the Kerry Co.Co. environmental department only two of which are listed as still active. The two active sites which will be characterised and discussed in further detail are:

- Star Seafoods (LA_Ref_W66) is a fish processing plant (granted in 1993, to be reviewed 2025), the wash waters from the factory floor are first passed through catch traps and baskets prior to discharge to settling tanks, with the screened/settled effluent then being discharged into Kenmare bay (51.84485N, -9.65049W (51°50’41.4”N, 9°39’1.77”W)); and
- F&M Hurley Plant Hire (Schull) Ltd (LA_Ref_W204). A Stone quarry operator in West Cork and South Kerry, granted in 2019 to discharge trade effluent from its quarry operation at Chaer West Kenmare, Co. Kerry following primary treatment to the Kilpatrick Stream (Tributary of the Cleady River) at Caher West, Knemare Co, Kerry (51.89626N, -9.534840W (51°53’46.5”N, 9°32’5.42”W))

2.6.3 Land Use

According to Corine (2018), land cover within the contributing catchment is dominated by Peat bogs (194.9km^2, 49.1%) *(Figure 2-13).* Land principally occupied by agriculture, with significant areas of natural vegetation is the next most dominant land cover type (79.7km^2, 20.1%). Other land use types within the contributing catchment are: Coniferous Forest (27.8km^2, 7.0%); Moors and heathland (26.2km^2, 6.6%); Pastures (24.2km^2, 6.1%); Transitional woodland-shrub (15.8km^2, 4.0%); Broad-leaved forest (8.6km^2, 2.2%); Mixed forest (7.1km^2, 1.8%) and Sparsely vegetated areas (6.3km^2, 1.6%). Several land cover types cover areas of less than 1%, namely: Natural grasslands; Discontinuous urban fabric; Sport and leisure facilities; Sea and ocean and Intertidal flats. Of the above land cover types, land principally occupied by agriculture with significant areas of natural vegetation is the most likely to give rise to faecal contamination in the contributing catchment.

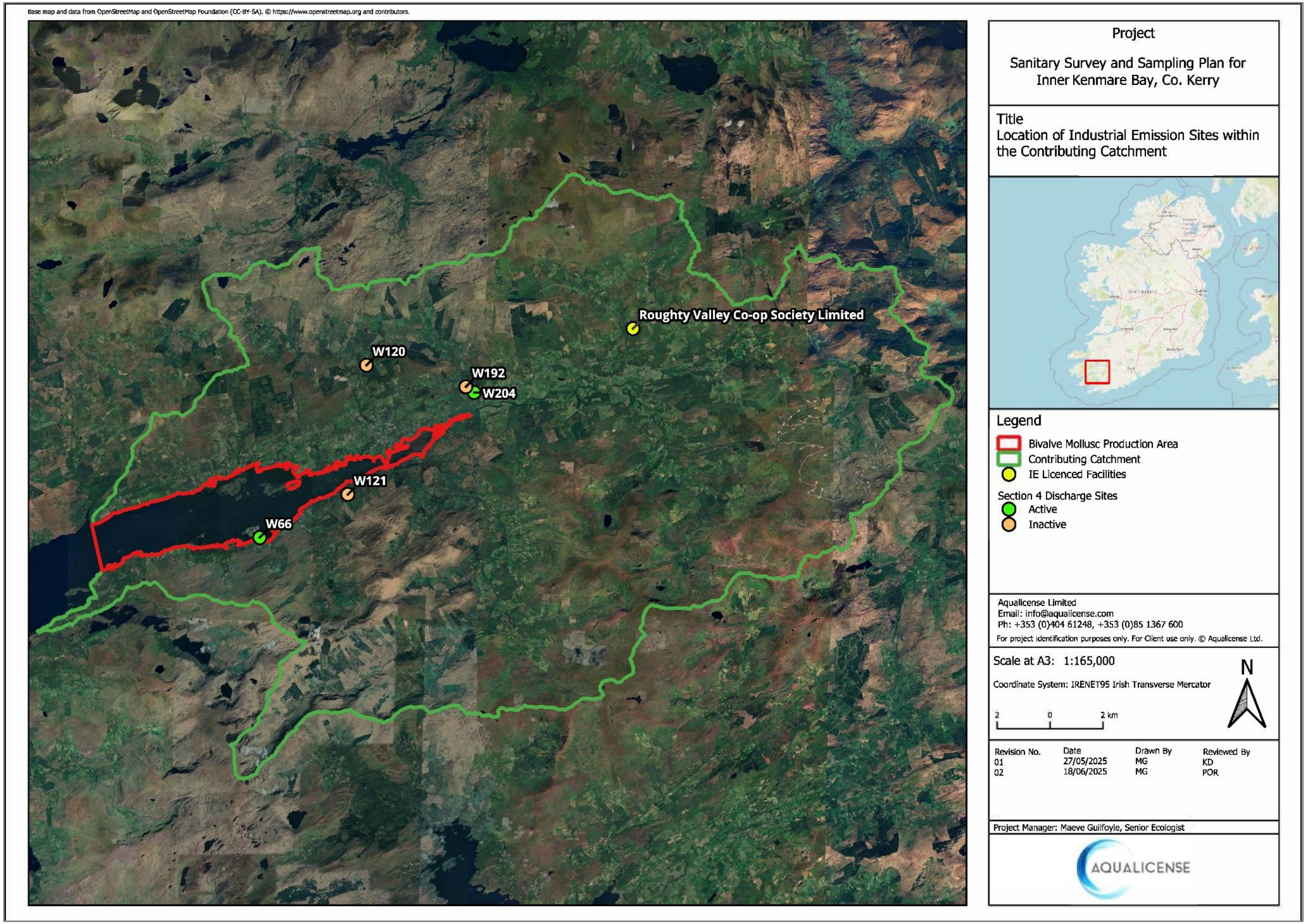


Figure 2-12. Industrial Emissions within the Contributing Catchment

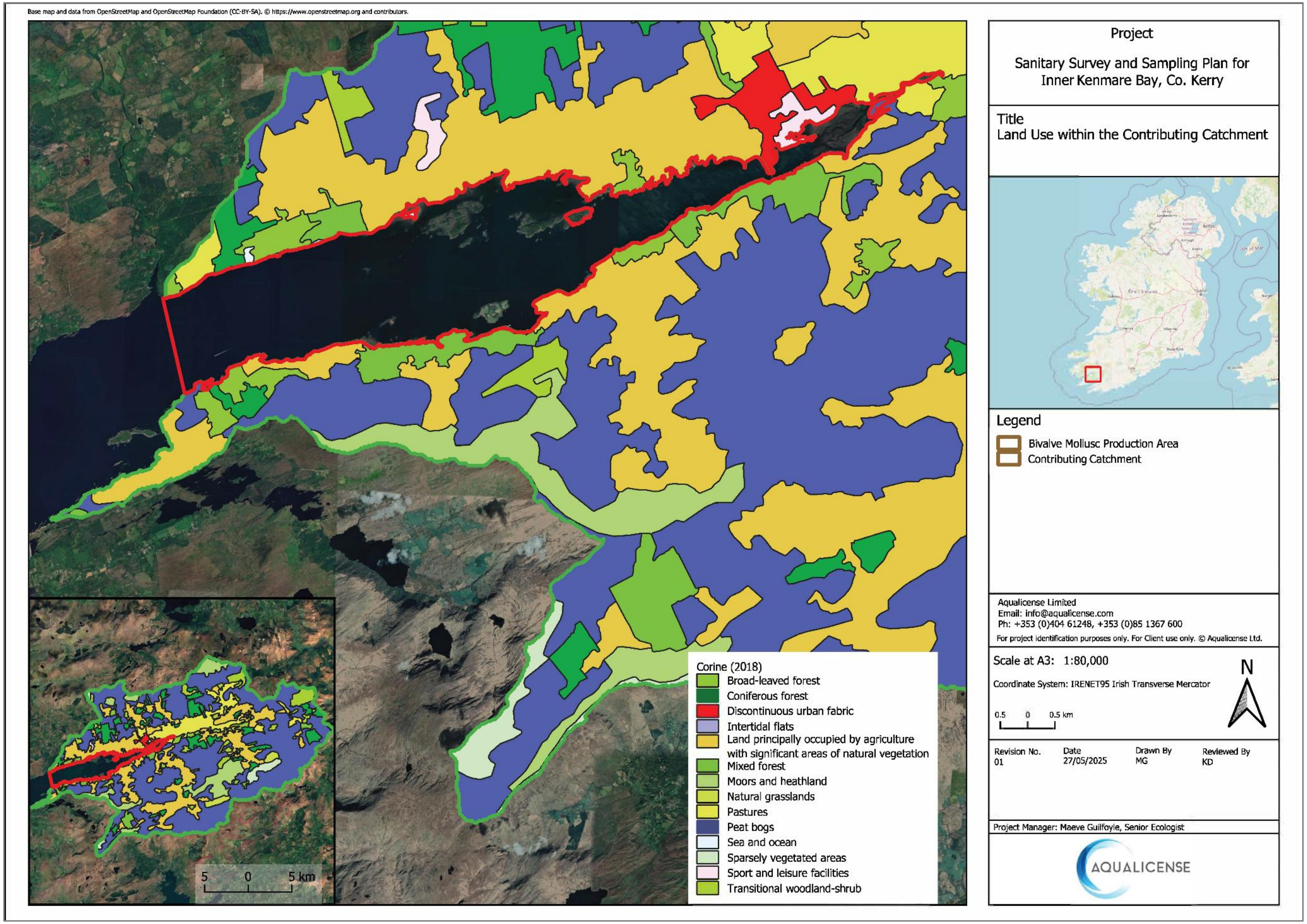


Figure 2-13. Land Use within the Contributing Catchment.

2.6.3.1 Agriculture

Animals

Faecal production and *E. coli* loads from domestic animals are often comparable to or greater than those from humans *(Table 2-4)* 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 2.5.2.2*). Stocking densities also play a role, with higher faecal contamination typically observed during summer months (Hunter *et al.*, 1999).

Table 2-4. 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 x 106^{6}	1.9 x 109^{9}
Cow	23600	0.23 x 106^{6}	5.4 x 109^{9}
Sheep	1130	16 x 106^{6}	18.1 x 109^{9}
Chicken	182	1.3 x 106^{6}	0.24 x 109^{9}
Pig	2700	3.3 x 106^{6}	8.9 x 109^{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 2.6.2.1.*

A total of 22 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 (*Table 2-5*) 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.

Table 2-5. Statistics from the Census of Agriculture 2020 relating to grazing farm animals 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
Ahil	<1%	0 (0)	1714 (9)	369 (2)	1110 (6)	9507 (51)
Banawn	98.9%	0 (0)	1748 (1729)	241 (238)	743 (735)	12468 (12334)
Bealanageary	<1%	0 (0)	1166 (5)	268 (1)	928 (4)	5348 (23)
Bealanageary	<1%	0 (0)	1709 (3)	301 (0)	1214 (2)	8642 (14)
Cappagh	>99%	0 (0)	1393 (1385)	493 (490)	1523 (1514)	3470 (3450)
Clydagh	<1%	0 (0)	1659 (0)	394 (0)	1123 (0)	9478 (0)

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

Electoral Division	Percentage Overlap of Contributing Catchment	Total (Corrected) Dairy Cows	Total (Corrected) Livestock	Total (Corrected) Other Cows	Total (Corrected) Cattle	Total (Corrected) Sheep
Coolies	<1%	0 (0)	732 (1)	104 (0)	676 (0)	2152 (2)
Dawros	62.1%	0 (0)	1131 (702)	320 (199)	898 (557)	5405 (3355)
Dromore	41.1%	0 (0)	318 (131)	141 (58)	299 (123)	1114 (457)
Flesk	7.9%	0 (0)	2251 (177)	383 (30)	2183 (172)	9040 (711)
Glanlee	>99%	0 (0)	1907 (1890)	328 (325)	892 (884)	11759 (11654)
Glanlough	>99%	0 (0)	1550 (1550)	372 (372)	833 (833)	9837 (9841)
Glanmore	<1%	0 (0)	1523 (2)	176 (0)	394 (0)	12681 (15)
Glengarriff	<1%	0 (0)	1345 (2)	417 (1)	1175 (2)	5939 (8)
Gortnatubbrid	1.3%	0 (0)	1692 (21)	367 (5)	1479 (19)	6812 (86)
Greenane	51.2%	0 (0)	1007 (516)	254 (130)	602 (308)	6015 (3081)
Kenmare	89.8%	210 (189)	1729 (1553)	471 (423)	1637 (1470)	5968 (5360)
Kilcaskan	<1%	0 (0)	1996 (6)	377 (1)	2103 (6)	5458 (16)
Kilgarvan	84.3%	512 (432)	5646 (4760)	557 (470)	2183 (1840)	11391 (9603)
Muckross	<1%	0 (0)	759 (4)	146 (1)	357 (2)	5142 (25)
Reen	78.0%	0 (0)	584 (455)	219 (171)	491 (383)	2619 (2042)
Slievereagh	<1%	433 (0)	2326 (0)	459 (0)	2665 (1)	5310 (1)

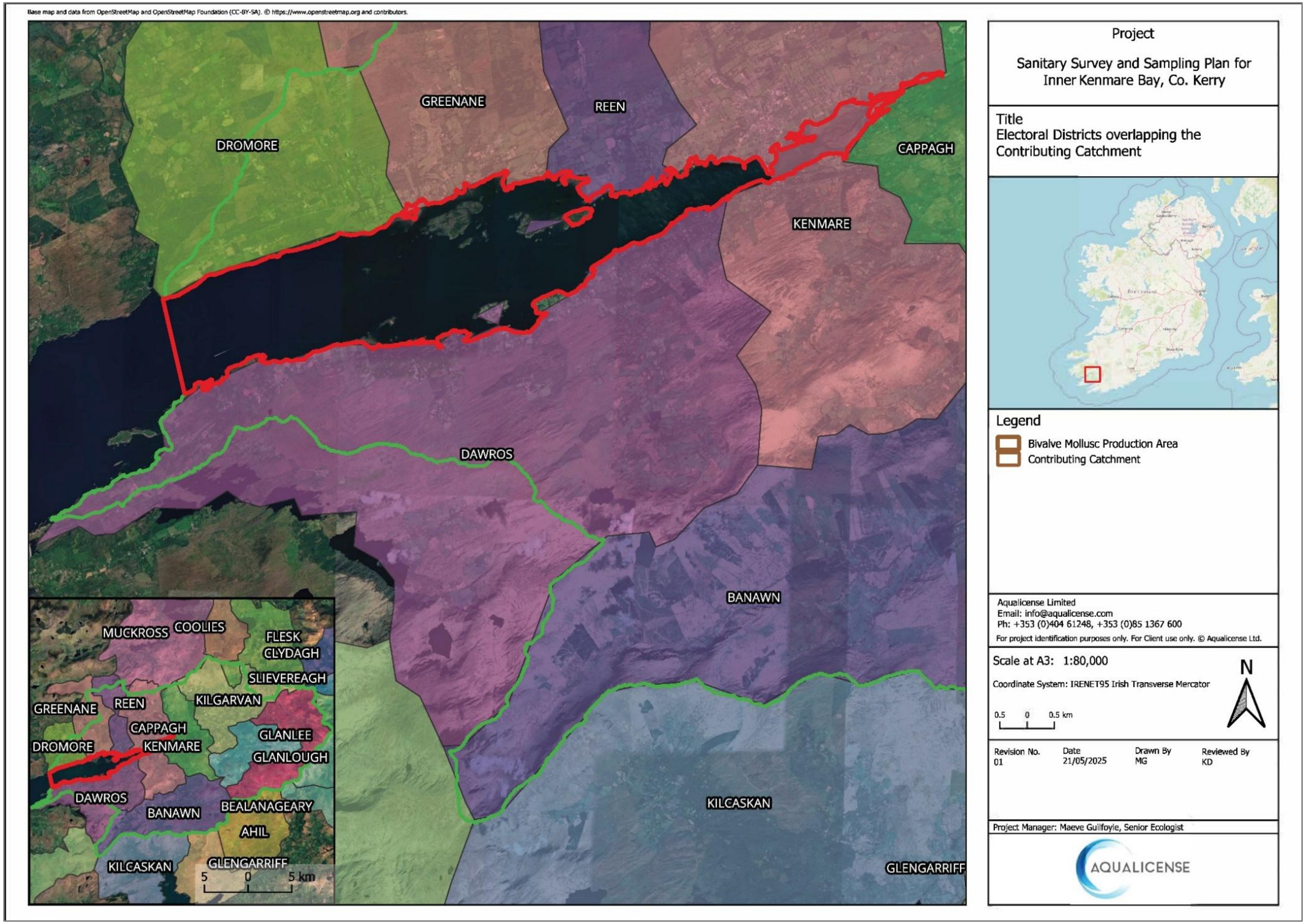


Figure 2-14. Electoral Divisions overlapping the Contributing Catchment.

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 relevance to this section are pressures from agriculture[3]. As part of the third WFD cycle, four groundwater bodies underlying the contributing catchment (Groundwater Body Ballinhassig West, Groundwater Body Beara Sneem, Groundwater Body Cahersiveen and Groundwater Body Kenmare). The Groundwater Bodies Ballinhassig West, Beara Sneem, Cahersiveen and Kenmare are not considered "At Risk" and therefore have not been classified for agricultural pressures.

Surface waters discharging into the BMPA are at risk of faecal contamination from agricultural sources particularly via runoff following rainfall and direct deposition into watercourses.

Table 2-5 and *Figure 2-14* show that several Electoral Divisions (EDs) significantly overlap with the contributing catchment, with, Banawn, Glanlee, Glanlough and Kenmare having the highest corrected counts for both cattle and sheep in the area. These areas are therefore critical in terms of grazing intensity and associated risks of faecal contamination, especially given the high *e. coli* load per sheep and cattle as outlined in *Table 2-4*. In terms of spatial influence, EDs with the greatest percentage of overlap- particularly Banawn, Glanlee, Glanlough and Kenmare – are of elevated concern due to their alignment with inflows into the BMPA. Sheep which contribute the highest daily *e. coli* loading among domestic animals, are most densely populated in Glanlee and Kilgarvan, increasing the likelihood of bacterial loading into the adjacent watercourses though overland flow or direct deposition.

While groundwater bodies underlying the catchment (Ballinhassig West, Beara Sneem, Cahersiveen, and Kenmare) are not classified as "At Risk" under the WFD, surface waters remain vulnerable to agricultural pressures. Figure 2-3 shows surface water pathways in proximity to intensive grazing areas, presenting clear risks for faecal runoff- particularly during periods of high rainfall and overland flow. Seasonality is a significant factor: increased stocking densities during summer months (Hunter et al., 1999) and more frequent rainfall events in autumn/ winter periods both elevate the risk of contaminant mobilisation and transport into the BMPA.

Therefore, considering grazing animal densities, groundwater vulnerability, and surface water inflows, are 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 *(Table 2-6)*. The largest assumed area of farmed land is in the Glanlee, followed by Banawn, used primarily for grazing.

In accordance with the 5th Nitrates Action Programme (Government of Ireland, 2022), the contributing catchment lies in Zone B, where a closed period for slurry spreading runs from 1st October to 15th

[3] Not all parameters from the WFD apply, please refer to Section 2.5.1

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. However, the contributing catchment does not overlie a karst limestone aquifer (GSI, 2023). A portion of the catchment does overlie areas of extreme groundwater vulnerability or areas with rock at or near the surface *(Figure 2-13)* suggesting karst vulnerability, which will be discussed further below.

Considering the 2020 Agriculture Census, c. 62.49 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 72.22 (c. 10388.45 ha) of agricultural land overlaps areas classified as having "extreme" or "rock-at-surface" groundwater vulnerability (GSI, 2021). Additionally, 18 EPA-mapped rivers (Figure 2-3) in the contributing catchment flow through agricultural land before entering the BMPA.

Therefore, considering the agricultural land use and groundwater vulnerability, in addition to all riverine inputs, and Glanlee and Banawn (due to their extensive farmed areas and high percentage overlaps (>99% and 98.9% respectively) with the contributing catchment) are 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.

Table 2-6. Statistics from Census of Agriculture 2020 relating to land utilisation within the Electoral Divisions overlapping the contributing catchment.

Electoral Division	Percentage Overlap of Contributing Catchment	Total (Corrected) Number of Holdings	Average Size of Holdings	Total (Corrected) Area Farmed (Hectares)	Total (Corrected) Cereals	Total (Corrected) Grassland
Ahil	<1%	65 (0)	42.8	2785.0 (15.0)	0.0 (0.0)	2738.9 (14.7)
Banawn	98.9%	73 (72)	50	3652.0 (3612.8)	0.0 (0.0)	3648.8 (3609.7)
Bealanageary	<1%	43 (0)	49.1	2112.0 (9.2)	0.0 (0.0)	2105.7 (9.2)
Bealanageary	<1%	44 (0)	69.8	3071.2 (4.8)	0.0 (0.0)	3069.2 (4.8)
Cappagh	>99%	55 (55)	38.5	2115.5 (2103.1)	0.0 (0.0)	2115.2 (2102.8)
Clydagh	<1%	46 (0)	70.8	3255.1 (0.1)	0.0 (0.0)	3253.0 (0.1)
Coolies	<1%	28 (0)	19.4	542.5 (0.4)	0.0 (0.0)	542.5 (0.4)
Dawros	62.1%	54 (34)	52.8	2851.4 (1769.8)	0.0 (0.0)	2850.2 (1769.0)
Dromore	41.1%	26 (11)	33.3	864.9 (355.1)	0.0 (0.0)	861.3 (353.6)
Flesk	7.9%	49 (4)	63.4	3105.7 (244.1)	0.0 (0.0)	3105.7 (244.1)
Glanlee	>99%	48 (48)	96.5	4631.2 (4589.7)	0.0 (0.0)	4631.1 (4589.6)
Glanlough	>99%	49 (49)	64.9	3179.4 (3180.8)	0.0 (0.0)	3175.7 (3177.1)
Glanmore	<1%	67 (0)	48.4	3240.1 (3.8)	0.0 (0.0)	3240.1 (3.8)

Electoral Division	Percentage Overlap of Contributing Catchment	Total (Corrected) Number of Holdings	Average Size of Holdings	Total (Corrected) Area Farmed (Hectares)	Total (Corrected) Cereals	Total (Corrected) Grassland
Glengarriff	<1%	66 (0)	19.5	1283.9 (1.7)	0.0 (0.0)	1274.1 (1.7)
Gortnatubbrid	1.3%	62 (1)	47	2914.8 (36.7)	0.0 (0.0)	2905.6 (36.5)
Greenane	51.2%	37 (19)	79.7	2948.7 (1510.3)	0.0 (0.0)	2947.9 (1509.9)
Kenmare	89.8%	87 (78)	33.9	2952.1 (2651.3)	0.0 (0.0)	2939.3 (2639.8)
Kilcaskan	<1%	71 (0)	44.1	3133.7 (9.0)	0.0 (0.0)	3132.7 (9.0)
Kilgarvan	84.3%	76 (64)	56.1	4265.7 (3596.1)	0.0 (0.0)	4264.3 (3594.9)
Muckross	<1%	29 (0)	149	4319.7 (21.2)	0.0 (0.0)	4319.7 (21.2)
Reen	78.0%	21 (16)	66.4	1393.7 (1086.6)	0.0 (0.0)	1392.7 (1085.8)
Slievereagh	<1%	54 (0)	53.1	2866.0 (0.6)	0.0 (0.0)	2864.3 (0.6)

2.6.3.2 Urban Areas and Human Populations

Human populations contribute to contamination from sewerage, as previously discussed in *Section 2.6.1*. However, examining urban areas and population dynamics can provide further insight into pollution sources and the seasonality of contamination.

The highest population density *(Table 2-3)* is recorded in Small Area A077089004, which includes the commercial and residential core of Kenmare town and the surrounding housing estates straddling the Finnihy/Roughty confluence to the east *(Figure 2-9).* This density is above the national average of 73 persons/km² (CSO, 2023b). During the most recent census (3rd April 2022), 25.73% of houses within the contributing catchment were identified as unoccupied holiday homes (CSO, 2023a). This share is higher than the national average (~11%) and indicates a substantial stock of seasonal dwellings; re-occupation in summer is therefore expected to boost wastewater loads from septic tanks and small package plants between May and September. For further information refer to *Section 2.6.1.2* relating to septic tanks.

In 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. A search of Google Maps for relevant facilities (e.g. schools, universities, nursing homes, hospitals, barracks, and prisons) yielded Kenmare Community Nursing Unit (~0.9km NE of the BMPA), St. Joesphs Nursing Home (1.1km NE), Pobalscoil Inbhear Sceine secondary school (0.8km N), two primary schools (~0.9km N) and Kenmare Community Hospital (1.4km NNE of the BMPA).

Tourist facilities can contribute to organic pollution, particularly in peak seasons. The contributing catchment lies within a high- density area of accommodation providers, including hotels, B&Bs, and campsites (Fáilte Ireland, 2018). Kenmare town itself falls in the "high- density" class, whereas the western rural fringe is mapped as "moderate-density" with scattered guesthouses and a single campsite near Inner Kenmare Bay village. 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 that Kenmare Camping and Glamping (~0.9 km N) of the bay, reliant on an on-site treatment system), the Park Hotel Kenmare, Sheen Falls Lodge and numerous town-centre B&Bs, the campsite represents the principal seasonal risk as its septic system is located close to the Finnihy river outflow. Other Pollution Sources

2.6.3.3 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.

A review of Google satellite imagery was conducted on 21 May 2025 to identify additional slips, piers, or jetties within the contributing catchment. However, given the scale of operations and 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.

2.6.3.4 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: 21 May 2025) was used to identify beaches and coastal walks within the BMPA *(Figure 2-15).*

2.6.3.5 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 2-16, 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.

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

Type	Name (Code)	Species	Location
I-WeBS	Kenmare River – Upper site (IE071)	Species include Light-bellied Brent Goose (*Branta bernicla hrota*), Wigeon (*Mareca penelope*), Teal (*Anas crecca*), Red-breasted	Counts taken along the northeastern shoreline of the BMPA, adjacent to Inner Kenmare Bay and Kenmare

Type	Name (Code)	Species	Location
		Merganser (*Mergus serrator)*, Great Northern Diver (*Gavia immer)*, Cormorant (*Phalacrocorax carbo)*, Grey Heron (*Ardea cinerea)*, Little Egret (*Egretta garzetta)*, Oystercatcher (*Haematopus ostralegus)*, Curlew (*Numenius Arquata)*, Redshank (*Tringa tetanus)*, Greenshank (*Tringa nebularia)*, Turnstone (*Arenaria interpres)*	
SPA	Beara Peninsula SPA (004155)	Fulmar (*Fulmarus glacialis*) [A009], Chough (*Pyrrhocorax pyrrhocorax*) [A346]	Coastal cliffs and slopes on the south side of the Kenmare Estuary c1-2 km opposite the BMPA's southern margin.
SPA	Killarney National Park, McGillicuddy's Reeks and Caragh Catchment SPA (004038)	Merlin (*Falco columbarius*) [A009], Greenland White-fronted Goose (Anser albifrons *flavirostris* [A395]	Upland basin ~10km north of the BMPA, though birds may forage down the Roughty and Sheen rivers
SAC	Kenmare River SAC (002158)	Lesser Horseshoe Bat *(Rhinolophus hipposideros*) [1303], Harbour Porpoise *(Phocoena phocoena*) [1351], Otter *(Lutra lutra*) [1355], Harbour Seal *(Phoca vitulina*) [1365]	SAC overlaps with the entire BMPA, covering intertidal flats, reefs and inner estuary areas

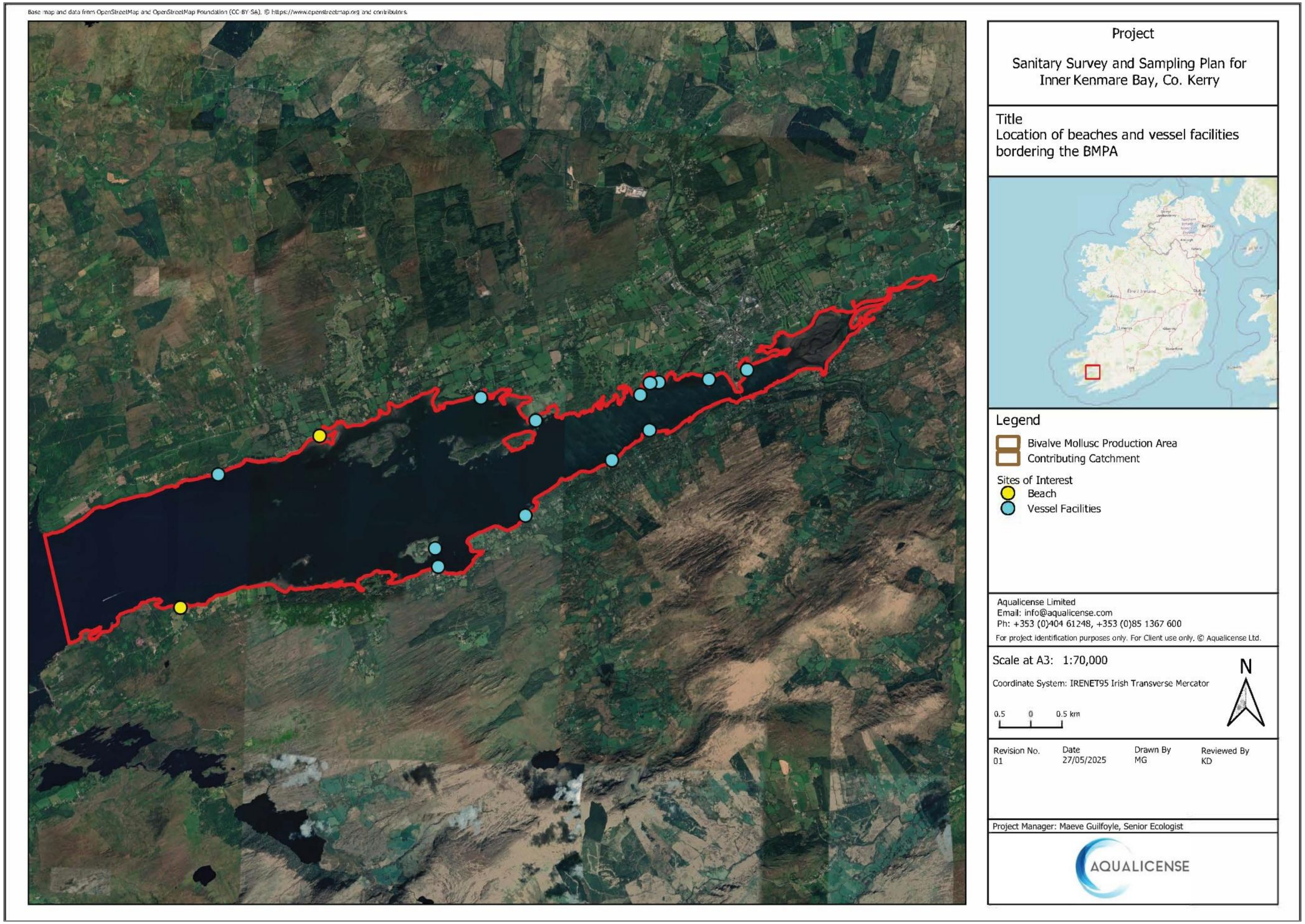


Figure 2-15. Location of beaches and vessel facilities bordering the BMPA.

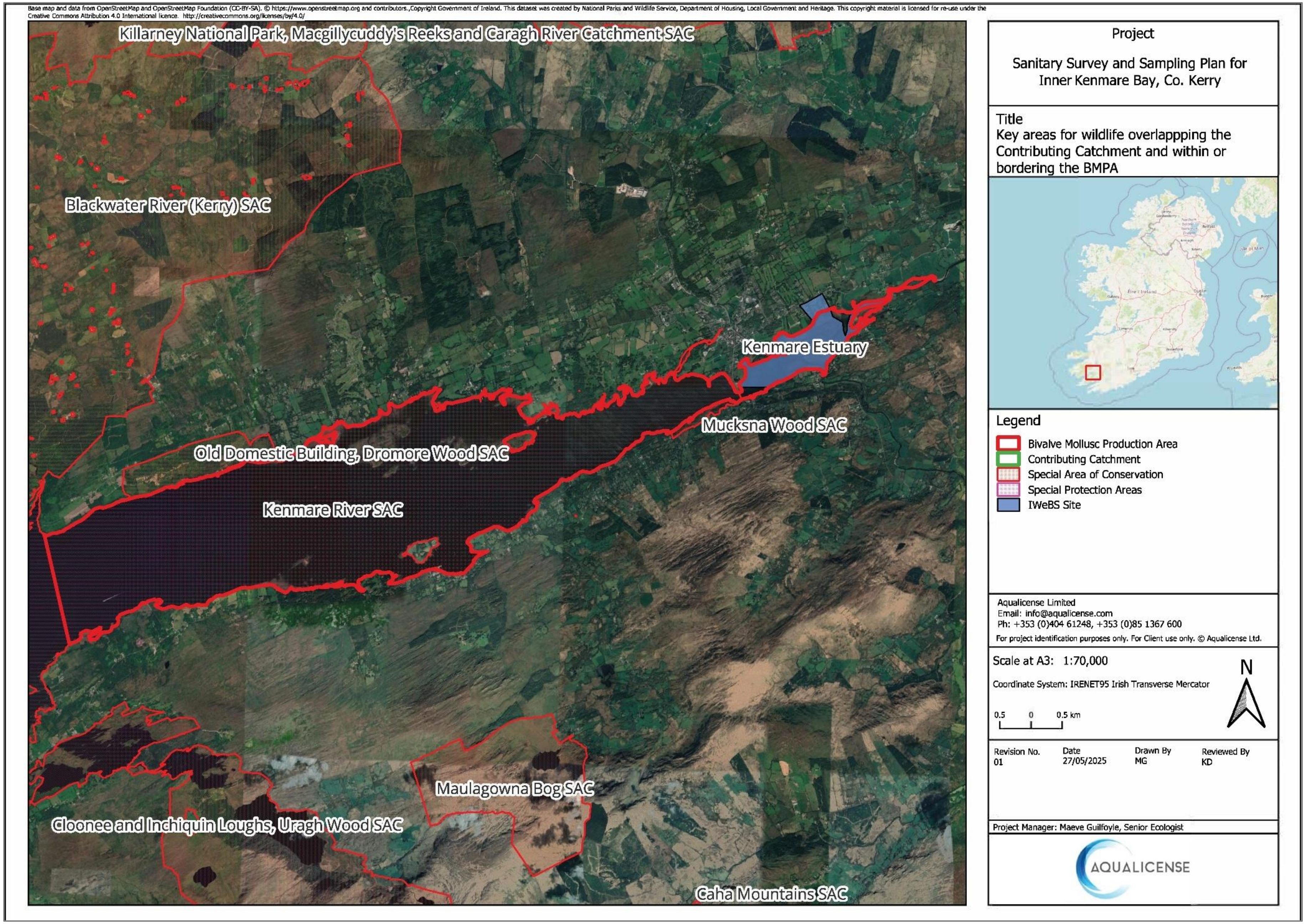


Figure 2-16. Key areas for wildlife within contributing catchment and with or bordering the BMPA.

2.7 Summary of Pollution Sources and Relative Risk

Considering the details in the above section, the Source-Pathway-Receptor (S-P-R) model was used to assess the relative risk of faecal contamination in Inner Kenmare Bay 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 Sites*	Details	Impact
UWWTPs	Kenmare municipal UWWTP (~4000PE) on north bank of Finnihy estuary.	Surface water via Finnihy–Roughty confluence; within Zone 1 DWWTS-risk strip.	< 800 m to nearest long-line plots off Inner Kenmare Bay; < 1 km to Dromquinna trestles.	• Highest contamination risk at Kenmare Bridge outfall during spring ebb tides. • Flood-tide residual currents set SW towards licensed trestles; neap tides give longest residence. • Moderate year-round loading; peak hotel/holiday occupancy raises summer BOD.	**Yes**: there is potential for direct, proximal outfall with short hydrodynamic travel time to the licensed sites. Moderate flushing times and loading during the peak tourist summer period increases the risk
Septic Tanks and Other Sewerage Types	Predominant in rural catchments; densest around Kenmare and Kilgarvan fringe areas	Surface water via Zone 1 rivers; infiltration in "Extreme" GW bands (Glanlee, Banawn).	Kenmare fringe tanks ≈ 0.5 km to trestles; Glanlee/Banawn tanks 2–4 km upriver.	• Greatest risk where high-density tanks overlie "Extreme" GW vulnerability (Glanlee/ Kilgarvan). • Flood currents carry any discharge seaward; weak neap flushing allows local build-up. • Summer peak from holiday homes (>25 % of stock) + dry-weather flows.	**Yes**: there are diffuse but numerous sources; which have the potential to result in episodic spikes after rainfall. This would be further attenuated by the 2-5 day flushing time of the bay.
IE and IPC Licenses	A single IE/IPC licence within 5km of the BMPA (EPA map 2024) (Kilgarvan Pig Unit ltd IPC P0511-01	Surface-water route through the Slaheny tributary to the Roughty River into Inner Kenmare Bay BMPA; additional possibility of seepage risk via adjoining Extreme groundwater (GW) vulnerability drift.	–Approximately 5km fluvial distance to the inner bay trestles off Inner Kenmare Bay	• There are no other IE or IPC licences of relevance within the contributing catchment • Slurry is land spread on adjoining fields under nutrient management conditions (mid-January to September)	**Yes**: the licensed waste storage and land spreading is episodic, this represents a risk of nutrient/microbial loading after heavy rain though this would be attenuated by travel time to the bay, and the flushing time of the bay of 2-5 days.

Source	Source Description	Pathway to Production Area	Pathway to Licensed Sites*	Details	Impact
Section 4 Discharges	Two active licences one fish processing factory and one quarry.	The quarry discharges into the Kilpatrick Stream, the Star seafoods factory discharges directly into Kenmare bay	All < 1.2 km to nearest long-line site.	• Greatest risk during high-load events (e.g. heavy rainfall periods) • Short (< 1 day) travel time from outfalls to trestles on ebb. • Overall risk moderate, mitigated by licence conditions.	**Yes:** though this has a limited volume there is a close proximity downstream of the closest site and seasonal peaks. The overall risk would be mitigated/limited by the licence conditions.
Agriculture	Mixed grazing; Glanlee and Kilgarvan highest stocking of livestock, sheep representing the highest overall *E. coli* load	Run-off to the various river inputs into the BMPA with possible infiltration in "Extreme" GW areas.	River mouths within 0.5–2 km of all farms.	• Highest loading during slurry-spreading season (Jan–Sep) and heavy rain. • Spring tides flush fields but also deliver pulses; neap tides allow persistence. • Risk: High for brief post-storm spikes, otherwise moderate.	**Yes:** this represents the largest possible source for faecal loading and broad spatial extent. While the tides do flush the area, they have the potential to deliver pulses from further down the bay
Urban Areas and Human Populations	Kenmare town (with the I highest population density; high end hotels and B&Bs	Surface water via the primary river sources with a minor groundwater link	< 1 km to Inner Kenmare Bay plots.	• Tourist occupancy May–Sep may double PE loads. • Flood tide inflow then ebb export past trestles. • Risk moderate; largely controlled by UWWTP performance.	**Yes:** Medium loads largely treated but seasonal surges.
Marine Vessels	Kenmare Pier (marine (~60 berths); Dromquinna harbour marine and various workboats.	Direct discharge in inner bay being dispersed by tides	< 0.5 km to inshore aquaculture.	• Considering current direction and the location of the piers, contaminants are unlikely to flow in the direction of the sites. • Given the scale of operations and regulatory controls and MARPOL which all dictates that no blackwater or greywater	**No** potential impact from this source would be negligible This is in combination with the hydrodynamics of the bay and the strict enforcement of MARPOL rules and regulations.

Source	Source Description	Pathway to Production Area	Pathway to Licensed Sites*	Details	Impact
				discharges may be allowed within 3nm of the shore.	
Swimming, Bathing and Recreation	Informal bathing at Inner Kenmare Bay Pier and Cos Strand (no Blue Flag sites).	Localised shedding at shoreline	< 300 m to trestles off Inner Kenmare Bay.	• However, due to the rural setting and low visitor numbers, contamination from recreational activities is assumed to be minimal. • Risk increases during summer, though the semi-diurnal nature of the tides and rapid flushing would mean fast dilution on spring tides.	**No** potential impact from this source would be negligible This is in combination with the hydrodynamics of the bay and availability of public sanitation
Wildlife	Harbour seal and harbour porpoise (SAC 002158); wintering waders, Brent geese (I-WeBS IE071)	Direct deposition in the intertidal and nearshore waters	Seal haul-out areas within close proximity to licenced sites, and overwintering/foraging wader species.	• Seal haul-outs may locally elevate faecal coliforms, but strong tidal dispersion. • Winter wader flocks concentrate at low-flow neap periods. • Wildlife-borne risk low–moderate, episodic.	**Yes**: However, these levels are likely to be **very low,** natural, sporadic and partially mitigated by tidal mixing (see section 2.5.1.4)

2.8 Conclusions of the Desk-Based Study

This desk-based component of the sanitary survey employed the S-P-R model to assess the principal potential impacts from the possible sources of faecal contamination identified during the desktop study (sections: 2.5.1.1 - 2.5.4.1), the mechanisms by which these contaminants are transported, and their circulation dynamics within the production area. The analysis identified the inflow from the Roughty River, with secondary inputs form the Sheen and Finnihy rivers as the principal sources of contaminant inflow, with additional smaller contributions from the numerous agricultural streams, Section 4 licenced areas, and diffuse run off distributed throughout the bay.

The predominant sources of faecal pollution were attributed to the widespread use of domestic septic tank systems and the extensive agricultural activity in the catchment, particularly livestock farming. Seasonal dynamics are expected to significantly influence contaminant loading, with elevated faecal inputs during summer months driven by increased animal stocking densities. Furthermore, extended dry periods followed by rainfall events may exacerbate pollutant runoff through the "first flush" effect.

Hydrodynamic characteristics of the BMPA, as identified through the desk-based review, indicated moderate tidal currents with semi-diurnal cycles and variable flushing times. These tidal dynamics suggest a potential for temporary accumulation of pollutants particularly during neap tides when flushing rates are reduced, enhancing the risk of contamination persistence within the shallow, sheltered areas of the BMPA.

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 following receipt of the desk-based study conducted by Aqualicense. The purpose of this shoreline survey is to confirm the findings of the desk-based study and identify any sources of contamination previously unidentified.

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.

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 two-day period, from 22nd May 2025 (10:30-16:00) to 23rd May 2025 (11:00-14:10). Weather conditions during the survey were dry, with no recorded precipitation on the survey days or in the two days prior.

Table 3-1 and *Figure 3-1* present all observations recorded during the shoreline survey. Photographs for each observation have been provided in *Appendix 2*, 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 Inner Kenmare Bay BMPA in May 2025.

Date	High		Low		ID	Latitude*	Longitude*	Observation	Comment
	Time	Height (m)	Time	Height (m)		(WGS84)	(WGS84)		
22/05/2025	12:45	3.16m	18:50	1.19m	1	51.8500	-9.7453	Sea	Blackwater, freshwater outlet to sea
					2	51.8535	-9.7239	Sea	Blackwater east, small stream entering sea
					3	51.8564	-9.7097	Sea	Dromore, stream entering sea
					4	51.8594	-9.6964	Sea	Dromore, evidence of runoff to sea, very low water
					5	51.8647	-9.6783	Stream	Inner Kenmare Bay, freshwater stream entering sea
					6	51.8655	-9.6752	Sea	Inner Kenmare Bay
					7	51.8660	-9.6663	Outfall	Inner Kenmare Bay, evidence of runoff from pipe
					8	51.8673	-9.6653	Stream	Inner Kenmare Bay. freshwater stream entering sea
					9	51.8683	-9.6628	Stream	Inner Kenmare Bay, freshwater stream entering sea
					10	51.8700	-9.6555	Sea	West Dromquinna, green algae present
					11	51.8706	-9.6414	Sea	East Dromquinna, large freshwater stream to sea
					12	51.8687	-9.6154	Sea	Dunkerron, large freshwater stream to sea
					13	51.8734	-9.5976	Sea	River Finnihy to sea

Date	High		Low		ID	Latitude*	Longitude*	Observation	Comment
	Time	Height (m)	Time	Height (m)		(WGS84)	(WGS84)		
					14	51.8712	-9.5823	Sea	Kenmare bridge north
23/05/2025	1:40	3.38m	19:20	1.02m	15	51.8837	-9.5551	Stream	Killowen, freshwater stream to sea
22/05/2025	12:45	3.16m	18:50	1.19m	16	51.8707	-9.5811	Sea	Kenmare bridge south
23/05/2025	1:40	3.38m	19:20	1.02m	17	51.8678	-9.5936	Stream	Killaha, evidence of runoff, very low water
					18	51.8626	-9.6098	Stream	Killaha East, evidence of runoff to sea, very low water
					19	51.8613	-9.6127	Stream	Killaha East, evidence of small freshwater runoff to sea, very low water
					20	51.8527	-9.6315	Stream	Dawros, freshwater stream entering sea, very low water
					21	51.8448	-9.6452	Stream	Runoff from land by R571 road, very low water
					22	51.8450	-9.6505	Outfall	Adventure centre, evidence of runoff from pipe
					23	51.8420	-9.6690	Sea	Feorus Bridge, freshwater stream entering sea, sample taken at river entrance
					24	51.8422	-9.6808	Stream	Feorus West, freshwater stream outlet, sample taken in very low water
					25	51.8426	-9.6923	Sea	Feoramore, freshwater stream outlet to sea
					26	51.8396	-9.7051	Stream	Lohart freshwater stream, very low water

Date	High		Low		ID	Latitude* (WGS84)	Longitude* (WGS84)	Observation	Comment
	Time	Height (m)	Time	Height (m)					
					27A	51.8390	-9.7080	Stream	Lohart freshwater stream, very low water- outfall pipe noted in the rocky back, strong odour
					27B	51.8393	-9.7069	Stream	Lohart freshwater stream, very low water, large amount of green algal growth
					28	51.8387	-9.7221	Sea	Lohart freshwater stream outlet
					29	51.8358	-9.7271	Sea	Derrynid brackish inlet
					30	51.8340	-9.7350	Sea	Derrynid freshwater stream outlet

**Further comparative table for latitude and longitude is provided in Appendix 2*

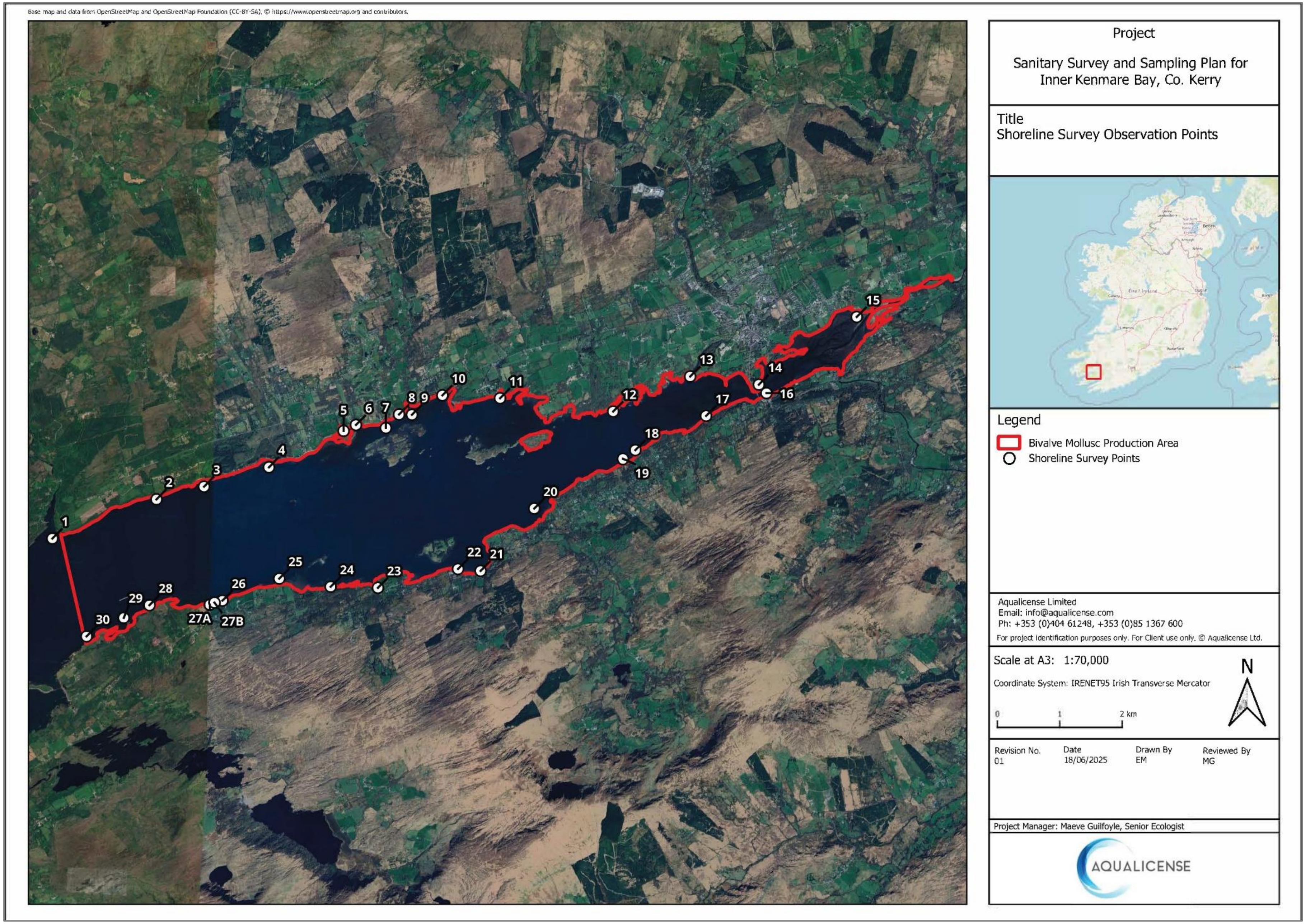


Figure 3-1. Location of observations made during the shoreline survey for Inner Kenmare Bay BMPA in May 2025

A total of 31 observations were recorded during the shoreline survey, each georeferenced and supported by photographic evidence. These included 13 streams located in the surrounding area, 10 locations in which streams and rivers discharge directly into the sea, and two engineered outfalls.

Discharge points around the bay generally corresponded with EPA-mapped rivers *(Figure 2-4).* Inflows were matched to the survey ID locations *(Table 3-2).* Potential evidence of contamination was recorded at ID 10, which is located ~182m from Inflow 24, and at ID_27B which had a green algal pool (near to a previously undocumented outfall pipe ID_27A which also had a strong odour). All areas of freshwater (e.g., run off, rivers) with inputs to the bay identified during the shoreline survey have been mapped and presented in *Figure 3-1.*

Evidence of runoff was observed at three sites (IDs: 7, 21, and 22). These runoff sources were attributed to the R571 regional road and nearby outflow pipes. Notable signs of potential faecal contamination included algae growth Indicators of potential faecal contamination were observed, most notably the presence of green algae growth at 4 locations, with the most pronounced growth at the Inner Kenmare Bay outfall (*Appendix 3*, ID 7 and 22)and a stretch with no mapped rivers or previously mapped outfalls (*Appendix* 3, ID 27B) .

It should be noted that weather conditions were extremely dry during the survey and in the preceding weeks, which may have limited observable contamination signals at the time of sampling. All 31 observations were sampled for bacteriological analysis, the results of which are further detailed 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 Points (RMP).

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

Inflow ID	Survey ID	Latitude (WGS84)	Longitude (WGS84)	Observation	Comment	Bacteriological sample taken (Y/N)
33	1	51.8687	-9.6154	Sea	Blackwater, freshwater outlet to sea	Y
32	2	51.8734	-9.5976	Sea	Blackwater east, small stream entering sea	Y
31	3	51.8712	-9.5823	Sea	Dromore, stream entering sea	Y
30	4	51.8837	-9.5551	Sea	Dromore, evidence of runoff to sea, very low water	Y
29	5	51.8707	-9.5811	Stream	Inner Kenmare Bay, freshwater stream entering sea	Y
28	6	51.8678	-9.5936	Sea	Inner Kenmare Bay	Y

Inflow ID	Survey ID	Latitude (WGS84)	Longitude (WGS84)	Observation	Comment	Bacteriological sample taken (Y/N)
27	7	51.8626	-9.6098	Outfall	Inner Kenmare Bay, evidence of runoff from pipe	Y
26	8	51.8613	-9.6127	Stream	Inner Kenmare Bay. freshwater stream entering sea	Y
25	9	51.8527	-9.6315	Stream	Inner Kenmare Bay, freshwater stream entering sea	Y
24	10	51.8448	-9.6452	Sea	West Dromquinna, green algae present	Y
23	11	51.8450	-9.6505	Sea	East Dromquinna, large freshwater stream to sea	Y
22	12	51.8420	-9.6690	Sea	Dunkerron, large freshwater stream to sea	Y
21	13	51.8422	-9.6808	Sea	River Finnihy to sea	Y
N/A*	14	51.8426	-9.6923	Sea	Kenmare bridge north	Y
19	15	51.8396	-9.7051	Stream	Killowen, freshwater stream to sea	Y
15	16	51.8390	-9.7080	Sea	Kenmare bridge south	Y
14	17	51.8393	-9.7069	Stream	Killaha, evidence of runoff, very low water	Y
13	18	51.8387	-9.7221	Stream	Killaha East, evidence of runoff to sea, very low water	Y
12	19	51.8358	-9.7271	Stream	Killaha East, evidence of small freshwater runoff to sea, very low water	Y
11	20	51.8340	-9.7350	Stream	Dawros, freshwater stream entering sea, very low water	Y
10	21	51.8687	-9.6154	Stream	Runoff from land by R571 road, very low water	Y

Inflow ID	Survey ID	Latitude (WGS84)	Longitude (WGS84)	Observation	Comment	Bacteriological sample taken (Y/N)
9	22	51.8734	-9.5976	Outfall	Adventure centre, evidence of runoff from pipe	Y
8	23	51.8712	-9.5823	Sea	Feorus Bridge, freshwater stream entering sea, sample taken at river entrance	Y
7	24	51.8837	-9.5551	Stream	Feorus West, freshwater stream outlet, sample taken in very low water	Y
6	25	51.8707	-9.5811	Sea	Feoramore, freshwater stream outlet to sea	Y
5	26	51.8678	-9.5936	Stream	Lohart freshwater stream, very low water	Y
4	27A	51.8626	-9.6098	Stream	Lohart freshwater stream, very low water- outfall pipe noted in the rocky back, strong odour	Y
4	27B	51.8613	-9.6127	Stream	Lohart freshwater stream, very low water, large amount of green algal growth	Y
3	28	51.8527	-9.6315	Sea	Lohart freshwater stream outlet	Y
32	29	51.8448	-9.6452	Sea	Derrynid brackish inlet	Y
1	30	51.8450	-9.6505	Sea	Derrynid freshwater stream outlet	Y

* Sample ID 14 was taken at the Kenmare bridge and therefore does not have a specific corresponding inflow

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 10 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 31 water samples were obtained at areas where faecal contamination was suspected. Samples were obtained at low tide in dry conditions. While it is recommended within the COP to obtain samples under worst-case environmental conditions, samples were obtained during dry weather conditions for logistical reasons. Sampling results are presented in *Table 4-1 (Figure 4-1).*

Table 4-1. Results of water sampling for E. coli in Inner Kenmare Bay BMPA. ID corresponds with observations from the shoreline survey.

Water Sample	Observation (ID)	MPN/100ml*	Date	Latitude (WGS84)	Longitude (WGS84)
1	1	<10	22/05/2025	51.8687	-9.6154
2	2	<10	22/05/2025	51.8734	-9.5976
3	3	<10	22/05/2025	51.8712	-9.5823
4	4	51	22/05/2025	51.8837	-9.5551
5	5	<10	22/05/2025	51.8707	-9.5811
6	6	<10	22/05/2025	51.8678	-9.5936
7	7	<10	22/05/2025	51.8626	-9.6098
8	8	504	22/05/2025	51.8613	-9.6127
9	9	31	22/05/2025	51.8527	-9.6315
10	10	<10	22/05/2025	51.8448	-9.6452
11	11	10	22/05/2025	51.8450	-9.6505
12	12	<10	22/05/2025	51.8420	-9.6690
13	13	<10	22/05/2025	51.8422	-9.6808
14	14	<10	22/05/2025	51.8426	-9.6923

Water Sample	Observation (ID)	MPN/100mL*	Date	Latitude (WGS84)	Longitude (WGS84)
15	15	1236	23/05/2025	51.8396	-9.7051
16	16	<10	22/05/2025	51.8390	-9.7080
17	17	97	23/05/2025	51.8393	-9.7069
18	18	8297	23/05/2025	51.8387	-9.7221
19	19	41	23/05/2025	51.8358	-9.7271
20	20	213	23/05/2025	51.8340	-9.7350
21	21	<10	23/05/2025	51.8687	-9.6154
22	22	6405	23/05/2025	51.8734	-9.5976
23	23	<10	23/05/2025	51.8712	-9.5823
24	24	134	23/05/2025	51.8837	-9.5551
25	25	<10	23/05/2025	51.8707	-9.5811
26	26	6294	23/05/2025	51.8678	-9.5936
27	27A	>24,196	23/05/2025	51.8626	-9.6098
28	27B	556	23/05/2025	51.8613	-9.6127
29	28	<10	23/05/2025	51.8527	-9.6315
30	29	<10	23/05/2025	51.8448	-9.6452
31	30	<10	23/05/2025	51.8450	-9.6505

*Most Probably Number of *E. coli* per 100 millilitres of a sample. See appendix 4 for comparative location data

The bacteriological water sampling results indicate varying levels of contamination across the BMPA. Specifically, 18 of the 31 sampled locations recorded low levels of *E. coli*, with an MPN/100mL of ≤10, indicating minimal faecal contamination. These locations include streams and runoff from the Blackwater (Samples 1 and 2), Kenmare bridge (Sample 14), Derrynid (Samples 29 and 30), as well as additional minor streams and runoff areas (Samples 5 and 21), suggesting limited faecal input during the survey period.

However, elevated *E. coli* concentrations were identified at several locations notably at Station 22 (the Star Fish processing plant outfall) showed 6405 MPN/100mL and Sample 26 at the Lohart freshwater stream, recorded 6294 MPN/100mL likely reflecting contamination from nearby agricultural activity, particularly sheep farming which is prevalent in the Dawros Electoral Division *(Table 2-5).*

Sample 18, which represents an area of freshwater runoff to the sea in Killaha East, recorded 8297 MPN/100mL potentially influenced by its proximity to a Section 4 water discharge site *(Section 2.6.2.2, Figure 2-12)*, adjacent to licenced bivalve aquaculture site (T06-388A), which had notably low water levels, potentially exacerbating contamination concentration for the site.

The highest contamination levels (> 24,196 MPN/100mL) were observed at Station 27 (Sample 27A), another within the aforementioned Dawros ED. This source was potentially from a previously unmapped drainage pipe *(Appendix 3*, fig 27a), strongly suggesting substantial agricultural derived faecal contamination. This was an additional drain that the survey team noted during the site visit. Although sampling occurred under dry conditions, preceding dry weather followed by intermittent rainfall events could have mobilised contaminants, thereby increasing the measured *E. coli* concentrations. 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 discharge, outfalls, and localised land-based sources such as land 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.

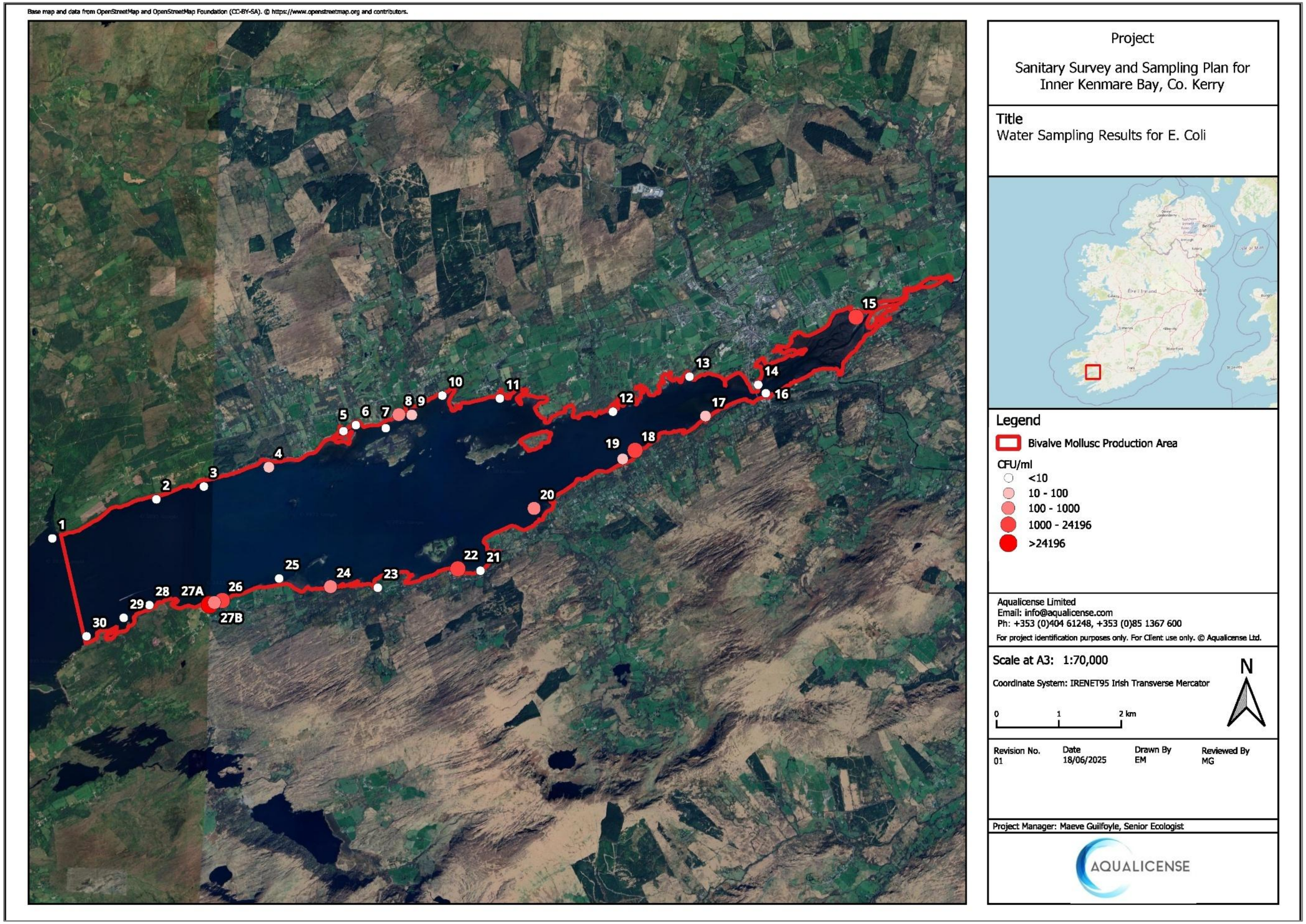


Figure 4-1 – Water Sampling Results for E. Coli

5 SANITARY SURVEY CONCLUSIONS

The sanitary survey findings were synthesised through the integration of the three primary data sources: a desk-based study which utilised the S-P-R model, the shoreline survey, and bacteriological analysis. Each component contributed distinct and complementary information toward the overall assessment.

The desk-based study identified three primary sources of potential sewage related faecal contamination: urban wastewater treatment plants (particularly Kenmare UWWTP), septic tanks concentrated around Kenmare and Kilgarvan, and licensed Section 4 wastewater discharge sites, notably the Star Fish processing factory and the Quarry outfall. These preliminary conclusions were substantiated by field-based shoreline surveys and bacteriological sampling, both of which confirmed the presence of faecal contamination at identified discharge points and freshwater inflows. In addition to this a previously unmapped discharge point was sampled at station 27a (outfall pipe in rocky bank), where there was an unmapped outfall pipe downstream of any of the aquaculture sites. This sampling location yielded the highest E.coli results for the survey area *(Table 3-1).*

Diffuse pollution from agricultural activities, predominantly intensive sheep farming in the Dawros, Glanlee and Banawn Eds, represents a significant ongoing contamination risk. Sampling was undertaken during a neap tide period and under prolonged dry conditions without significant rainfall in the previous five days, elevated *E. coli* levels were detected in areas associated with agricultural runoff. The combination of the neap tide (longer period needed for the flushing of the bay) and low rainfall, indicates a persistent background contamination potentially due to livestock proximity and faecal accumulation rather than recent rainfall induced runoff.

Hydrodynamic considerations indicate that contaminant dispersion within Inner Kenmare Bay BMPA is primarily governed by semi-diurnal tidal cycles, characterised by moderate-strength ebb currents and weaker inflowing tides, resulting in flushing times between two and five days. Consequently, contaminants entering during low- flow periods or dry conditions can persist, especially in sheltered intertidal and shallow embayment areas.

Areas exhibiting the highest *E. coli* concentrations in both the desk-based assessment and field survey results include the Lohart freshwater stream (>24, 196 MPN/100mL at Station 27A), Killaha East runoff (8297 MPN/100mL, Station 18), and the newly mapped outfall (6405 MPN/100mL, Station 22). These locations represent the areas of greatest risk for shellfish contamination within the BMPA, though it should be noted that (with the exception of 18) these locations are downstream of all of the current aquaculture sites.

6 Amended Bivalve Mollusc Production Area (BMPA)

The Upper Kenmare River and Inner Kenmare Bay BMPA currently extends to the mouth of the River Roughty: to the innermost edge of the mouth of the River Blackwater. The boundary of this BMPA corresponds with the Marine Institutes monitored Harmful Algal Blooms (HABs) Inshore shellfish production area.

Considering the contributing catchment (in particular the main River Roughty), demonstrated hydrodynamic connectivity, restricted accessibility to the area in general beyond the main bridge, use of the area by local sailing and rowing clubs, it is recommended that upper reaches of the Inner Kenmare Bay BMPA be reduced *(Table 6-1).* This refined approach will better reflect the catchment and provide a more coherent basis for managing contamination risks (*see Figure 6-1*).

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).*

The refined BMPA extends from the mouth of the River Finnihy extending across the bay (south) to the Killaha East/Dawros side and extends to the Kerry Blackwater River estuary *(Table 6-1) (Figure 6-1).*

*Table 6-1**:** The coordinates of the Inner Kenmare Bay BMPA in Bay Latitude and longitude values Decimal and Degree, Minutes Seconds (DMS) are in coordinate reference system (CRS) WGS84, easting and northing values are in CRS Irish Transverse Mercator*

Corner	Latitude (WGS 84) (Decimal)	Longitude (WGS 84) (Decimal)	Latitude (WGS 84) (DMS)	Longitude (WGS 84) (DMS)	Easting (ITM)	Northing (ITM)
Finnihy River North	51.87363132	-9.597916933	51°52′25.07″	-9°35′52.50″	489972.7	570256.8
Finnihy River South	51.86739304	-9.592789101	51°52′2.61″	-9°35′34.04″	490310.6	569555.1
Blackwater North	51.84903811	-9.744086686	51°50′56.54″	-9°44′38.71″	479843.1	567752.2
Blackwater South	51.82926401	-9.741801028	51°49′45.35″	-9°44′30.48″	479948.0	565548.9

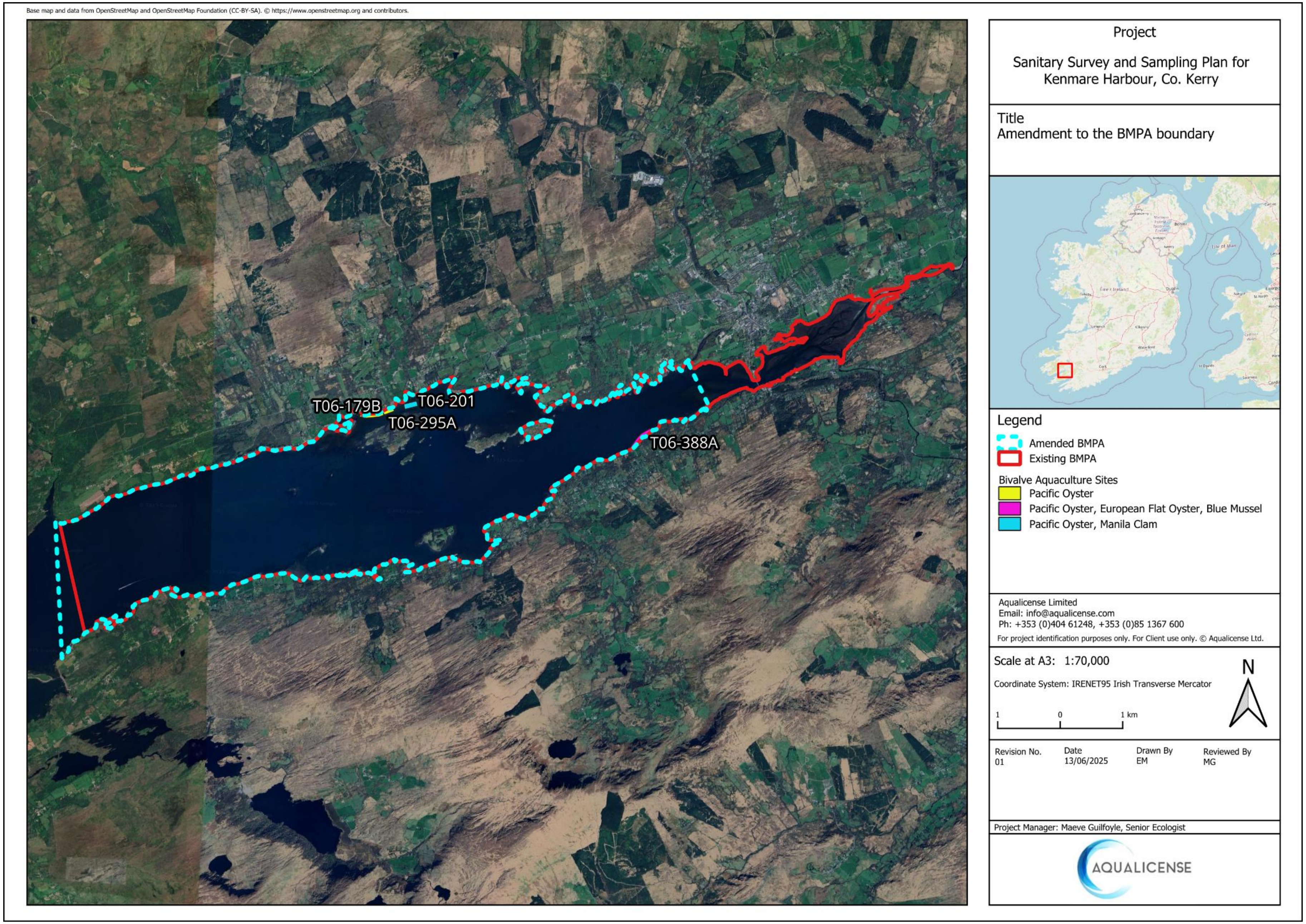


Figure 6-1 Amendments to the BMPA Boundary

7 SAMPLING PLAN FOR PACIFIC OYSTERS

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 POINT (PACIFIC OYSTERS)

The recommended RMP is located at WGS_84 coordinates 51.86509N, -9.67112W (51°51"54.3'N, 9°40"16.0'W), within the licensed site T06-179B *(Figure 7-1).*

Based on the findings of the desk based current pattern analysis *(Section 2.4.3.4, Figure 2-7),* S-P-R outcome *(Table 2-8)* sanitary survey and bacteriological results, summarised in *Section 1*, site T06-179B is identified as the most representative sampling location. Considering the size of the BMPA, prevailing circulation patters, a single Representative Monitoring Point (RMP) is recommended.

This location is likely to be influenced by contamination from the Rossacoosane_010 river subbasin and related unnamed rivers including inflows 25 and 26 (sample station 8) which was highlighted as an inflow of concern for sewage. Its proximity to the coast further ensures its suitability as the most representative location for the Pacific Oyster RMP.

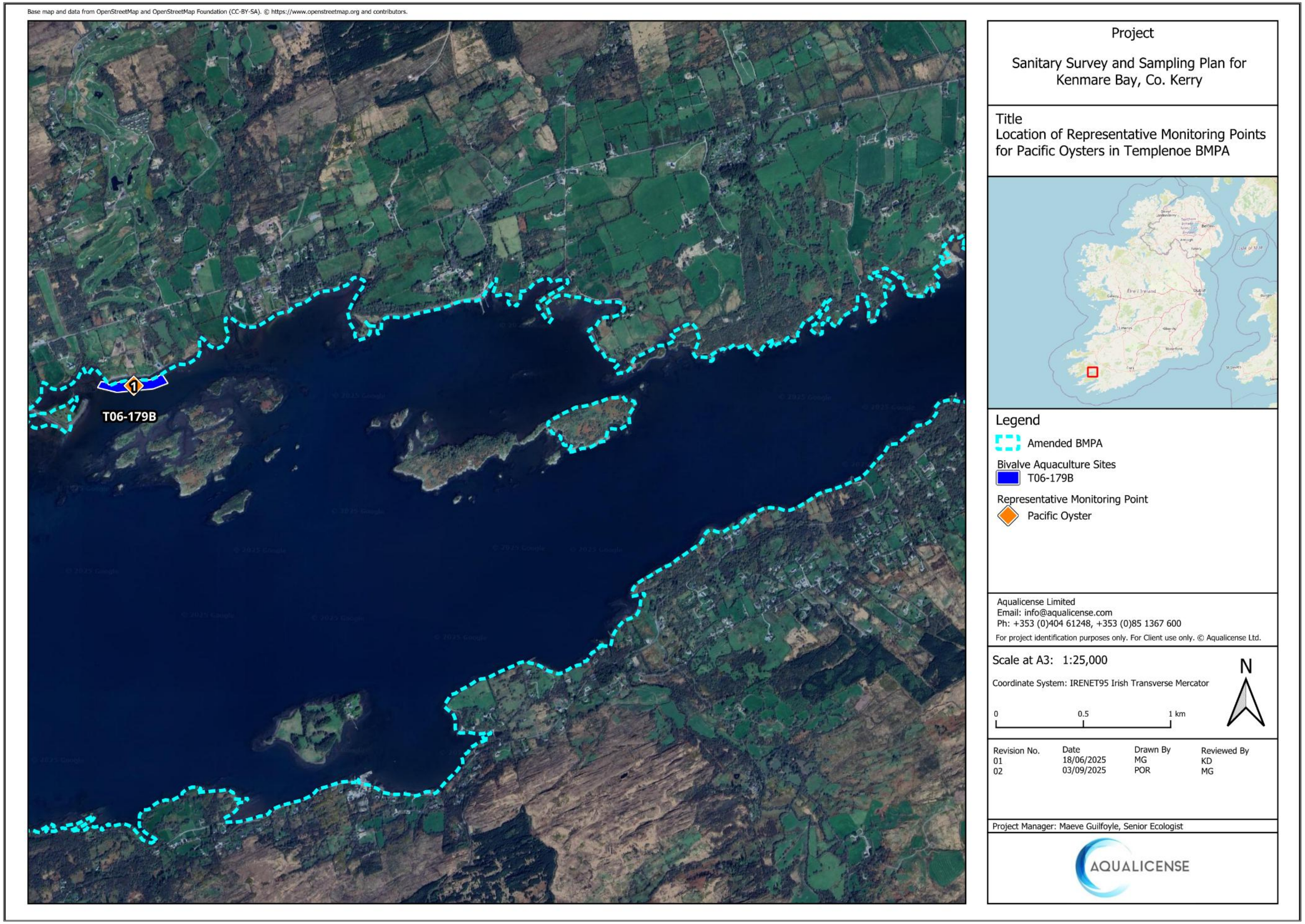


Figure 7-1. Location RMP for Pacific Oysters in Inner Kenmare Bay BMPA.

7.2 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). Key features of the plan are detailed in *Table 7-1:*

Table 7-1. Sampling Plan for Pacific Oysters

Species	*Magallana gigas*
Site Name	Inner Kenmare Bay BMPA
Sample Point Identifier	KY-KI-TE-PO
Geographical location of sampling point (RMP)	51.86509N, -9.67112W (51°51"54.3'N, 9°40"16.0'W)
Sampling Frequency	Samples shall be taken monthly upon classification of Inner Kenmare Bay 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 oysters of market size
Authorised Samplers	It is the responsibility of the SFPA Dingle Port Office 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.

8 SAMPLING PLAN FOR CURRENTLY LICENCED SPECIES (IN THE EVENT OF FUTURE PRODUCTION)

8.1 REPRESENTATIVE MONITORING POINT- BLUE MUSSELS

In the event that commercial production starts an RMP is recommended at ITM coordinates 51.86577N, -9.66739W (51°51"56.7'N, 9°40"2.60'W) within the central portion of licensed site T06-295A *(Figure 8-1)*. Mussel harvesting in the area is contingent upon the availability of stock. In the absence of mussel production, the RMP will remain inactive until harvesting activities resumes.

Based on the findings of the desk based current pattern analysis *(Section 2.5, Figure 2-6),* S-P-R outcome *(Table 2-8)* and sanitary survey, summarised in *Section 1* site T06-295A is identified as the most representative sampling location. Considering the size of the BMPA, prevailing circulation patterns a single Representative Monitoring Point (RMP) is recommended.

While a specific RMP have been identified for site T06 295A, it is recognised that, due to the unpredictable nature of seed mussel supply, intermittent growth at this site, sample 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.

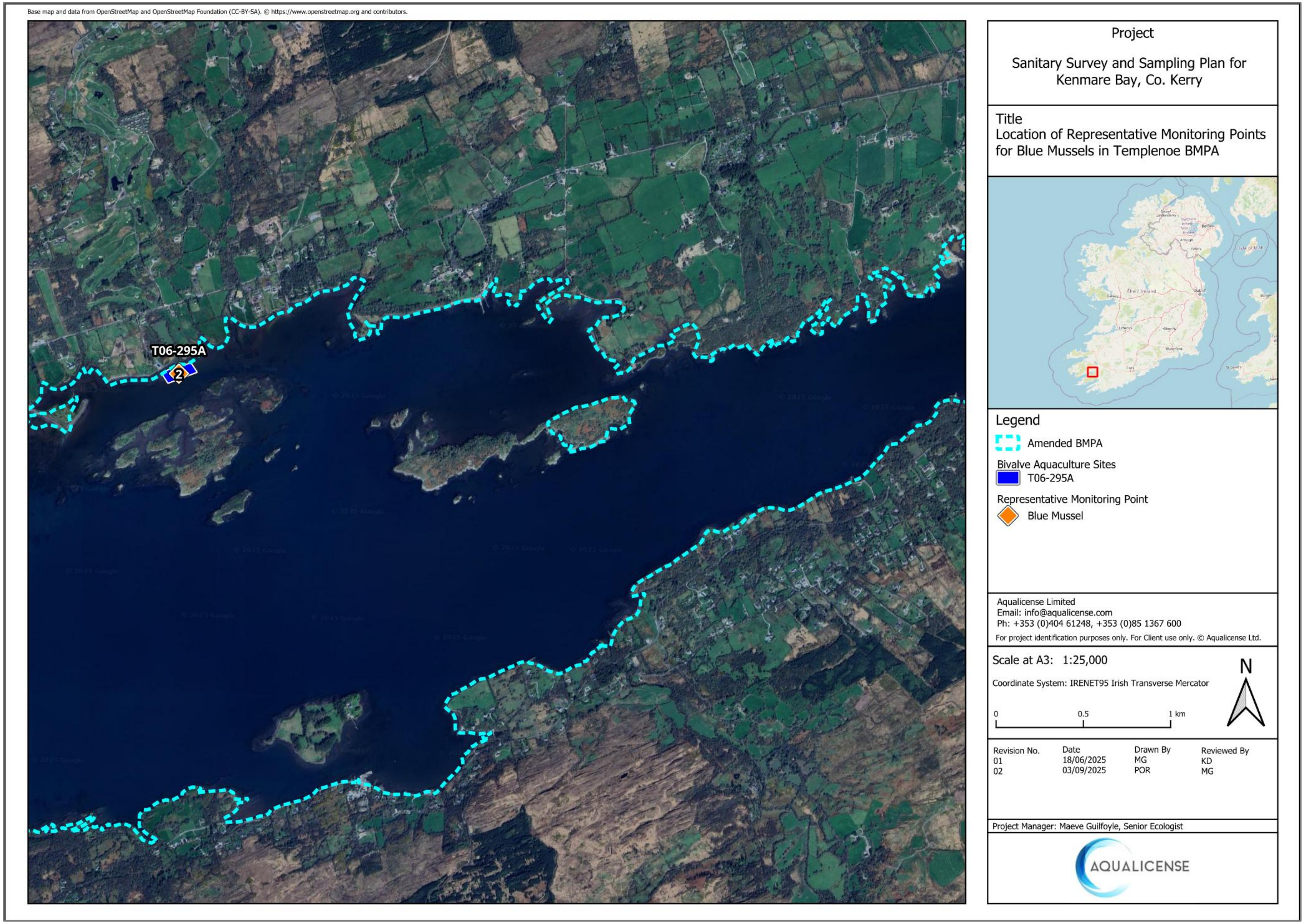


Figure 8-1. Location RMP for Blue Mussels in Inner Kenmare Bay BMPA.

8.2 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 are detailed in *Table 8-1 :*

Table 8-1. Sampling Plan for Blue Mussels

Species	Mytilus edulis
Site Name	Inner Kenmare Bay BMPA
Sample Point Identifier	KY-KI-TE-MU
Geographical location of sampling point (RMP)	51.86577N, -9.66739W (51°51"56.7'N, 9°40"2.60'W)
Sampling Frequency	Samples shall be taken monthly upon classification of Inner Kenmare Bay 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 15 mussels of market size (minimum length of 4 cm).
Authorised Samplers	It is the responsibility of the SFPA Dingle Port Office 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.

8.3 REPRESENTATIVE MONITORING POINT- MANILA CLAM

In the event that commercial production starts an RMP is recommended at ITM coordinates 51.86669N, -9.66219W (51°52"0.09'N, 9°39"43.8'W), within the central portion of licensed site T06-201 (*Figure 8-2*). Manila clam harvesting in the area is contingent upon the availability of stock. In the absence of Manila Clam production, the RMP will remain inactive until harvesting activities begin.

Based on the findings of the desk based current pattern analysis *(Section 2.5, Figure 2-6),* S-P-R outcome *(Table 2-8)* and sanitary survey, summarised in Section 5 site T06-201 is identified as the most representative sampling location. Considering the size of the BMPA, prevailing circulation patterns a single Representative Monitoring Point (RMP) is recommended.

While a specific RMP have been identified for site T06-201, it is recognised that, due to the unpredictable nature of Manila clam supply, intermittent growth at this site, sample 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.

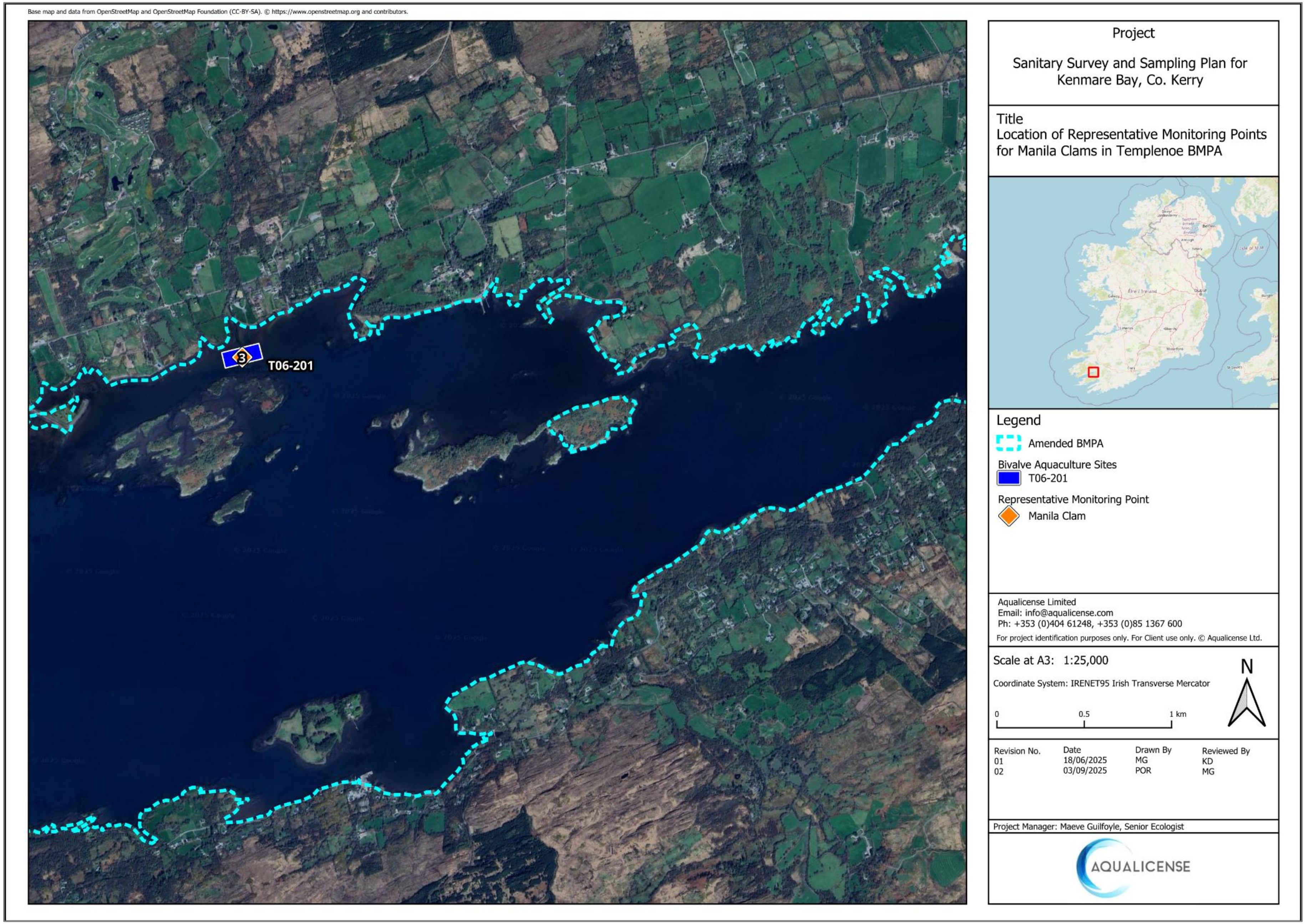


Figure 8-2. Location of inactive RMP for Manila Clam in Inner Kenmare Bay BMPA

8.4 Sampling Plan for Manila Clam

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 are detailed in *Table 8-2* :

Table 8-2. Sampling Plan for Manila Clam

Species	*Ruditapes philippinarum*
Site Name	Inner Kenmare Bay BMPA
Sample Point Identifier	KY-KI-TE-CM
Geographical location of sampling point (RMP)	51.86669N, -9.66219W (51°52"0.09'N, 9°39"43.8'W)
Sampling Frequency	Samples shall be taken monthly upon classification of Inner Kenmare Bay 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 15 clams of market size
Authorised Samplers	It is the responsibility of the SFPA Dingle Port Office 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

8.5 Representative Monitoring Point - Native Oysters

In the event that commercial production starts an RMP is recommended at ITM coordinates: 51.86255N, -9.609379W (51°51"45.1'N, 9°36"33.7'W), within the central portion of licensed site T06-388A *(Figure 8-3)*. Native Oyster harvesting in the area is contingent upon the availability of stock. In the absence of Native Oyster production, the RMP will remain inactive until harvesting activities begin.

Based on the findings of the desk based current pattern analysis *(Section 2.5, Figure 2-6),* S-P-R outcome *(Table 2-8)* and sanitary survey, summarised in Section 5 site T06-388A is identified as the most representative sampling location. Considering the size of the BMPA, prevailing circulation patterns a single Representative Monitoring Point (RMP) is recommended.

While a specific RMP have been identified for site T06-388A, it is recognised that, due to the intermittent growth at this site, sample 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.

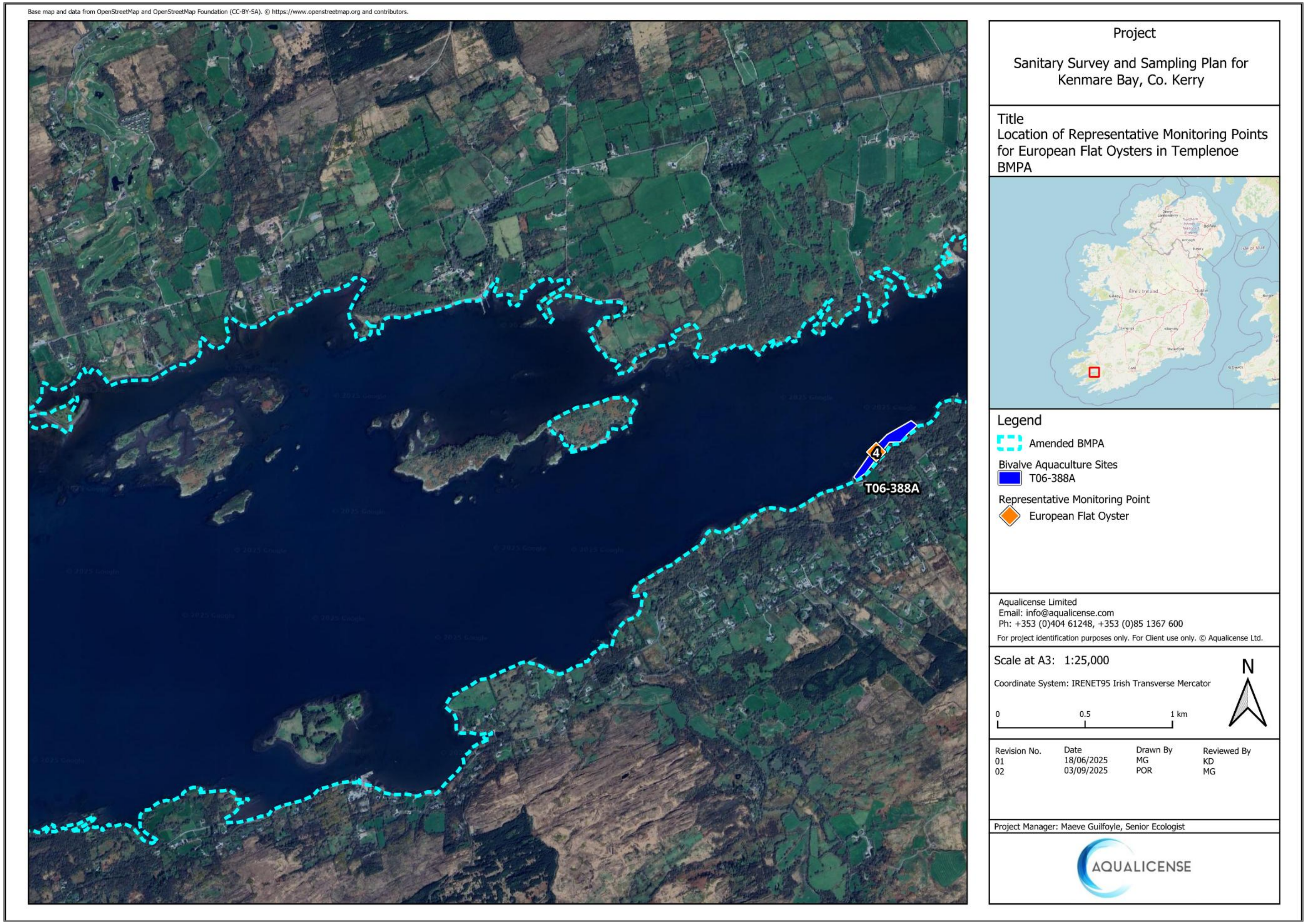


Figure 8-3. Location of inactive RMP for Native Oyster in Inner Kenmare Bay BMPA

8.6 Sampling Plan - Native Oysters

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 are detailed in *Table 8-2.*

Table 8-3. Sampling Plan for Native Oysters

Species	*Ostrea edulis*
Site Name	Inner Kenmare Bay BMPA
Sample Point Identifier	KY-KI-TE-NO
Geographical location of sampling point (RMP)	51.86255N, -9.609379W (51°51"45.1'N, 9°36"33.7'W)
Sampling Frequency	Samples shall be taken monthly upon classification of Inner Kenmare Bay 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 oysters of market size
Authorised Samplers	It is the responsibility of the SFPA Castletownbere Port Office 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 Inner Kenmare Bay.

These findings informed the delineation of the Bivalve Mollusc Production Area (BMPA), identification of a Representative Monitoring Points (RMPs), and the development of a microbiological sampling plan.

The outputs of the survey are as follows:

- A geographically defined BMPA boundary of approximately 19.54 km².
- To capture the dominant contamination pressures four (1 active, 3 inactive) RMPs have been created located at the following:
  - Active 1 (51.86509N, -9.67112W (51°51"54.3'N, 9°40"16.0'W)),
  - Inactive 2 (51.86577N, -9.66739W (51°51"56.7'N, 9°40"2.60'W)),
  - Inactive 3 51.86669N, -9.66219W (51°52"0.09'N, 9°39"43.8'W),
  - Inactive 4 (51.86255N, -9.609379W (51°51"45.1'N, 9°36"33.7'W)
- A species-specific sampling plan for, Pacific Oyster (*Magallana gigas), Blue mussel (Mytilus edulis)*, Manilla clam (*Ruditapes philippinarum)* and European flat oyster (*Ostrea edulis)* in line with SFPA and EU regulatory requirements.

These components provide the scientific basis for the classification and ongoing monitoring of Inner Kenmare Bay BMPA as a shellfish production area.

10 References

Alderisio, K.A. and Deluca, N. (1999) *Seasonal Enumeration of Fecal Coliform Bacteria from the Feces 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 fecal contamination in marine recreational water', *Environmental Research*, 190. Available at: *https://doi.org/10.1016/j.envres.2020.109982*.

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: 21 May 2025).

Corine (2018) 'Corine Landcover 2018 - National (ITM)'. Available at: *https://gis.epa.ie/GetData/Download* (Accessed: 21 May 2025).

CSO (2020) 'Census of Agriculture'. Available at: *https://data.cso.ie/product/COA* (Accessed: 21 May 2025).

CSO (2023a) 'Occupancy Status of Permanent Dwellings on Census Night: SAP2022T6T8SA'. Available at: *https://data.cso.ie/table/SAP2022T6T8SA* (Accessed: 21 May 2025).

CSO (2023b) 'Population Density and Area Size'. Available at: *https://data.cso.ie/table/F1011* (Accessed: 21 May 2025).

CSO (2023c) 'SAPMAP 2022/Theme 6: Housing/Permanent Private Households'. Available at: *https://data.cso.ie/table/SAP2022T6T7SA* (Accessed: 21 May 2025).

Department of Housing, Local Government and Heritage (2024) *EIA Portal*. *https://housinggovie.maps.arcgis.com/apps/webappviewer/index.html?id=d7d5a3d48f104ecbb206e7e5f84b71f1* (Accessed 21 May 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.

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: 21 May 2025).

EPA (2022) 'Data Download: Catchments Data Package - June 2022'. Available at: *https://gis.epa.ie/GetData/Download* (Accessed: 21 May 2025).

EPA (2023) *Data Download: WFD Status Geodatabase (All Waterbodies) 2016-2021 - May 2023*. Available at: *https://gis.epa.ie/GetData/Download* (Accessed: 21 May 2025).

EPA (2024a) *EPA Licensed Facilities (IPC, IEL and Waste) - 13/09/2024*. Available at: *https://gis.epa.ie/GetData/Download* (Accessed: 21 May 2025).

EPA (2024b) 'WFD Section 4 Discharges - 19/11/2024'. Available at: https://gis.epa.ie/GetData/Download (Accessed: 21 May 2025).

EPA (2024c). Environmental Protection Agency Hydrometric Data Portal: Station Data for Roughty River at Dromagorteen Bridge and Sheen River at Sheen Falls. EPA Ireland. Available online: https://gis.epa.ie/EPAMaps/Water [Accessed: May 2024].

EPA (2025a) 'catchments.ie'. Available at: https://www.catchments.ie/ (Accessed: 21 May 2025).

EPA (2025b) 'EPA Licensed UWWT Plants and 2018 Status - 20/02/2020'. Available at: https://gis.epa.ie/GetData/Download (Accessed: 21 May 2025).

European Union (Good Agricultural Practice for Protection of Waters) Regulations 2022. Available at: https://www.irishstatutebook.ie/eli/2022/si/113/made/en/print (Accessed: 21 May 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: 21 May 2025).

FSAI (2013) 'Risk Management of Norovirus in Oysters'. Available at: https://www.fsai.ie/getmedia/0780ad8e-a014-4c59-a408-189e1bd6e676/norovirus-opinion-paper-2013-final.pdf?ext=.pdf (Accessed 13 June 2025).

Godino Sanchez, A. *et al.* (2024) 'Grey and harbor 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: 21 May 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: 21 May 2025).

GSI (2023) 'IE GSI Aquifers Ireland (ROI) ITM'. Available at: https://dcenr.maps.arcgis.com/home/item.html?id=3dc543ff975941118c56263bd0e03d03 (Accessed: 21 May 2025).

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.

MaREI (2016a) *Ferry Port*. Available at: https://data.gov.ie/dataset/ferry-port (Accessed: 21 May 2025).

MaREI (2016b) *Fishing Port*. Available at: https://data.gov.ie/dataset/fishing-port (Accessed: 21 May 2025).

Marine Institute (2010) ‘Commercial Port’. Available at: https://data.gov.ie/dataset/commercial-port (Accessed: 21 May 2025).

Marine Institute (2024). Irish Operational Hydrodynamic Model: Kenmare Bay and South-West Coast (120 m ROMS Grid). Marine Institute, Galway, Ireland. Available online: https://www.marine.ie/Home/site-area/data-services/marine-forecasts/hydrodynamic-models [Accessed: 26 May 2024].

Marine Institute (2025) ‘Irelands Marine Atlas’. Available at: https://atlas.marine.ie/#?c=53.9108:-15.9192:6 (Accessed: 21 May 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) *SynopticWeatherStation Daily Data*. Available at: DailyDataURL (Accessed: 23 May 2025).

Met Éireann (2025b) *SynopticWeatherStation Monthly Data*. Available at: MonthlyDataURL (Accessed: 23 May 2025).

NPWS (2025) ‘Protected Sites in Ireland’. Available at: https://www.npws.ie/protected-sites (Accessed: 21 May 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.

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

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: 6 February 2025).

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

UK Hydrographic Office (2025) Admiralty Chart 2495.

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

Appendix 1 SUMMARY STATISTICS FOR WEATHER

Appendix 1A. Summary statistics for wind derived from Valentia observatory weather station (May 2015 to April inclusive 2025)

DIRECTION	FREQUENCY (%)	MAX. MEAN WIND SPEED (M/S)	MEAN WIND SPEED (M/S)
W	25.2	15.8	5.1
S	20.4	12.1	5.2
SW	14.7	14.5	5.7
NW	10.4	11.9	4.1
E	8.9	10	4
SE	8.6	10	4.8
N	8	9.8	4.4
NE	3.7	8.5	3.3

Appendix 1B. Summary statistics for daily rainfall derived from Valentia observatory weather station (May 2015 to April inclusive 2025)

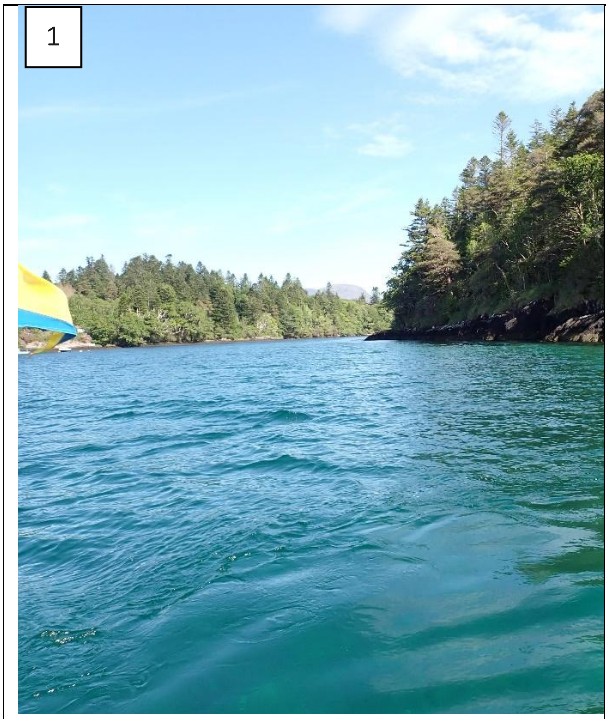
MONTH	MAX. DAILY RAIN (MM)	MEAN DAILY RAIN (MM)	MEDIAN DAILY RAIN (MM)
Oct	105.5	6.34	2.45
Aug	74	4.35	1.45
Sep	55.4	4.99	1.45
Jul	54.5	3.28	1.1
Apr	46.2	3.08	0.4
Nov	45.2	6.07	3.2
Feb	43.6	5.85	3.8
Jun	41.6	3.21	0.7
Dec	39.3	6.78	5
Jan	38.8	5.58	2.75
Mar	34.3	4.37	2.2
May	29.4	2.78	0.55

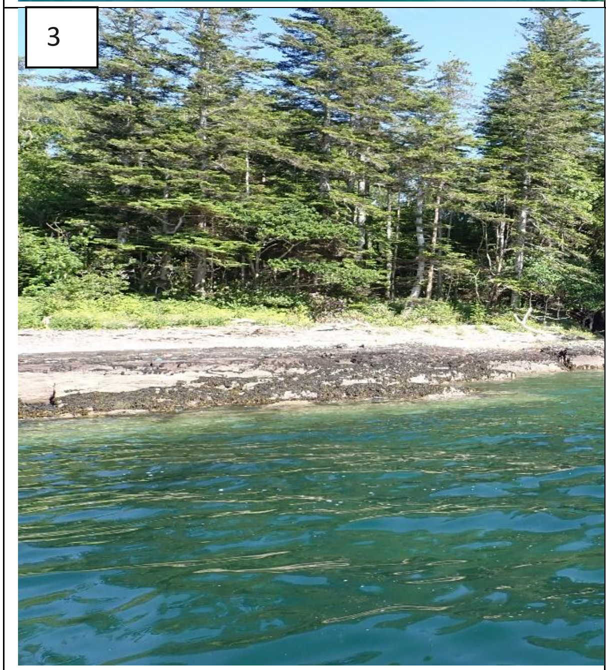
Appendix 2 COMPARATIVE COORDINATES

Appendix 2A Comparative Coordinates for Survey Locations

ID	EASTING (ITM)	NORTHING (ITM)	LATITUDE (WGS 84) (DECIMAL)	LONGITUDE (WGS 84) (DECIMAL)	LATITUDE (WGS 84) (DMS)	LONGITUDE (WGS 84) (DMS)
1	479760	567861	51.8500	-9.7453	51°50′59.9" N	9°44′43.2" W
2	481245	568214	51.8535	-9.7239	51°51′12.5" N	9°43′26.0" W
3	482230	568519	51.8564	-9.7097	51°51′23.1" N	9°42′34.9" W
4	483156	568831	51.8594	-9.6964	51°51′33.9" N	9°41′46.9" W
5	484413	569389	51.8647	-9.6783	51°51′52.9" N	9°40′42.0" W
6	484629	569468	51.8655	-9.6752	51°51′55.6" N	9°40′30.8" W
7	485246	569514	51.8660	-9.6663	51°51′57.6" N	9°39′58.6" W
8	485317	569653	51.8673	-9.6653	51°52′2.18" N	9°39′55.0" W
9	485492	569760	51.8683	-9.6628	51°52′5.75" N	9°39′46.0" W
10	486000	569938	51.8700	-9.6555	51°52′11.8" N	9°39′19.7" W
11	486969	569991	51.8706	-9.6414	51°52′14.3" N	9°38′29.1" W
12	488759	569740	51.8687	-9.6154	51°52′7.48" N	9°36′55.3" W
13	489995	570235	51.8734	-9.5976	51°52′24.3" N	9°35′51.2" W
14	491041	569960	51.8712	-9.5823	51°52′16.2" N	9°34′56.3" W
15	492948	571308	51.8837	-9.5551	51°53′1.18" N	9°33′18.1" W
16	491123	569905	51.8707	-9.5811	51°52′14.4" N	9°34′52.0" W
17	490255	569600	51.8678	-9.5936	51°52′4.02" N	9°35′37.0" W
18	489126	569051	51.8626	-9.6098	51°51′45.4" N	9°36′35.3" W
19	488927	568911	51.8613	-9.6127	51°51′40.8" N	9°36′45.5" W
20	487612	567980	51.8527	-9.6315	51°51′9.74" N	9°37′53.2" W
21	486644	567120	51.8448	-9.6452	51°50′41.2" N	9°38′42.7" W
22	486282	567150	51.8450	-9.6505	51°50′41.9" N	9°39′1.68" W
23	484998	566848	51.8420	-9.6690	51°50′31.2" N	9°40′8.40" W
24	484186	566885	51.8422	-9.6808	51°50′31.7" N	9°40′50.8" W
25	483391	566951	51.8426	-9.6923	51°50′33.3" N	9°41′32.4" W
26	482505	566643	51.8396	-9.7051	51°50′22.6" N	9°42′18.3" W
27A	482303	566577	51.8390	-9.7080	51°50′20.4" N	9°42′28.8" W
27B	482377	566611	51.8393	-9.7069	51°50′21.5" N	9°42′24.9" W
28	481334	566569	51.8387	-9.7221	51°50′19.4" N	9°43′19.4" W
29	480977	566255	51.8358	-9.7271	51°50′8.99" N	9°43′37.6" W
30	480429	566062	51.8340	-9.7350	51°50′2.33" N	9°44′6.02" W

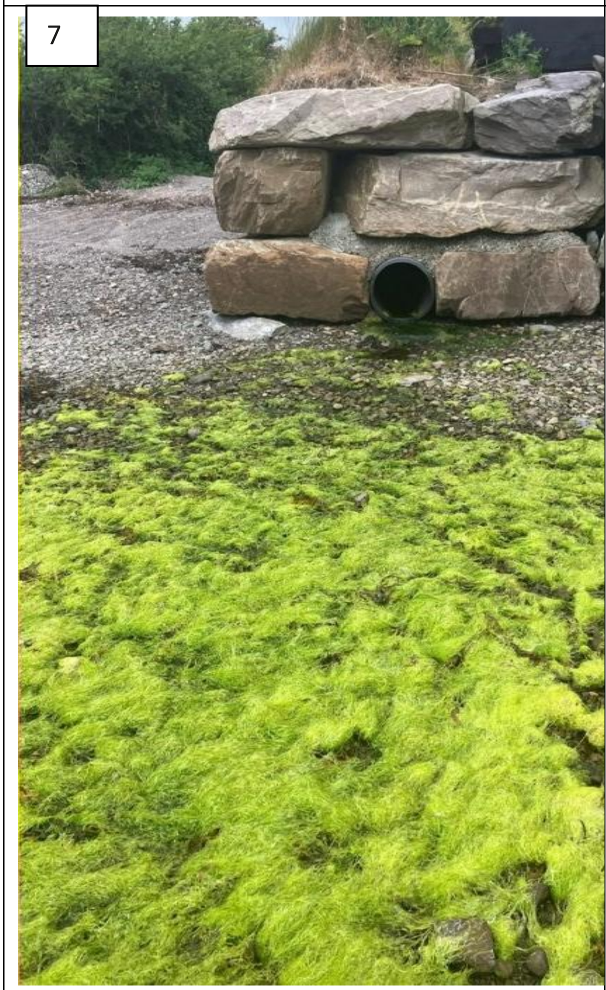
Appendix 3 SHORELINE SURVEY PHOTOGRAPHS






5


6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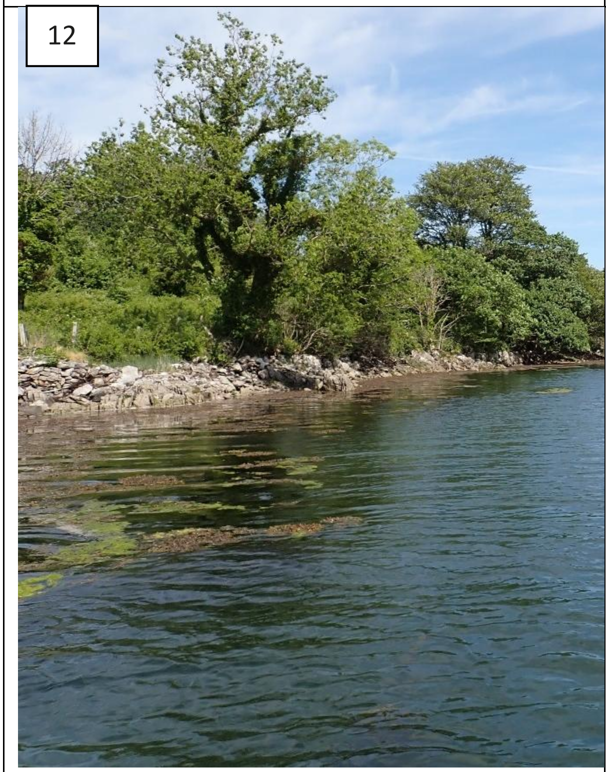

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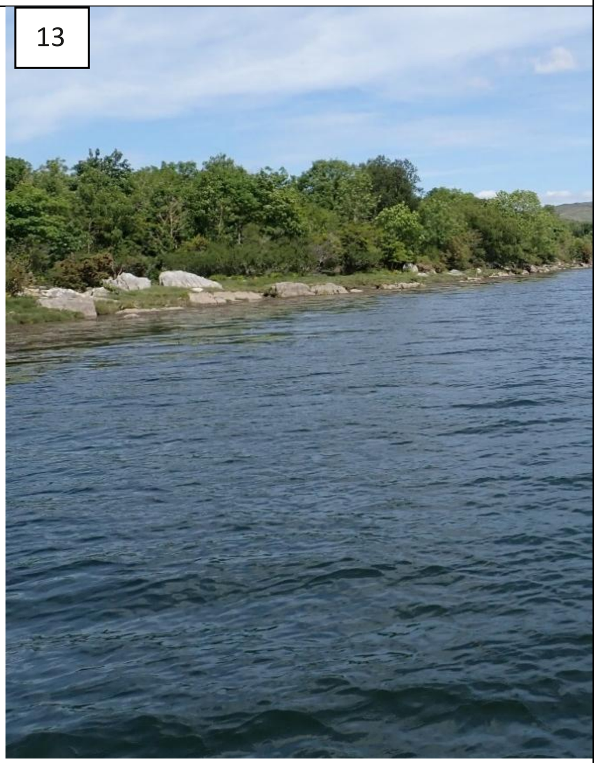

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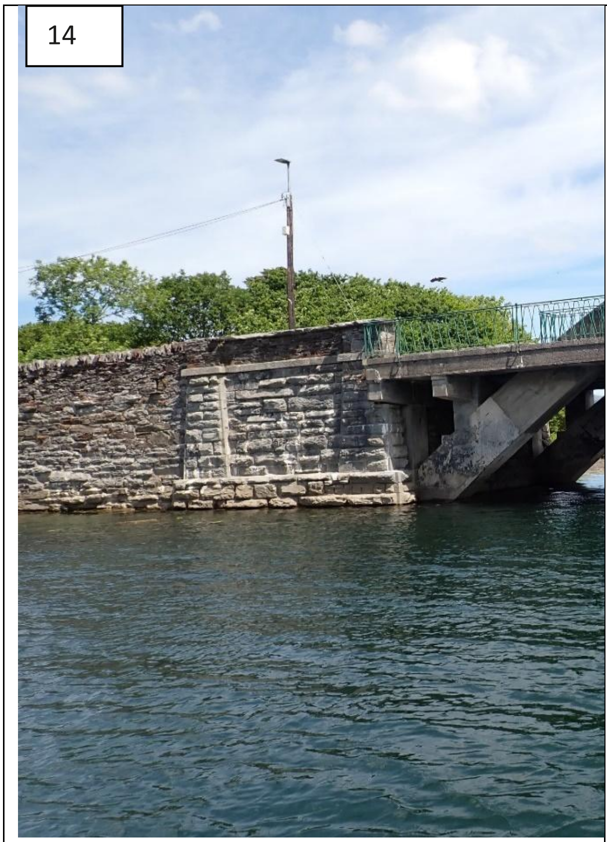

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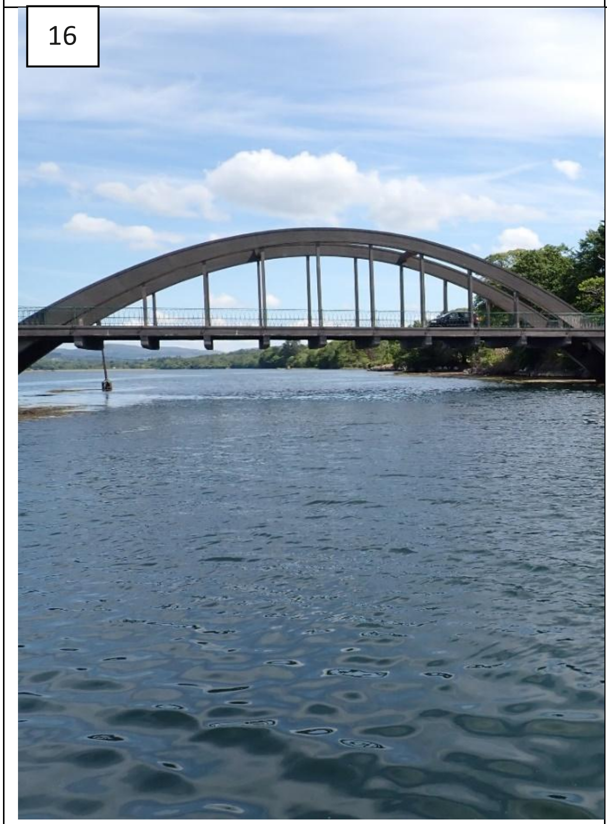
16



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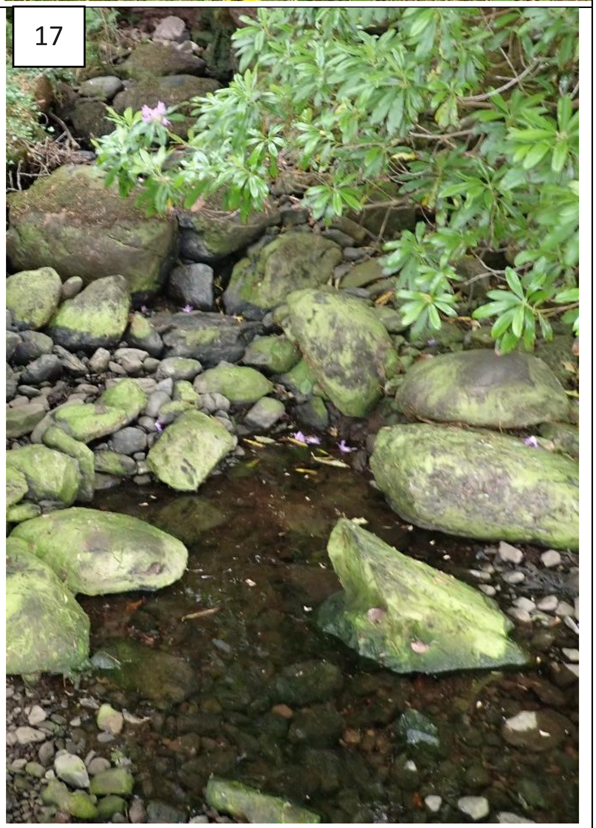
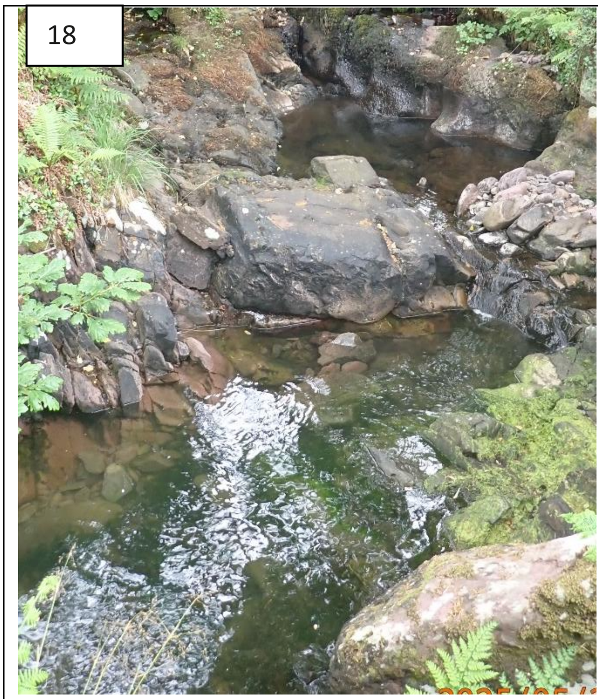
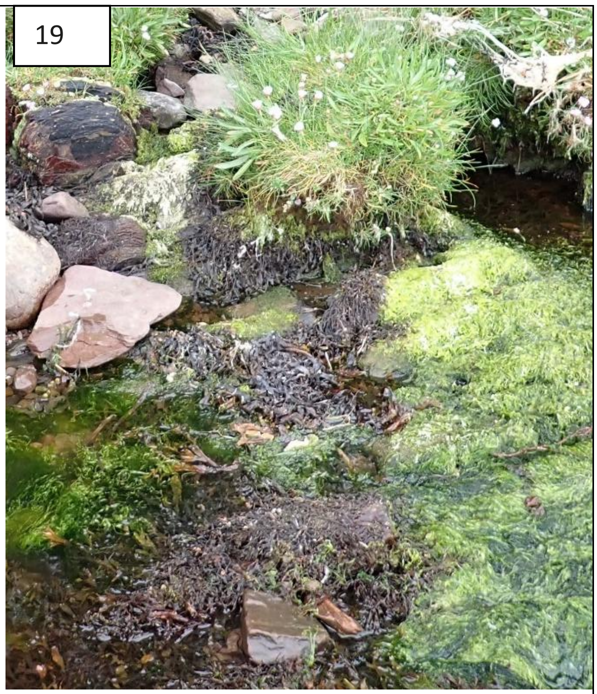
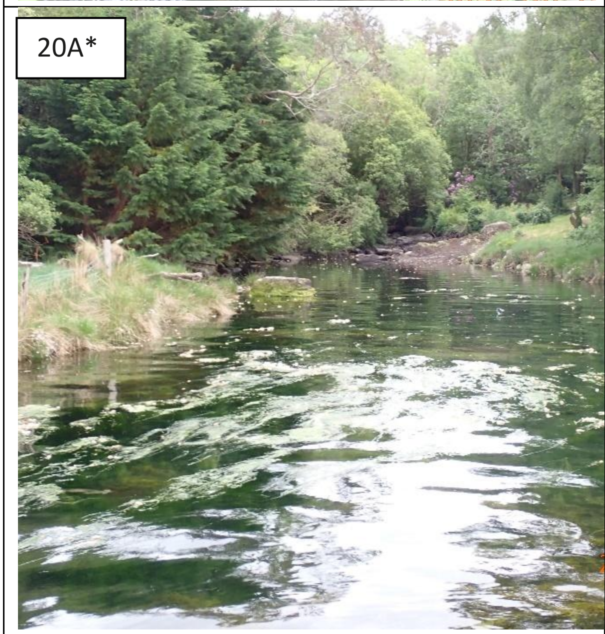
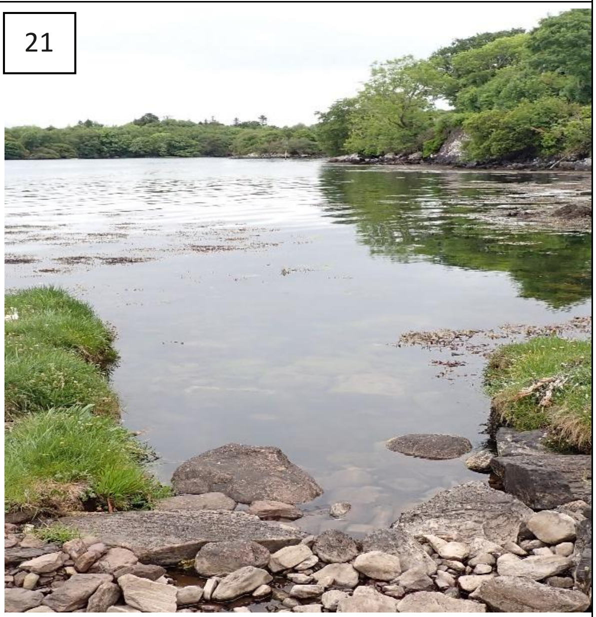



18


19

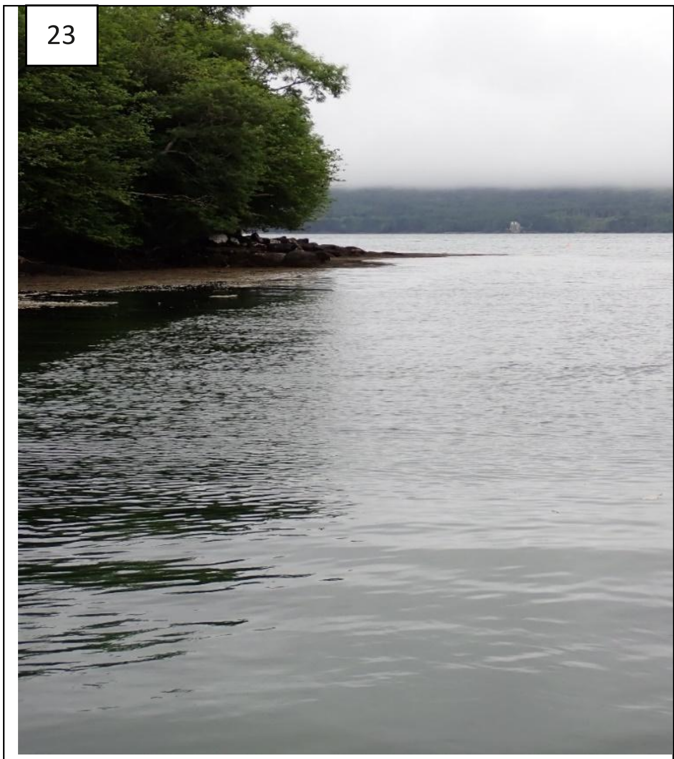

20A*


21


20B*


22

23



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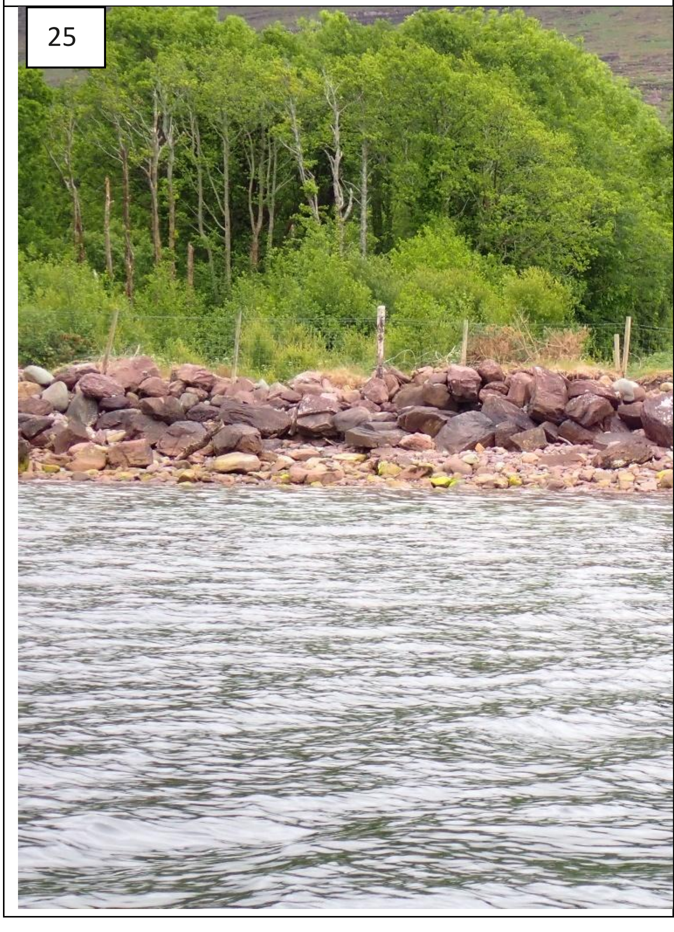
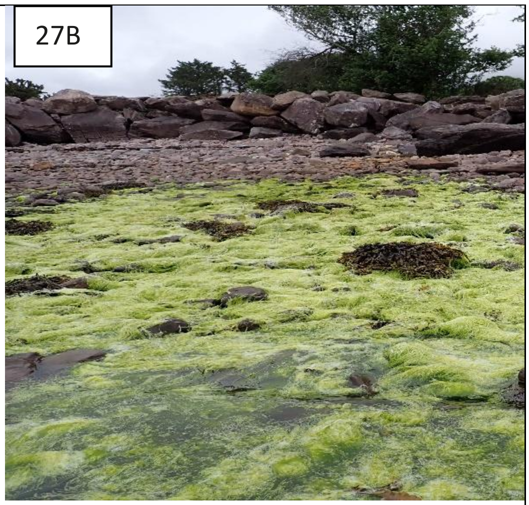


26

27A

27B



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*Site 20 was not subdivided into two sections (as seen with site 27A and B), instead two images are provided to better describe the site.

Appendix 4 INDUSTRY ENGAGEMENT SUMMARY (PREPARED BY SFPA)

Date of Circulation of Draft Report: 25.08.2025

Stakeholders contacted: BIM and local Pacific oyster operators previously active in the BMPA

Method of Engagement: Email

Period for Responses: 02.09.2025

Summary of Feedback Received: **No Response**

Outcome:

- Given the feedback, this report is recommended for publication and finalisation.