UISCE ÉIREANN

Cromane and Valentia

Stage 4A Detailed Assessment of the Primary Discharges (Existing Baseline and Future Scenarios)

P2423_R6466_Rev0 | 24 June 2025

Intertek Metoc
Exchange House, Station Road, Liphook, Hampshire GU30 7DW, United Kingdom

DOCUMENT RELEASE FORM

Uisce Éireann

P2423_R6466_Rev0

Cromane and Valentia

Detailed Assessment of the Primary Discharges (Existing Baseline and Future Scenarios)

Author/s

Nikolaos Spanakis, Gina Dockree

Project Manager	Authoriser
	
Georgina Dockree	Paul Taylor

Rev No	Date	Reason	Author	Checker	Authoriser
DRAFT	15/07/2024	Working Draft	NS	YW	PAT
DRAFT	11/10/2024	Revised based on Uisce Éireann comments	GD	YW	PAT
Rev0	24/06/2025	Issue of final document	GD	YW	PAT

EXECUTIVE SUMMARY

Intertek Metoc has been commissioned by Uisce Éireann to undertake a modelling impact assessment of the main outfall discharges on the water quality of the Designated Shellfish Waters (SFWs) in Cromane and Valentia as part of the Wastewater Treatment Plant (WwTP) Disinfection Programme.

The main objective of this modelling study is to assess whether the discharges from WwTP agglomerations discharging directly to the waterbodies in the region of Cromane (Castlemaine Harbour) and Valentia Harbour are impacting microbial water quality of the Designated SFWs and to quantify the proportional contribution of all modelled sources.

This study assesses discharges under the existing Baseline conditions and one Future scenario considering ongoing or planned projects, with discharge loading rates based on population projections at 2031 (10 years).

For the Valentia area a 2D model was used and for the Cromane area a 3D model of the same model mesh was run with 10 vertical layers. This approach was applied as during the 2D model calibration, the performance in the Cromane area, specifically around Castlemaine Harbour, was unsatisfactory due to localised stratification effects. Therefore, a 3D model was developed for that area. The 2D model performance was acceptable in the Valentia area.

Using this model, a Stage 4A detailed assessment of the impact of discharges from WwTPs was carried out in accordance with the methodology agreed with stakeholders under the Uisce Éireann Shellfish Assessment Programme. A Stage 4B assessment, providing a cumulative impact assessment for both WwTPs and SWO discharges is currently being progressed under a separate contract and is outside the scope of this report.

Nineteen assessment locations were used to extract results for the 97th percentile (%-ile) concentration, geomean concentration and source apportionment, consisting of ten locations around Cromane and nine locations around Valentia.

The key conclusions taken from this study are as follows:

- In the Valentia area, the model results predict that the 97%-ile water quality standard is met throughout the whole Designated SFW under Baseline winter and summer conditions. The geomean standard is met in the Designated SFW, apart from in the immediate vicinity of the discharge locations of the Oghermong and Dereen rivers under Baseline winter conditions. The geomean concentration also exceeds 110 EC/100 ml in the vicinity of the Knightstown WwTP under Baseline winter and summer conditions, although this is outside of the Designated SFW.
- In the Cromane area, both the 97%-ile and geomean standards are met across the Designated SFW for both Baseline summer and winter conditions, apart from the vicinity of the River Emlagh discharge where both standards are exceeded in winter.
- T_{90} sensitivity runs were undertaken for the Cromane area, to determine the impact of longer decay rates. These runs used the T_{90} values for turbid estuaries outlined in Uisce Éireann's Technical Standard for Marine Modelling (TSMM) version 3.0. The runs were only undertaken for Cromane as the Valentia SFW is in coastal waters, whilst the Cromane SFW covers both coastal and estuarine waters. The results indicate that the maximum impact is sensitive to the bacteria die-off rate, however increased T_{90} values have little effect on the exceedance of both thresholds in the SFW, and in fact only cause exceedance during Baseline winter conditions in small areas (Laune and Maine estuaries and close to the Glenbeigh / Rossbeigh WwTPs).
- In the Valentia area the modelled 97%-ile and geomean concentrations across the SFW is less than the threshold for both the Future winter and summer conditions. The reduction of EC concentrations in the

Portmagee and Knightstown WwTP discharges show an improvement in the water quality of the area in the immediate vicinity of the discharge compared to Baseline conditions.

- In the Cromane area the results of modelled Future conditions show that both the 97%-ile and geomean concentrations do not exceed the relevant thresholds, apart from in the immediate vicinity of the River Emlagh discharge location.
- The increase of T_{90} values for both Future summer and winter conditions indicate that the modelled impact is sensitive to bacteria die-off rate. Both the 97%-ile and the geomean thresholds are exceeded in winter in the vicinity of the River Emlagh discharge and in the north-east region of the Cromane SFW.

CONTENTS

LIST OF TABLES AND FIGURES

Tables

Figures

GLOSSARY

2D
Two-Dimensional

CFU
Colony Forming Unit

EC
Escherichia coli

EPA
Environment Protection Agency

MPN
Most Probable Number

NOD
Nicholas O'Dwyer

SAC
Special Area of Conservation

SFPA
Sea-Fisheries Protection Authority

SFW
Shellfish Water

SPA
Special Protection Area

SWO
Stormwater Water Overflow

TSMM
Technical Standard Marine Modelling

WwTP
Wastewater Treatment Plant

1. INTRODUCTION

1.1 Background and Objectives

Intertek Metoc has been commissioned by Nicholas O'Dwyer (NOD) on behalf of Uisce Éireann to undertake a modelling impact assessment of the main outfall discharges on the water quality of the Designated Shellfish Waters (SFWs) in the Cromane and Valentia Harbours, as part of the Uisce Éireann Wastewater Treatment Plant (WwTP) Disinfection Programme.

The overall goals of the WwTP programme are to:

- Identify where WwTP discharges, including Stormwater Overflows (SWOs) are the likely source of SFW contamination.
- Ensure that all discharges into, or proximate to, Designated SFWs meet receiving water quality standards and.
- Provide new process equipment including disinfection where appropriate, to mitigate the impacts on the receiving waters.

The aim of this modelling study is to assess whether discharges from agglomerations discharging directly to Cromane (Castlemaine Harbour) and Valentia Harbour are impacting microbial water quality of the Designated SFWs.

The key specific objective of the assessment is to carry out a detailed Stage 4A assessment as to whether untreated, primary and secondary discharges from WwTPs discharging into Cromane and Valentia Harbours are impacting *Escherichia* coli (hereafter referred to as EC) water quality of the Designated SFW.

A Stage 4B assessment, providing a cumulative impact assessment for both WwTPs and SWO discharges is currently being progressed under a separate contract and is outside the scope of this report.

This document assesses discharges under the existing Baseline conditions with present day population equivalent (PE), and one Future scenario, with summer and winter discharge loading rates based on population projections at the 2031 (10 year) design horizon in line with the requirements of Uisce Éireann's Technical Standard Marine Modelling Version 3.00 (TSMM 2022 – hereafter referred as the TSMM).

1.2 Study Area

Cromane (Castlemaine Harbour) and Valentia lie at opposite ends of Dingle Bay on the west coast of Ireland. Dingle Bay is oriented approximately east/west, its seaward end is approximately 22 km wide and is open to the Atlantic Ocean. Valentia lies at the seaward end of Dingle Bay, the bay narrows and shallows toward Cromane (Castlemaine Harbour), which is separated from the bay by a series of (north / south) sand spits.

1.2.1 Cromane

Cromane is situated on the coast of County Kerry in the South-Western River Basin District. The designated shellfish area is 37.6 km^2. The SFW is situated in a large shallow tidal estuary at the head of Dingle Bay and includes Castlemaine Harbour. The estuary is fed by five rivers – Emlagh, Maine, Laune, Caragh and Behy.

The Castlemaine (Cromane) SFWs were designated in 1994 under the Quality of Shellfish Waters Regulations, S.I. No. 200 of 1994 (which was subsequently repealed and replaced by the 2006

regulations, as amended). The contributing catchment area to the shellfish water is 1659 km^2. The Designated SFW lies within Cromane Special Area of Conservation (SAC, Site Code 000343).

1.2.2 Valentia

Valentia Harbour is situated on the coast of County Kerry in the South-Western River Basin District. The Valentia Harbour Designated SFW was designated in 2009 under the European Communities (Quality of Shellfish Waters) (Amendment) Regulations 2009 (S.I. 55 of 2009). The total area of the Valentia Harbour Designated SFW is 24.26 km^2 and comprises a channel and estuary on the landward side of Valentia Island.

The designated SFW lies within the Valentia Harbour coastal water and is defined by a line from Bray Head to Reencaheragh to the south-west, a line from Reenadrolaun point to Doulus Head to the north-west, and upstream as far as Foughil Island.

The contributing catchment area to the shellfish water is 204 km^2. It is dominated by steep mountains, blanket bog and rough grazing with some improved grasslands. The main freshwater inputs from the catchment area are the rivers Ferta, Cahern and Valentia Derreen. The designated shellfish area lies within the Valentia Harbour SAC. Figure 1-1 presents a geographic overview of the area. Figure 1-2 and Figure 1-3 present a detailed view of the Cromane and Valentia Designated SFWs.

Figure 1-1 Geographic Overview of the Computational Domain

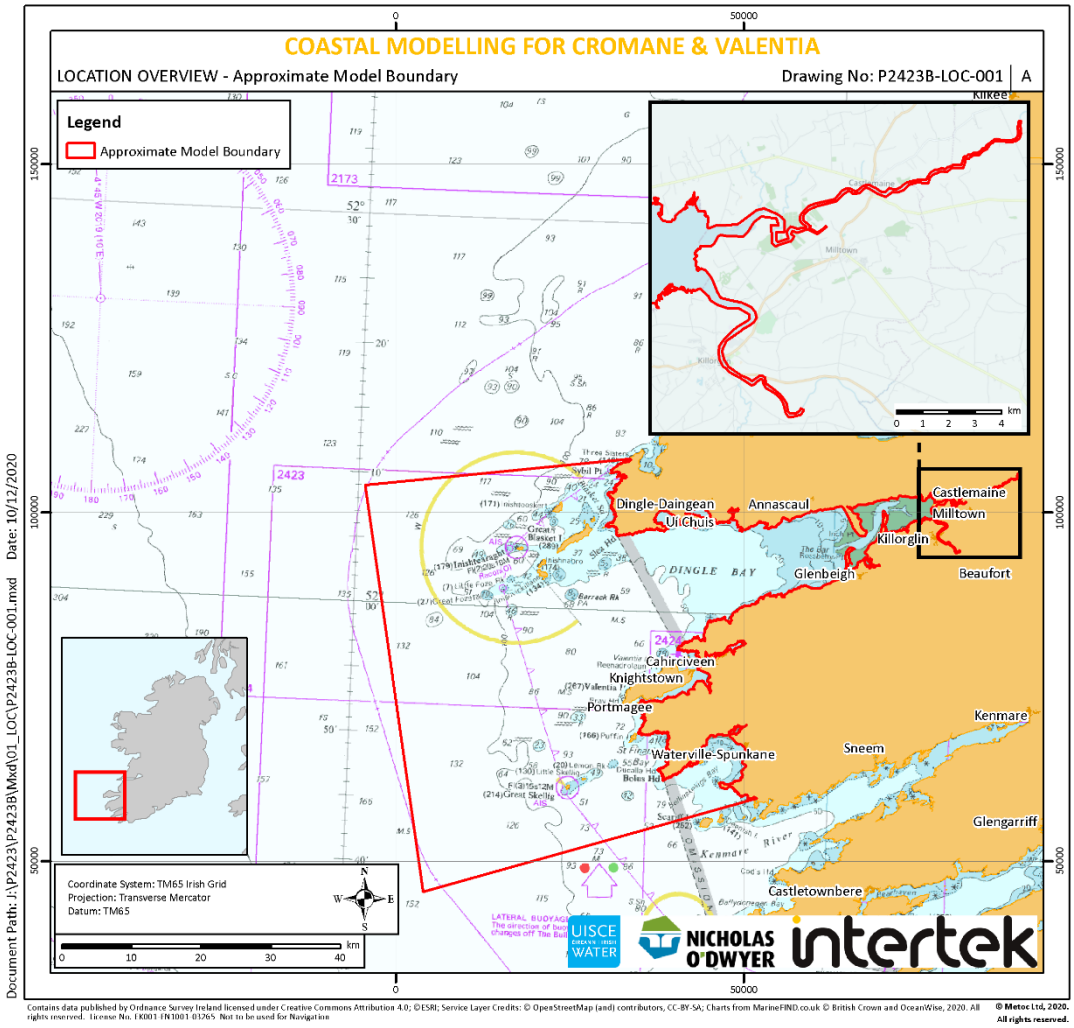


Figure 1-2 Geographic Overview of the Cromane Study Area

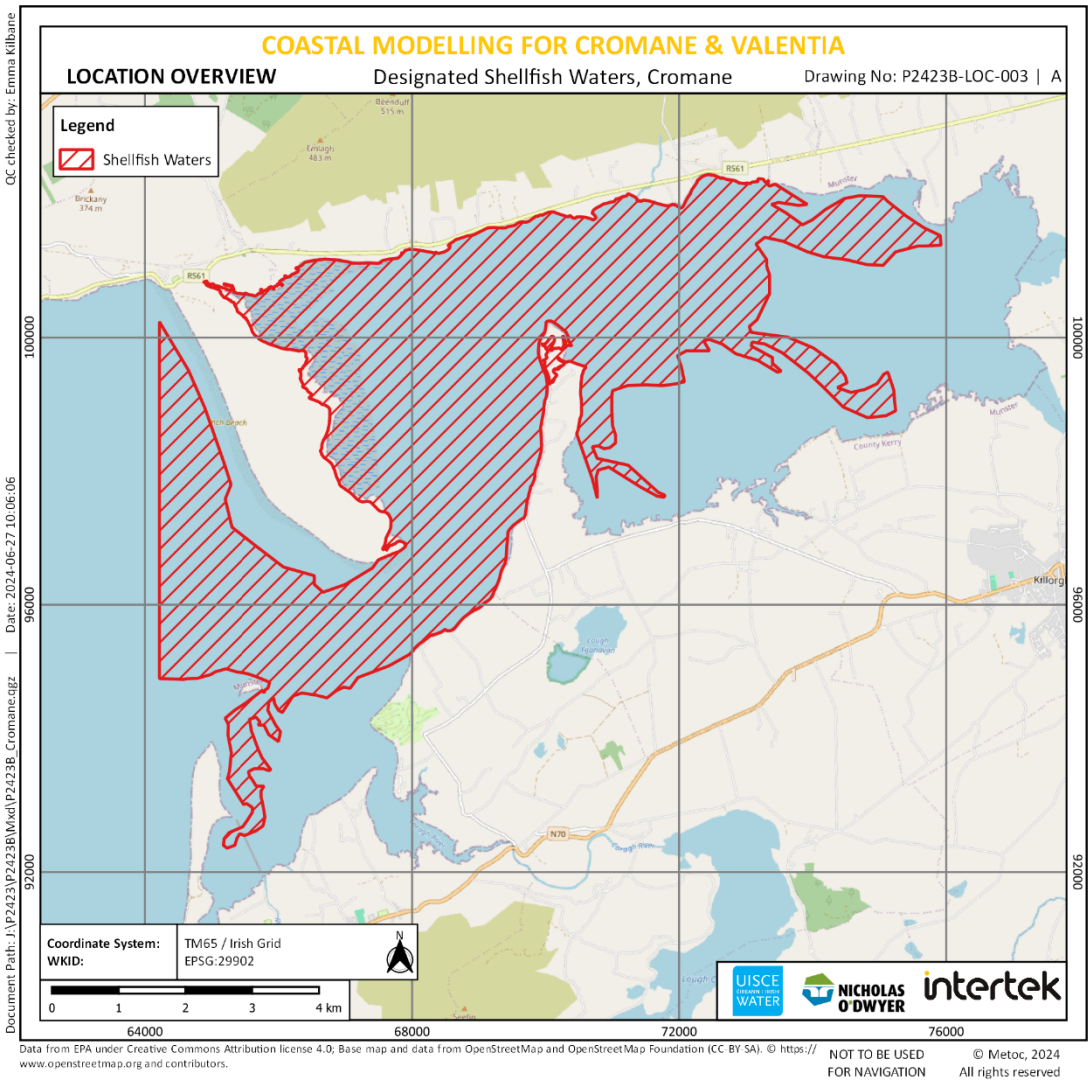
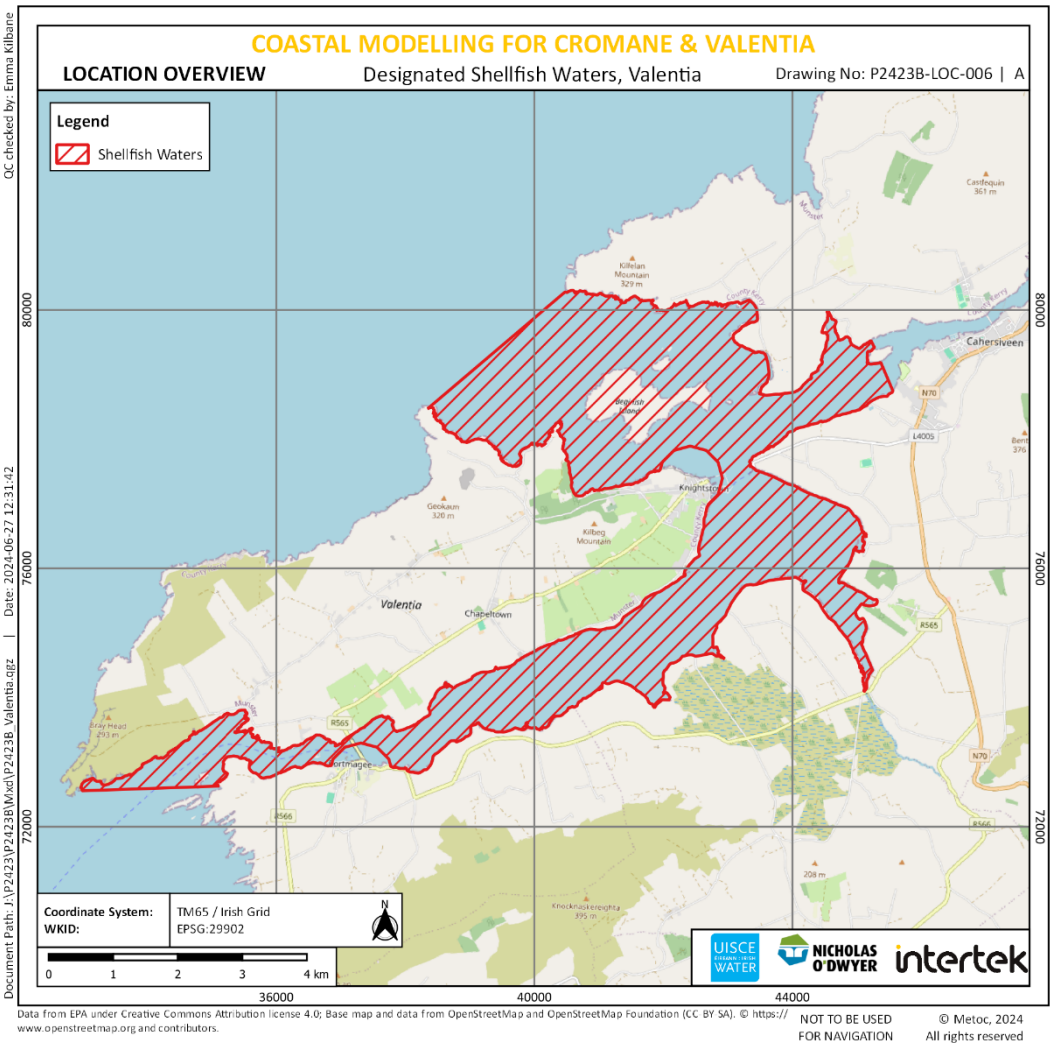


Figure 1-3 Geographic Overview of the Valentia Study Area



2. APPROACH

The assessment has followed the approach outlined in the TSMM, to demonstrate the impact of the discharges on Designated SFWs for the existing (Baseline) and Future scenarios.

A 2D model and a 3D model have been built and applied to assess the impact of 20 potential sources, with the 2D model utilised for the impact assessment of the SFW at Valentia, and the 3D model utilised for the impact assessment of the SFW at Cromane where periodic stratification exists (Intertek, 2023).

The model was built using the best available bathymetry and boundary condition data, and calibrated and validated against site specific water levels, current velocities, salinity, temperature and EC concentration data collected through a bespoke survey commissioned by NOD (Intertek 2023). The model performance was assessed using industry standard criteria and the model is considered to be of a good standard and fit for the proposed use of assessing bacterial impacts at the Cromane and Valentia SFWs. A full description of the model development and the assessment of model calibration and validation performance is provided in the Cromane and Valentia Calibration and Validation Report (Intertek, 2024).

Two scenarios have been assessed:

- **Baseline Scenario.** This represents the likely microbial impacts from the 20 continuous sources identified, under both winter (A01w) and summer(A01s) conditions.
- **Future Scenario.** This scenario considers changes in discharge loads from WwTPs due to the projected population growth for one Future horizon i.e. seven years to 2031, under both winter (A02w) and summer (A02s) conditions.

The TSMM specifies summer and winter T_{90} values to use, one set for coastal waters, and one for turbid estuaries. The Valentia area is considered a coastal water. However, there are no turbidity data available the Cromane area to determine if this should be considered a turbid estuary, and in the Calibration and Validation report, there was a recommendation to undertake a sensitivity test for decay rate for the Cromane area.

To simulate the likely microbial impacts at Valentia and Cromane (considered as a coastal water) the following decay rates, as specified in the TSMM for coastal areas, were used:

- T_{90} 24 hours for winter scenario (Baseline and Future)
- T_{90} 12 hours for summer scenario (Baseline and Future)

To simulate the potential microbial impacts at Cromane (considered as a turbid estuary) the following decay rates have also been modelled to demonstrate sensitivity to T_{90}:

- T_{90} 48 hours for winter scenario (Baseline and Future)
- T_{90} 24 hours for summer scenario (Baseline and Future)

The total impacts throughout the model domain have been determined, and the proportional contribution from all sources have been calculated at 19 key locations agreed with Uisce Éireann. Nine assessment locations were chosen in the Portmagee Channel up to Valentia Bay and 10 points from Rossbeigh Beach upstream towards the Castlemaine Harbour. Figure 2-1 and Figure 2-2 show the assessment locations for Cromane and Valentia respectively. The assessment locations are listed in Table 2-1.

Figure 2-1 Cromane Assessment Locations

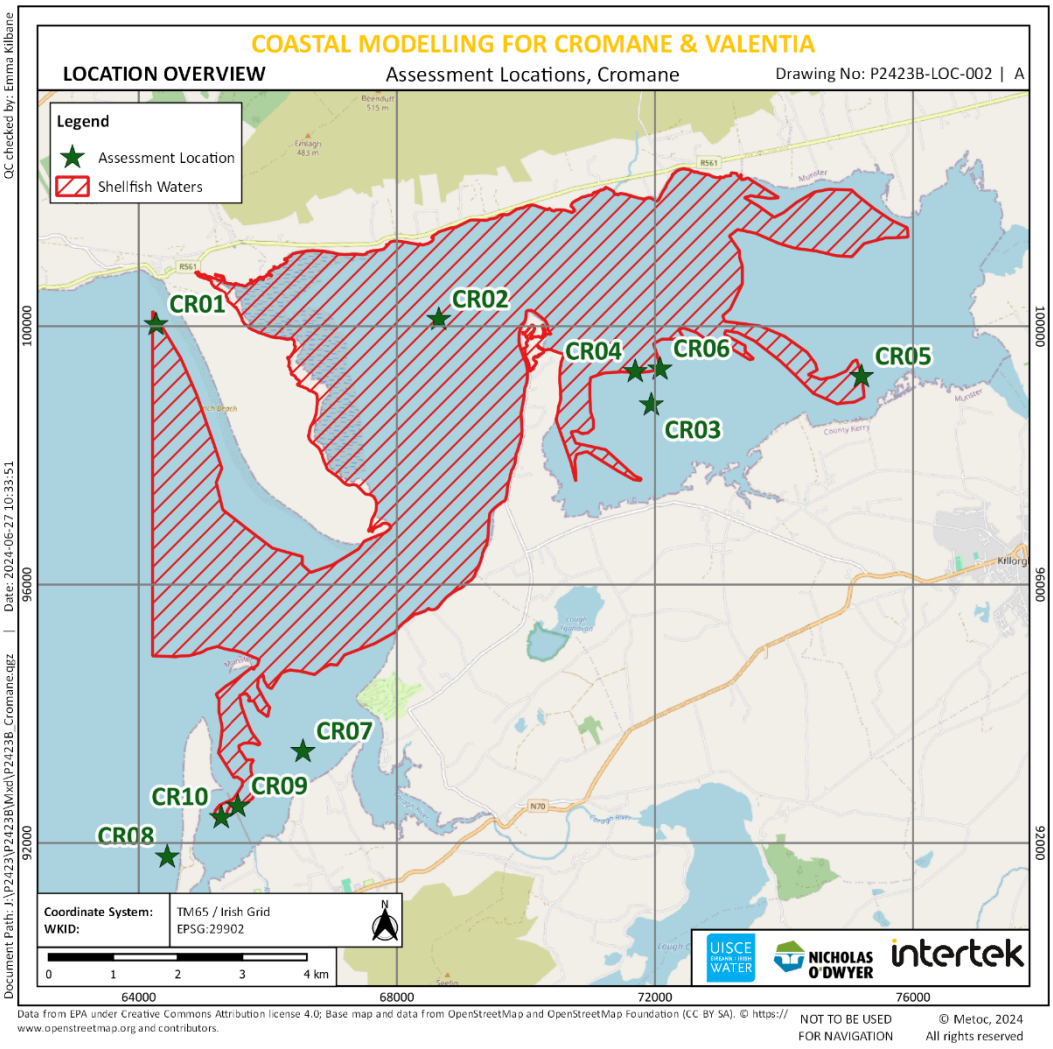


Figure 2-2 Valentia Assessment Locations

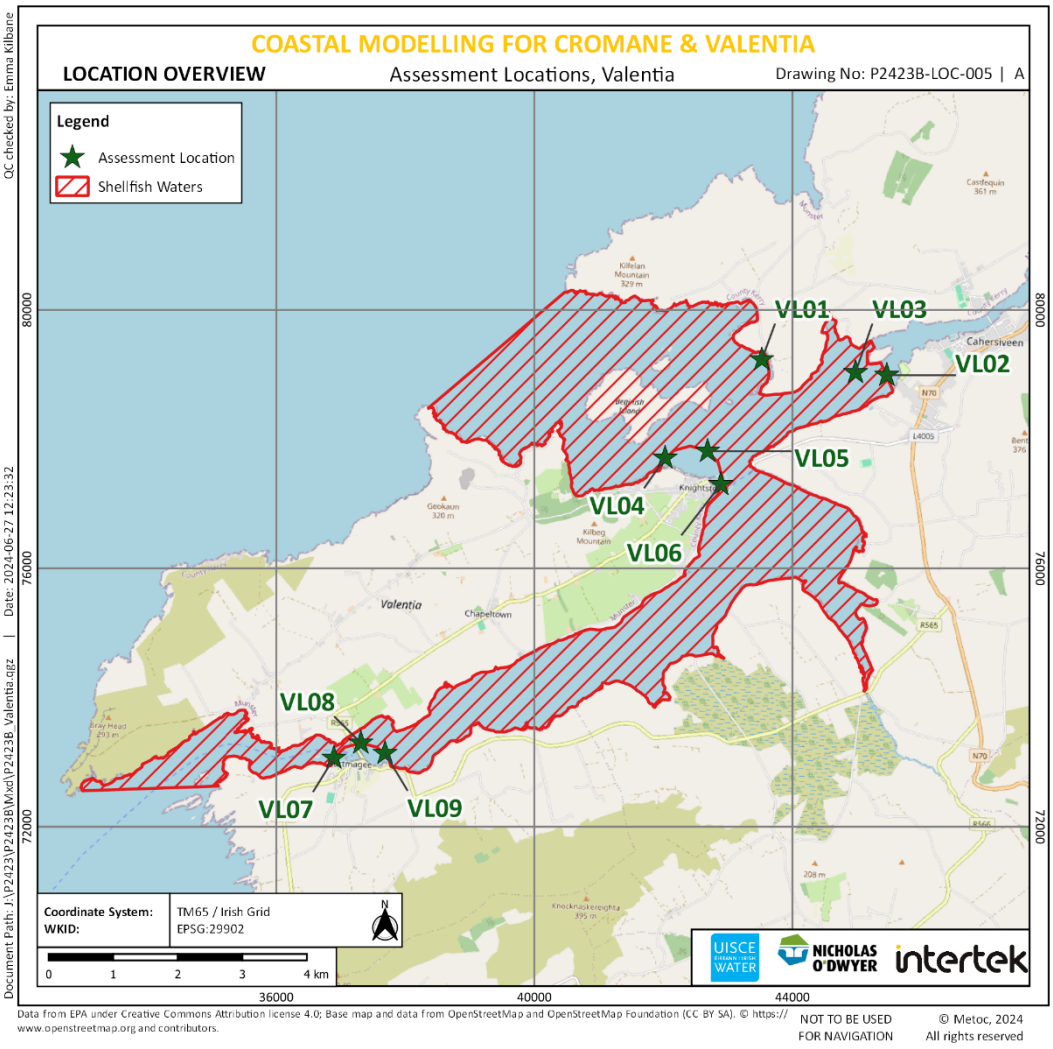


Table 2-1 Assessment Locations

Assessment Location	Easting (TM65)	Northing (TM65)	Water
CR01	64269	100027	Inch BW
CR02	68652	100105	Castlemaine Harbour SFW RMP B3
CR03	71946	98783	Castlemaine Harbour SFW RMP B1
CR04	71697	99299	Castlemaine Harbour SFW NE point
CR05	75203	99220	Castlemaine Harbour SFW SE point
CR06	72080	99336	Castlemaine Harbour SFW mid point
CR07	66547	93415	Castlemaine Harbour SFW RMP B4

Assessment Location	Easting (TM65)	Northing (TM65)	Water
CR08	64443	91783	Rossbeigh White Strand BW
CR09	65537	92567	Cromane SFW S point 1
CR10	65281	92393	Cromane SFW S point 2
VL01	43527	79233	White Strand BW
VL02	45464	78991	Valentia SFW eastern point
VL03	44979	79033	Valentia SFW RMP
VL04	42027	77708	Valentia SFW Knightstown west
VL05	42686	77814	Valentia SFW Knightstown mid
VL06	42891	77299	Valentia SFW Knightstown east
VL07	36894	73061	Valentia SFW Portmagee west
VL08	37312	73296	Valentia SFW Portmagee mid

As per the TSMM, for this assessment the default T_{90} values have been applied in the model, i.e. 12 hours for summer and 24 hours for winter for coastal waters. To demonstrate model sensitivity to T_{90}, a T_{90} of 24 hours for summer and 48 hours for winter have been also modelled for the Cromane area only.

The model simulations were run for a sufficiently long 'spin-up' period to enable dynamic equilibrium of bacterial concentration in the environment to be reached (approximately two weeks). In accordance with the TSMM, the assessment period covered a spring-neap tidal cycle (15 days), following the spin-up period.

2.1 Model Sources

Figure 2-3 and Figure 2-4 show the locations of the modelled sources of EC at Valentia and Cromane, respectively, Table 2-2 and Table 2-3 present their locations. The following sections provide descriptions of the discharges and flow rates, for each scenario during summer and winter.

Figure 2-3 Modelled WwTP Outfall and River Discharge Locations at Valentia

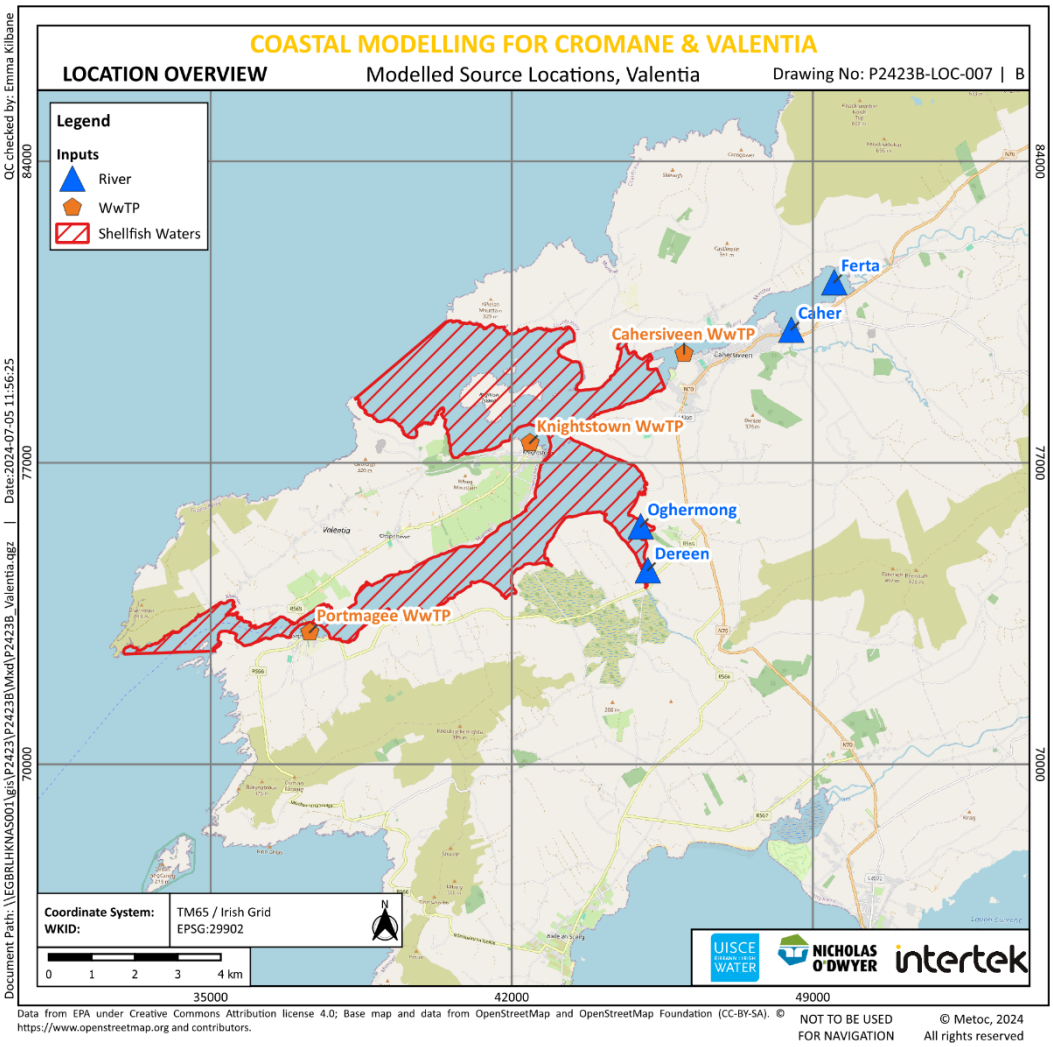


Figure 2-4 Modelled WwTP Outfall and River Discharge Locations at Cromane

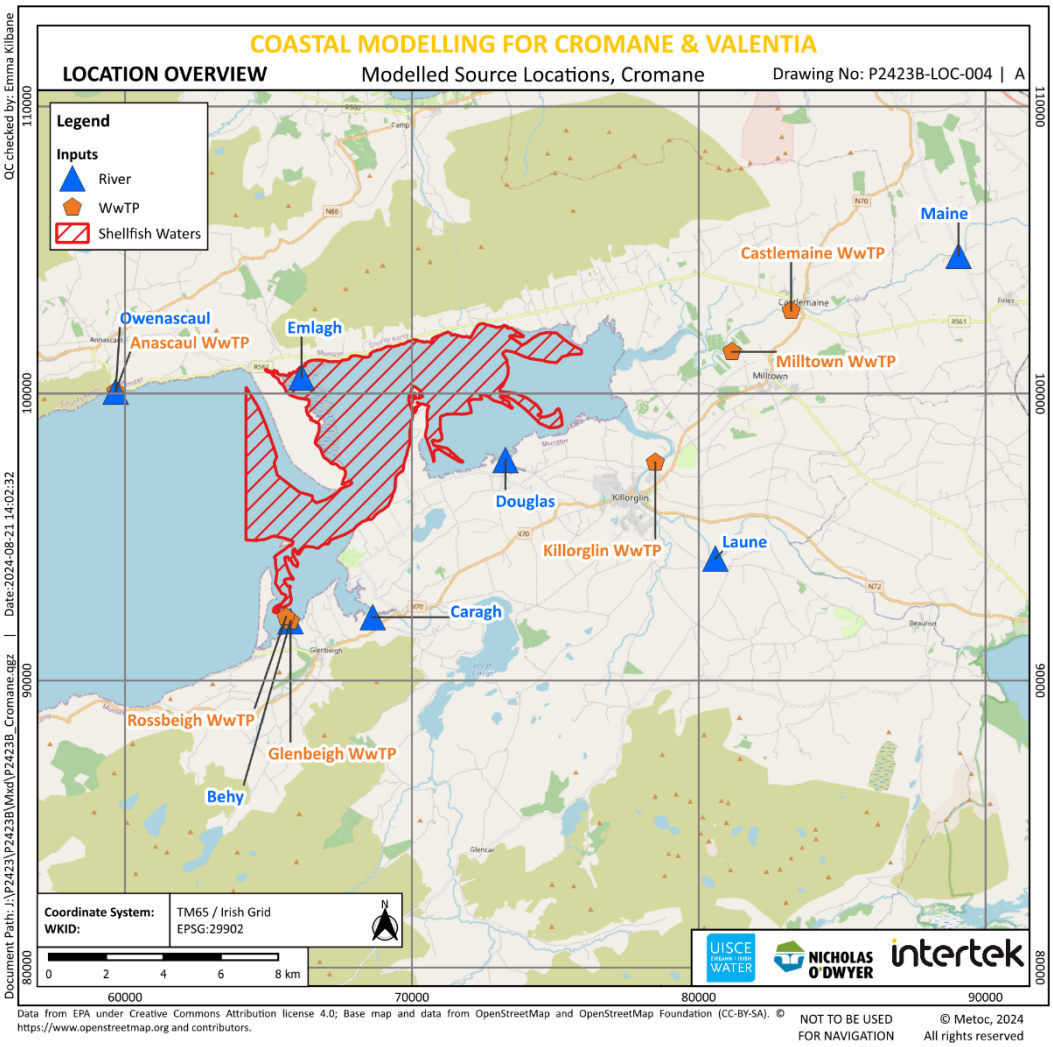


Table 2-2 Modelled Sources Locations at Valentia

Modelled Source	Easting (TM65)	Northing (TM65)
Ferta River	49500	81194
Caher River	48502	80091
Derren River	45166	74504
Oghermong River	45000	75524
Cahersiveen WwTP	46009	79535
Portmagee WwTP	37307	73064
Knightstown WwTP	42426	77460

Table 2-3 Modelled Sources Locations at Cromane

Modelled Source	Easting (TM65)	Northing (TM65)
Laune River	80588	94250
Maine River	89067	104798
Caragh River	68637	92208
Behy River	65768	92071
Douglas River	73267	97683
Emlagh River	66156	100572
Owenascaul River	59672	100071
Glenbeigh WwTP	65768	92071
Anascaul WwTP	59672	100071
Castlemaine WwTP	83229	102893
Rossbeigh WwTP	65614	92214
Killorglin WwTP	78492	97597
Milltown WwTP	81166	101454

2.1.2 WwTPs

The modelled flows for the WwTPs were based on an average discharge flow for each WwTP, representative of current measured (or estimated) hydraulic loadings as provided by Uisce Éireann. The modelled concentrations for the WwTPs were based on the average (mean) of the 2022 Uisce Éireann sample data for the Baseline scenario and concentrations specified by Uisce Éireann for the Future scenarios depending on the level of treatment, as follows:

- Primary treated effluent 1×10^6 EC/100 ml
- Secondary treated effluent 1×10^5 EC/100 ml

For consistency throughout this document, bacteria concentrations (whether those from samples or from model predictions) are referred to simply as *number* EC/100ml, rather than using the terms Most Probable Number (MPN) or Colony Forming Unit (CFU). Table 2-4 presents the WwTPs, discharge flows and concentrations, for both Baseline and Future scenarios.

Table 2-4 Uisce Éireann WwTP Flows and Concentrations

WwTP	Baseline	Baseline Summer (A01s)		Baseline Winter (A01w)		Future	Future summer (A02s)		Future Winter (A02w)	
	Treatment	Discharge Flow[1] (m^3/day)	Concentration (EC/100ml)	Discharge Flow[1] (m^3/day)	Concentration (EC/100ml)	Treatment	Discharge Flow[1] (m^3/day)	Concentration (EC/100ml)	Discharge Flow[1] (m^3/day)	Concentration (EC/100ml)
Castlemaine	Secondary	121	7,201	121	7,201	Secondary	149	100,000	149	100,000
Rossbeigh	Secondary	50	23,900	32	23,900	Secondary	54	100,000	44	100,000
Glenbeigh	Secondary	569	864,666	98	864,666	Secondary	612	100,000	223	100,000
Killorglin	Secondary	2,307	8,451	2,144	8,451	Secondary	2,518	100,000	2,340	100,000
Milltown	Secondary	585	14,072	585	14,072	Secondary	721	100,000	721	100,000
Anascaul	Primary	169	5,040,252	117	5,040,252	Secondary	169	100,000	142	100,000
Cahersiveen	Secondary	1,758	6,421	1,105	6,421	Secondary	1,827	100,000	1,258	100,000
Portmagee	Primary	81	10,076,875	64	10,076,875	Primary	93	1,000,000	86	1,000,000
Knightstown	Secondary	233	3,128,375	151	3,128,375	Secondary	241	100,000	153	100,000

[1] Rounding to the nearest whole number

2.1.3 Rivers

The modelled flows for the rivers are based on the estimated Q30 flows for winter and Q95 flows for summer. The flow values were extracted from the Environmental Protection Agency (EPA) HydroTool.

The modelled concentrations for the rivers were based on samples collected for the purpose of this assessment. The modelled river flows and concentrations are presented in Table 2-5.

Table 2-5 River Flows and Concentrations

River	Catchment Size (km^2)	Q30 flow (m^3/s)	Q95 flow (m^3/s)	Mean Concentration (EC/100ml)
Laune	777.7	45.34	6.78	289
Maine	317.4	11.70	1.42	8830
Ferta	53.4	2.52	0.22	403
Caragh (Carach)	136.4	8.57	0.82	40
Behey (Behy)	46.0	2.33	0.32	1780
Carhar (Carhan or Caher)	23.4	1.07	0.10	537
Dereen	17.9	0.67	0.06	248
Douglas	11.7	0.42	0.04	1110
Emlagh	21.9	0.87	0.08	2720
Oghermong	10.9	0.39	0.03	625
Owenascaul	39.1	1.88	0.19	1290

3. RESULTS

Results for the Baseline and Future scenarios are presented as follows:

- **Contour plots.** Plots showing the 97%-ile and geomean concentrations resulting from combined total impact from all modelled sources.
- **Source apportionment.** Tables of the main contributors for EC.

Source apportionment is an effective means of identifying the relative significance of each source to the impact at the SFW. It is calculated from the contribution of each source to the total impact (concentration) at the key assessment locations. The percentages of the total impact of each source can be then expressed in a table or pie chart.

The modelled sources in the Valentia area are distant from the Cromane area of interest, and vice versa, which is an indication that the sources from one area will only have a small impact at the other. To avoid unnecessary runs, without losing information, it was decided to group the distant sources and model them under the same computational run.

To model the impact of all sources (rivers and WwTPs) in the Valentia area, the 2D model was used. WwTPs and rivers in Valentia were modelled individually, while sources near Cromane were represented in two groups: one group consisted of all rivers and the other group with all WwTPs, in the area.

To model the impact of all sources in the Cromane area, the 3D model was used. WwTPs and rivers around Cromane were modelled individually. Sources in the Valentia area were represented in two groups. One group consisted of all rivers and the second consisted of all WwTPs. Model results from the surface layer were used in the assessment.

3.1 Baseline Scenario

3.1.1 Contour Plots

to present the 97%-ile contour plots, and to present the geomean plots for the following scenarios, respectively:

- Baseline winter T_{90} = 24 hours for the Valentia area (A01w24).
- Baseline summer T_{90} = 12 hours for the Valentia area (A01s12).
- Baseline winter T_{90} = 24 hours for the Cromane area (A01w24).
- Baseline summer T_{90} = 12hours for the Cromane area (A01s12).
- Baseline sensitivity winter T_{90} = 48 hours for the Cromane area (A01w48).
- Baseline sensitivity summer T_{90} = 24 hours for the Cromane area (A01s24).

Figure 3-1 and Figure 3-2Figure 3-6, show the 97%-ile concentration contour plots for the combined total impact from all modelled sources for the Baseline scenario (winter T_{90}=24 hours and summer T_{90}=12 hours respectively) in Valentia. Figure 3-3 and Figure 3-4 present the impact from all modelled sources for the Baseline scenario (winter T_{90}=24 hours and summer T_{90}=12 hours respectively) for Cromane.

For the majority of the SFWs the 97%-ile concentration does not exceed 1500 EC/100 ml – impacts are generally less than 500 EC/100 ml in the majority of both SFWs, under any scenario. However, there are some localised areas of water quality concentrations greater than 1500 EC/100 ml within the Portmagee Channel and upstream of the Cromane SFW where multiple sources of both WwTP and rivers outflow (Callanafersy West). The local area around each discharge (river and WwTP) has high

EC concentrations which exceed 1500 EC/100 ml. There is also an area of EC concentration greater than 1500 EC/100 ml in the vicinity of the Glenbeigh WwTP. However, each of these high concentrations quickly reduce within a short distance from the discharge points, so overall, both of the Designated SFW areas meet the 97%-ile standards, apart from in the immediate vicinity of the River Emlagh discharge in Cromane under the winter condition.

The results of the sensitivity tests undertaken to see the impact of using a higher T_{90} (48 hours for winter and 24 hours for summer) are shown in Figure 3-5 and Figure 3-6. These values were based on the decay rates for a turbid estuary outlined in the TSMM. As outlined in Section 2, the sensitivity tests were only undertaken for the Cromane area. When compared with the Baseline, the sensitivity test results for the winter scenario show a larger area that exceeds the 97%-ile concentration threshold of 1500 EC/100 ml along the River Maine, but the high concentrations remain outside of the Designated SFW. A small area of the Designated SFW close to the Glenbeigh WwTP exceeds the 1500 EC/100 ml threshold, unlike in the Baseline scenario where these high concentrations are confined to outside the Designated area. In summer, there is little difference between the Baseline and the sensitivity test results. In both the Baseline and sensitivity test winter scenarios, there is a similarly sized small area of exceedance in the immediate vicinity of the River Emlagh discharge.

Figure 3-7 and Figure 3-8 show the geomean concentration contour plots for the combined total impact from all modelled sources for the Baseline scenario (winter T_{90}=24 hours and summer T_{90}=12 hours respectively) in Valentia. Figure 3-9 and Figure 3-10 present the same for the Cromane area.

For the majority of the SFW the geomean concentration does not exceed 110 EC/100 ml and impacts are generally less than 50 EC/100 ml in the majority of the SFW, under any scenario. However, there are some localised areas of water quality concentrations greater than 110 EC/100 ml within the Portmagee Channel, and upstream of the Cromane SFW where multiple sources of both WwTP and rivers outflow (Callanafersy West). The local area around each discharge (river and WwTP) has high EC concentrations which exceed 110 EC/100 ml. However, these high concentrations quickly reduce within a short distance from the discharge point, so overall, the Designated SFW area meets the geomean standard, apart from in the immediate vicinity of the discharge locations of the Oghermong and Dereen rivers in winter, and in the immediate vicinity of the Knightstown WwTP discharge in winter and summer in Valentia. Similarly to the 97%-ile standard, the geomean standard is exceeded in the immediate vicinity of River Emlagh discharge under winter conditions.

The results of the sensitivity tests undertaken to see the impact of using a higher T_{90} (48 hours for winter and 24 hours for summer) are shown in Figure 3-11 and Figure 3-12. The results for the winter show a larger area that exceeds the geomean threshold of 110 EC/100 ml when compared to the Baseline. Of this area, a small part is in the Designated SFW close to the rivers Maine and Laune (Callanafersy West). There is also a small area of exceedance in the Designated SFW close to the Glenbeigh WwTP , whereas in the Baseline the area of exceedance is outside of the Designated SFW. In summer, there is little difference between the Baseline and the sensitivity test results.

Figure 3-1 Contour Plot of Valentia Area for Baseline Scenario 97%-ile: Winter (T90 = 24 hours)

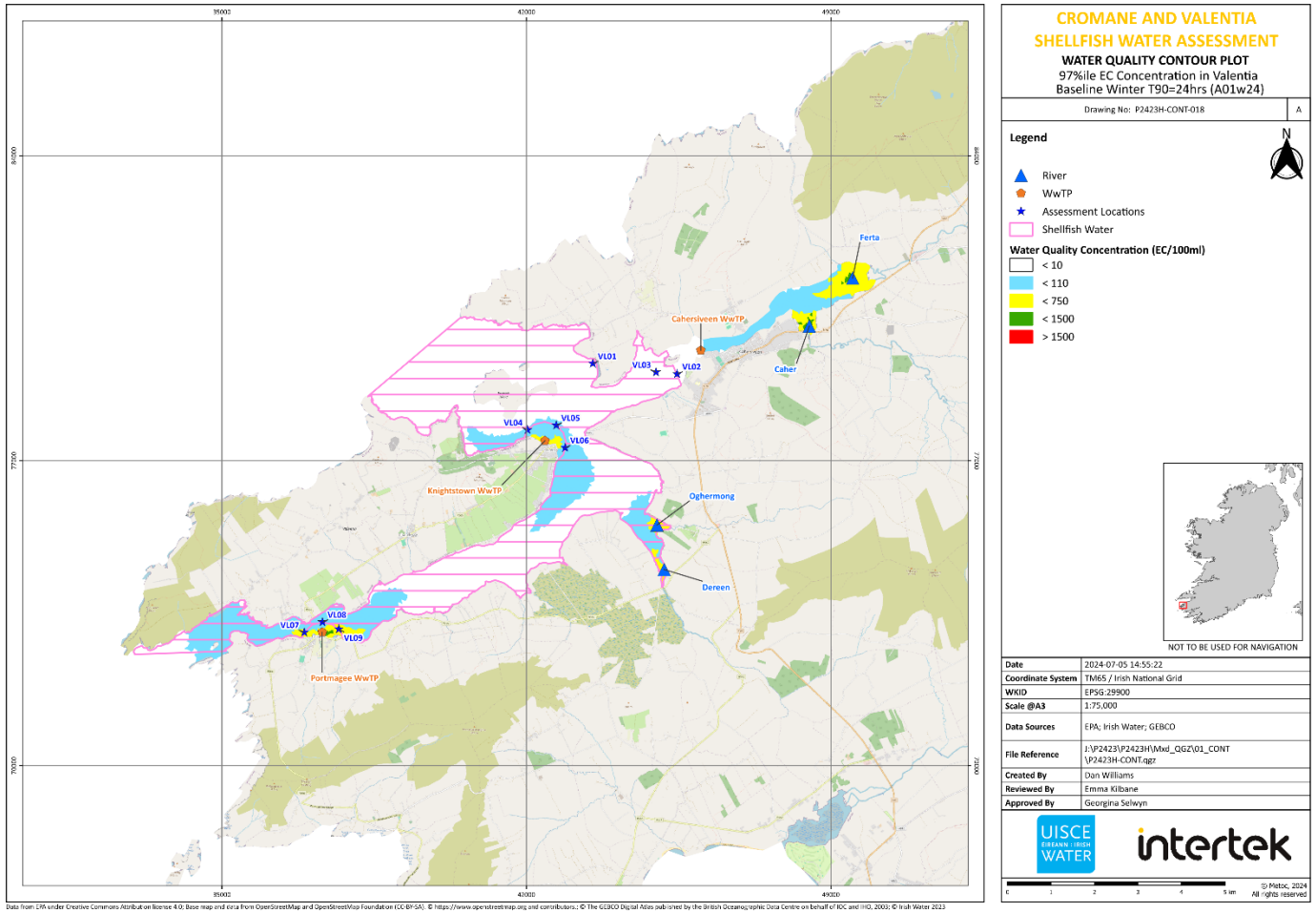
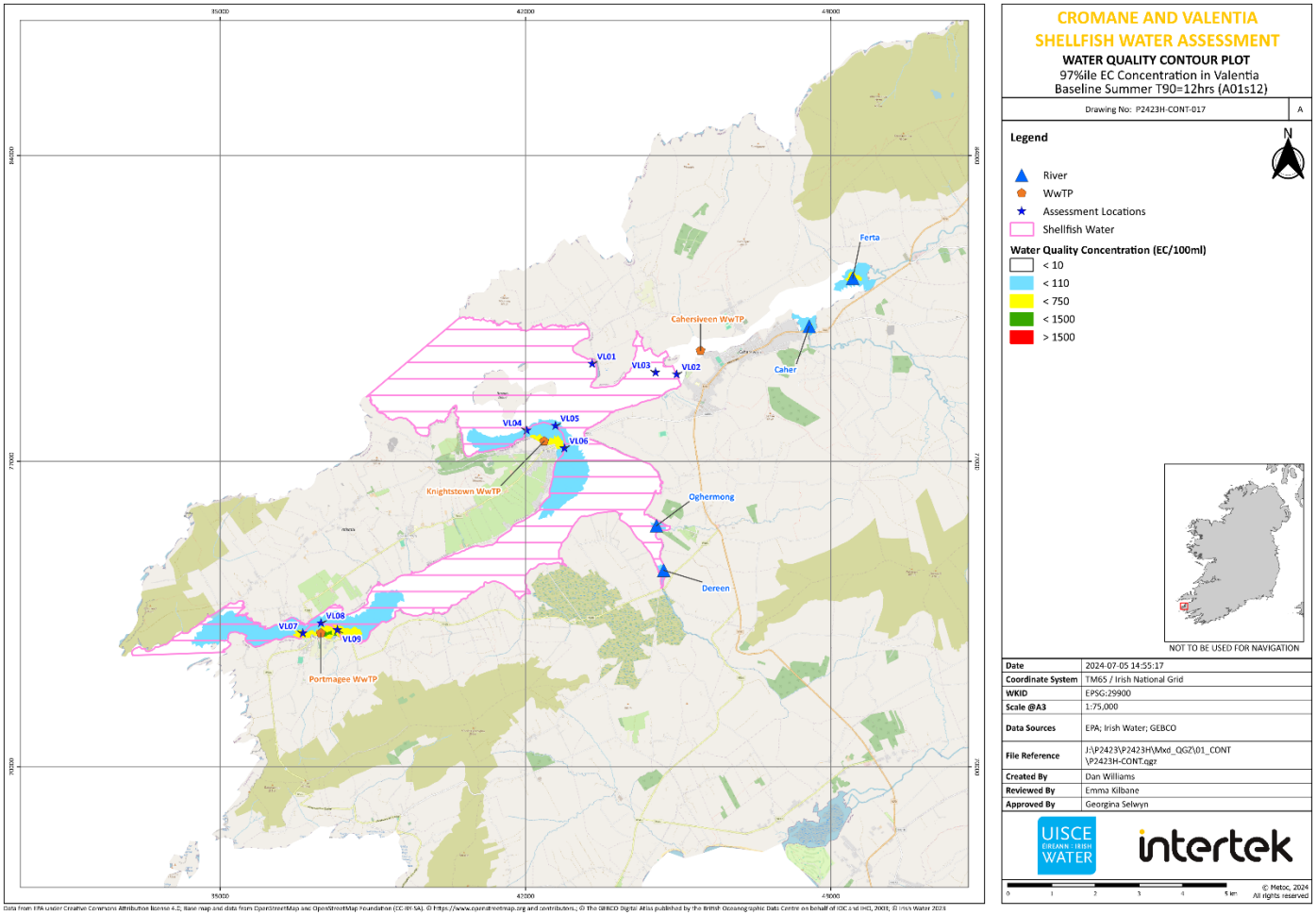


Figure 3-2 Contour Plot of Valentia Area for Baseline Scenario 97%-ile: Summer (T90 = 12 hours)



CROMANE AND VALENTIA
SHELLFISH WATER ASSESSMENT
WATER QUALITY CONTOUR PLOT
97%ile EC Concentration in Valentia
Baseline Summer T90=12hrs (A01s12)

Drawing No: P2423H-CONT-017 | A

Legend

- River
- WwTP
- Assessment Locations
- Shellfish Water

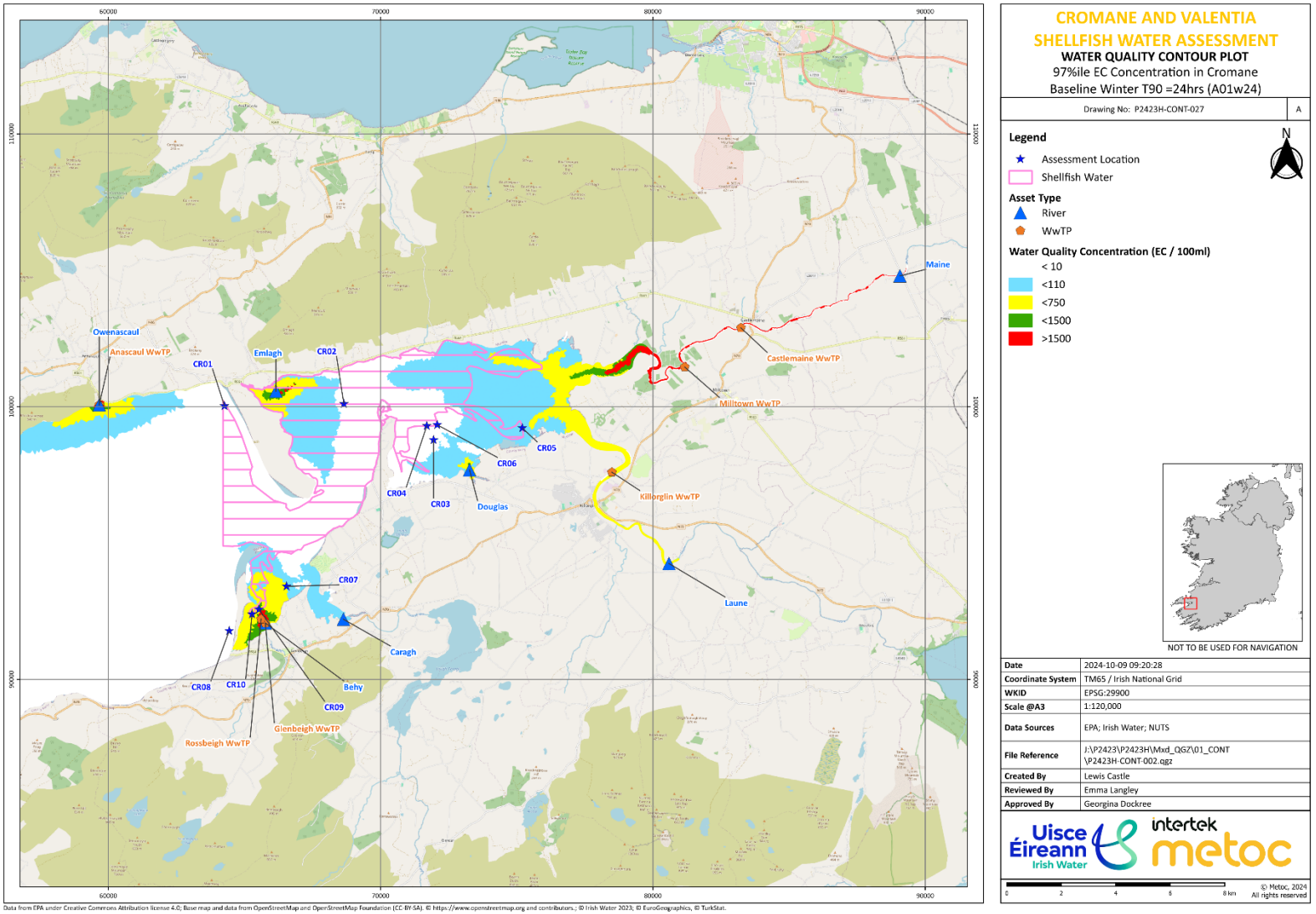
Water Quality Concentration (EC/100ml)

- < 10
- < 110
- < 750
- < 1500
- > 1500

NOT TO BE USED FOR NAVIGATION

Date	2024-07-05 14:55:17
Coordinate System	TM65 / Irish National Grid
WKID	EPSG:29900
Scale @A3	1:75,000
Data Sources	EPA; Irish Water; GEBCO
File Reference	J:\P2423\P2423H\Mxd_QGZ\01_CONT \P2423H-CONT.qgz
Created By	Dan Williams
Reviewed By	Emma Kilbane
Approved By	Georgina Selwyn

Figure 3-3 Contour Plot of Cromane Area for Baseline Scenario 97%-ile: Winter (T90 = 24 hours)



CROMANE AND VALENTIA
SHELLFISH WATER ASSESSMENT
WATER QUALITY CONTOUR PLOT
97%ile EC Concentration in Cromane
Baseline Winter T90 =24hrs (A01w24)

Drawing No: P2423H-CONT-027 | A

Legend
- Assessment Location
- Shellfish Water

Asset Type
- River
- WwTP

Water Quality Concentration (EC / 100ml)
- < 10
- <110
- <750
- <1500
- >1500

N

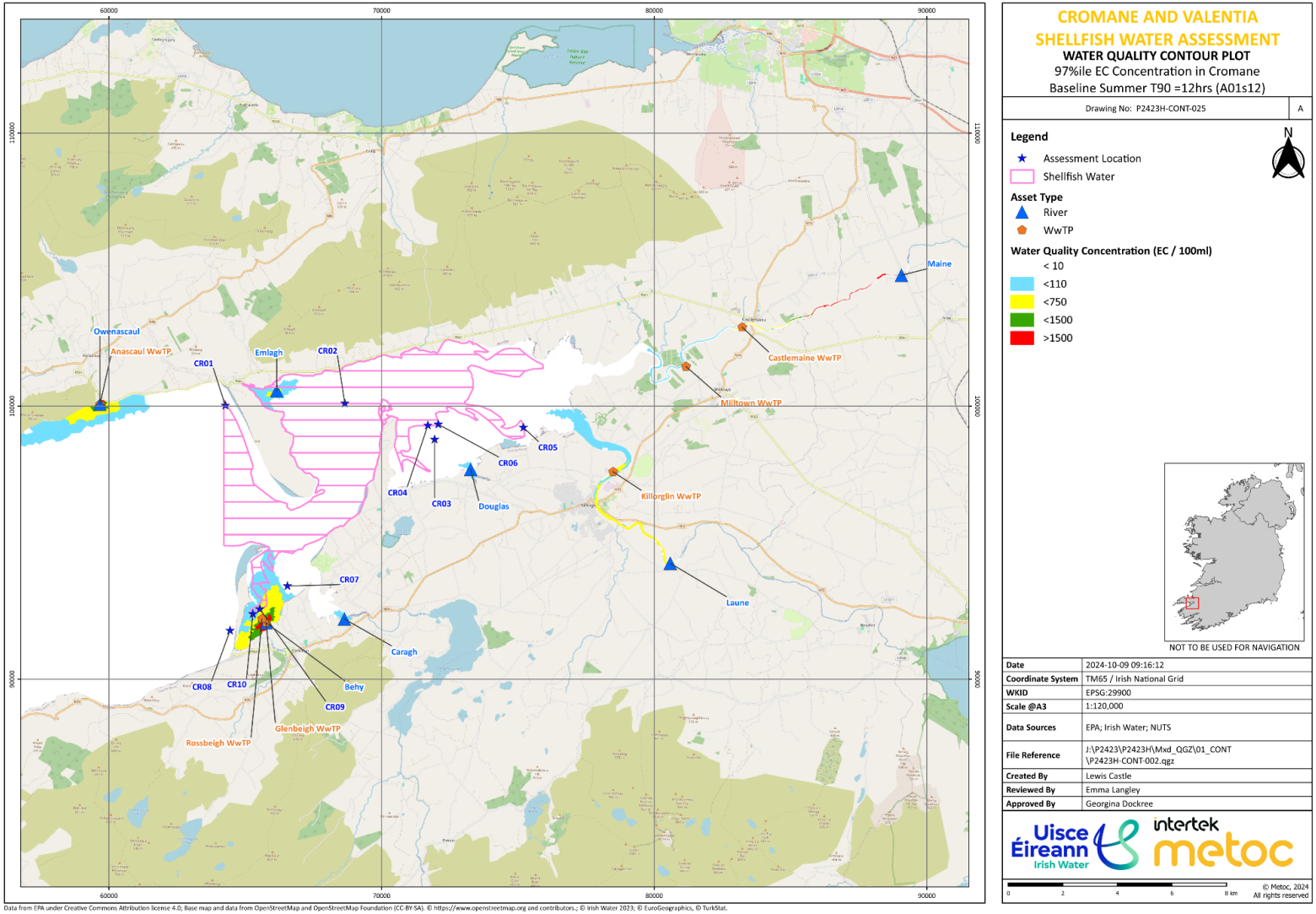
NOT TO BE USED FOR NAVIGATION

Date	2024-10-09 09:20:28
Coordinate System	TM65 / Irish National Grid
WKID	EPSG:29900
Scale @A3	1:120,000
Data Sources	EPA; Irish Water; NUTS
File Reference	J:\P2423\P2423H\Mxd_QGZ\01_CONT \P2423H-CONT-002.qgz
Created By	Lewis Castle
Reviewed By	Emma Langley
Approved By	Georgina Dockree

Uisce Éireann Irish Water | intertek metoc

0 2 4 6 8 km

Figure 3-4 Contour Plot of Cromane Area for Baseline Scenario 97%-ile: Summer (T90 = 12 hours)



CROMANE AND VALENTIA
SHELLFISH WATER ASSESSMENT
WATER QUALITY CONTOUR PLOT
97%ile EC Concentration in Cromane
Baseline Summer T90 =12hrs (A01s12)

Drawing No: P2423H-CONT-025	A

Legend

- Assessment Location
- Shellfish Water

Asset Type

- River
- WwTP

Water Quality Concentration (EC / 100ml)

- < 10
- <110
- <750
- <1500
- >1500

N

NOT TO BE USED FOR NAVIGATION

Date	2024-10-09 09:16:12
Coordinate System	TM65 / Irish National Grid
WKID	EPSG:29900
Scale @A3	1:120,000
Data Sources	EPA; Irish Water; NUTS
File Reference	J:\P2423\P2423H\Mxd_QGZ\01_CONT \P2423H-CONT-002.qgz
Created By	Lewis Castle
Reviewed By	Emma Langley
Approved By	Georgina Dockree

Uisce Éireann Irish Water
intertek metoc

0 2 4 6 8 km

Figure 3-5 Contour Plot of Cromane Area for Baseline Scenario 97%-ile: Winter (T_{90} = 48 hours) – Sensitivity Test

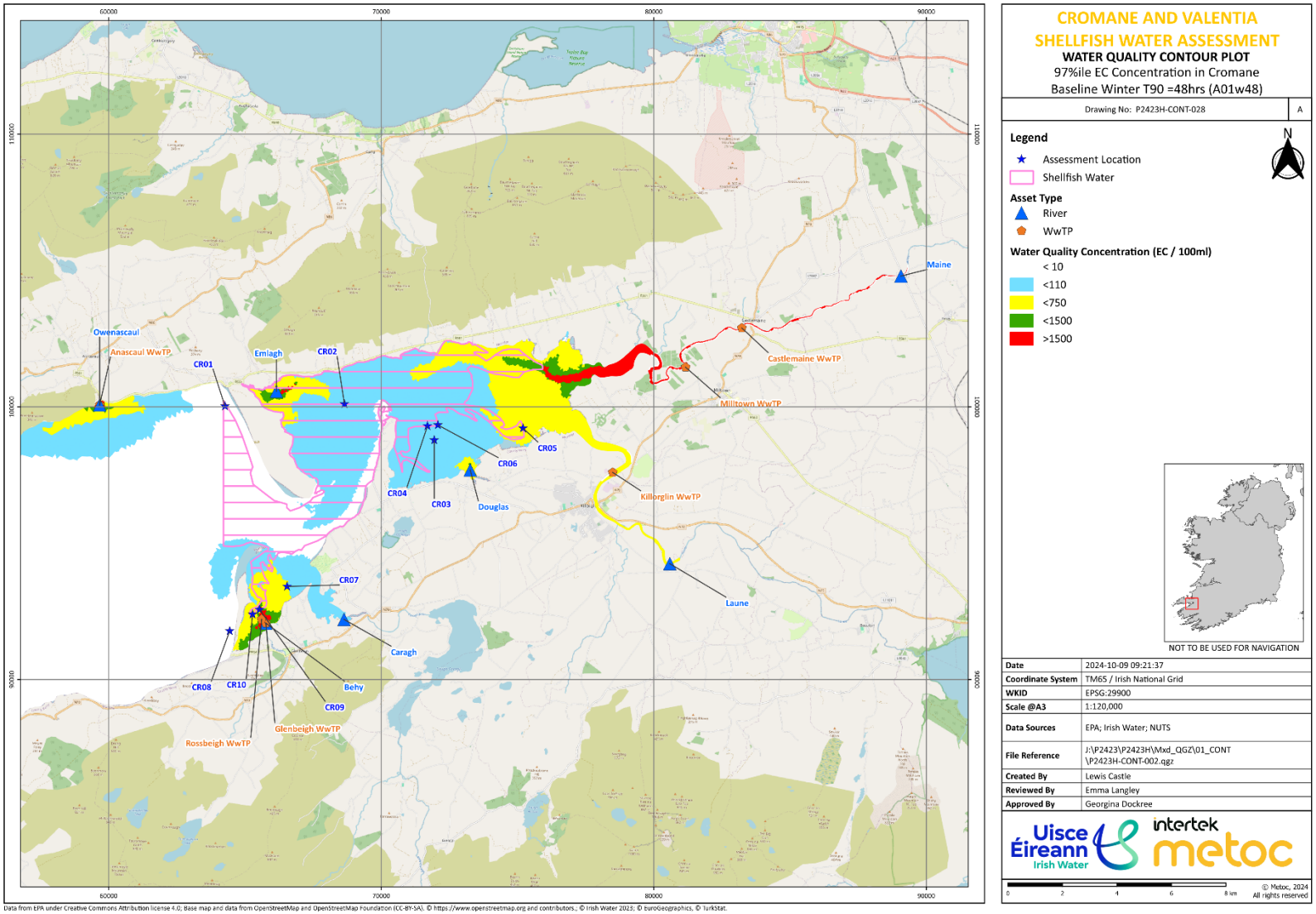
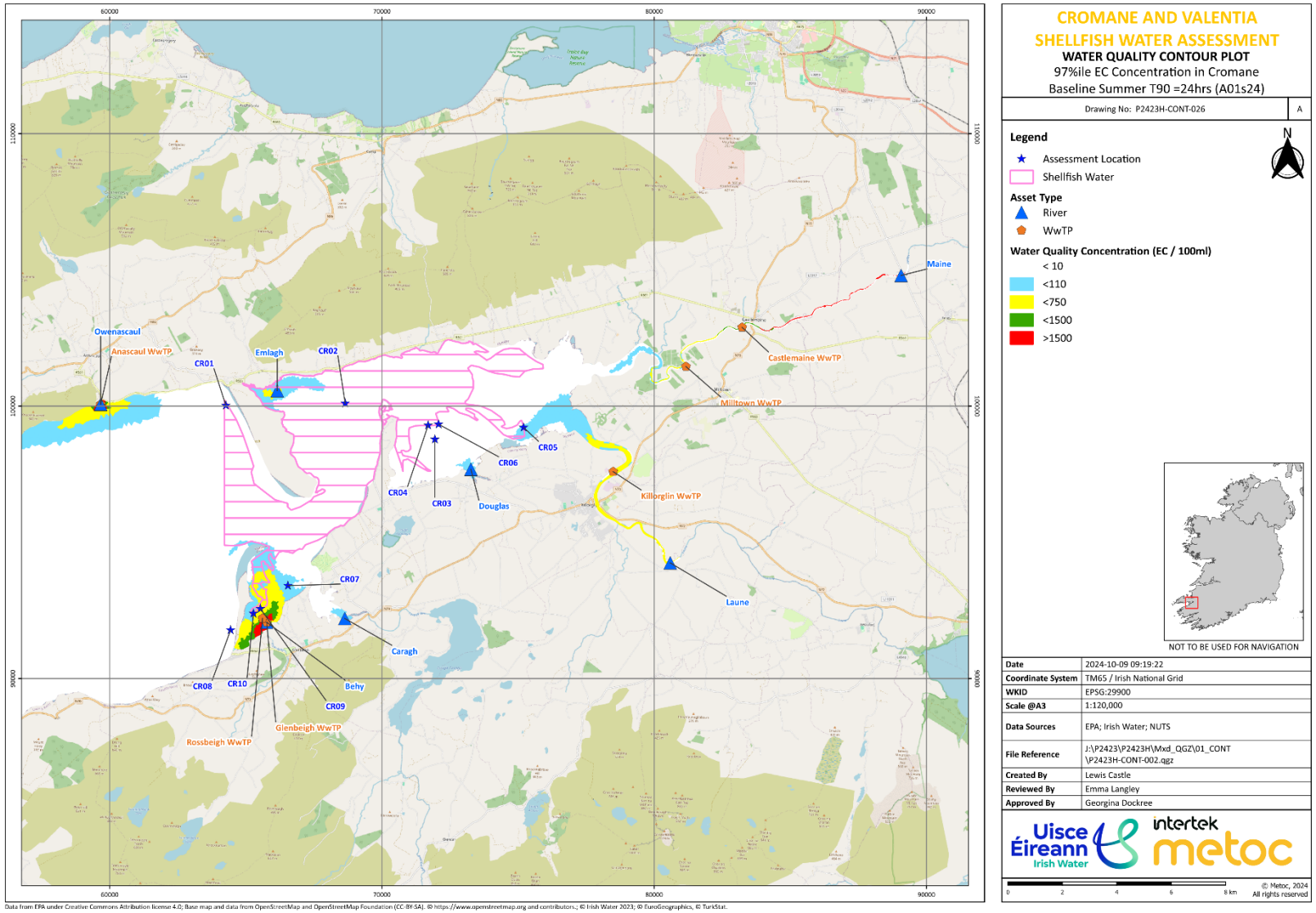


Figure 3-6 Contour Plot of Cromane Area for Baseline Scenario 97%-ile: Summer (T_{90} = 24 hours) – Sensitivity Test



CROMANE AND VALENTIA
SHELLFISH WATER ASSESSMENT
WATER QUALITY CONTOUR PLOT
97%ile EC Concentration in Cromane
Baseline Summer T90 =24hrs (A01s24)

Drawing No: P2423H-CONT-026 | A

Legend

- Assessment Location
- Shellfish Water

Asset Type

- River
- WwTP

Water Quality Concentration (EC / 100ml)

- < 10
- <110
- <750
- <1500
- >1500

N

NOT TO BE USED FOR NAVIGATION

Date	2024-10-09 09:19:22
Coordinate System	TM65 / Irish National Grid
WKID	EPSG:29900
Scale @A3	1:120,000
Data Sources	EPA; Irish Water; NUTS
File Reference	J:\P2423\P2423H\Mxd_QGZ\01_CONT \P2423H-CONT-002.qgz
Created By	Lewis Castle
Reviewed By	Emma Langley
Approved By	Georgina Dockree

Uisce Éireann Irish Water
intertek metoc

0 2 4 6 8 km

Figure 3-7 Contour plot of Valentia Area for Baseline Scenario Geomean: Winter (T90 = 24 hours)

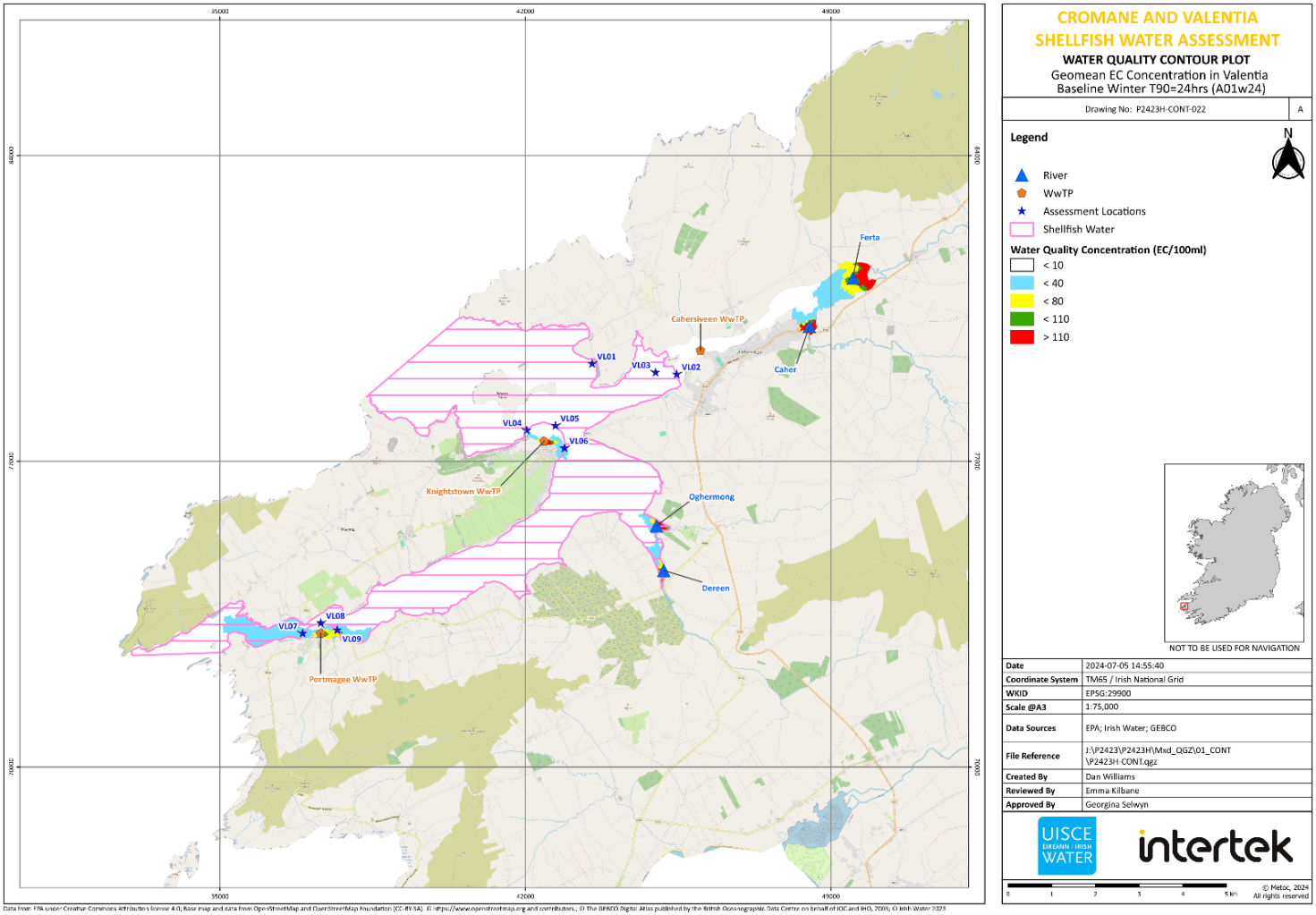


Figure 3-8 Contour Plot of Valentia Area for Baseline Scenario Geomean: Summer (T90 = 12 hours)

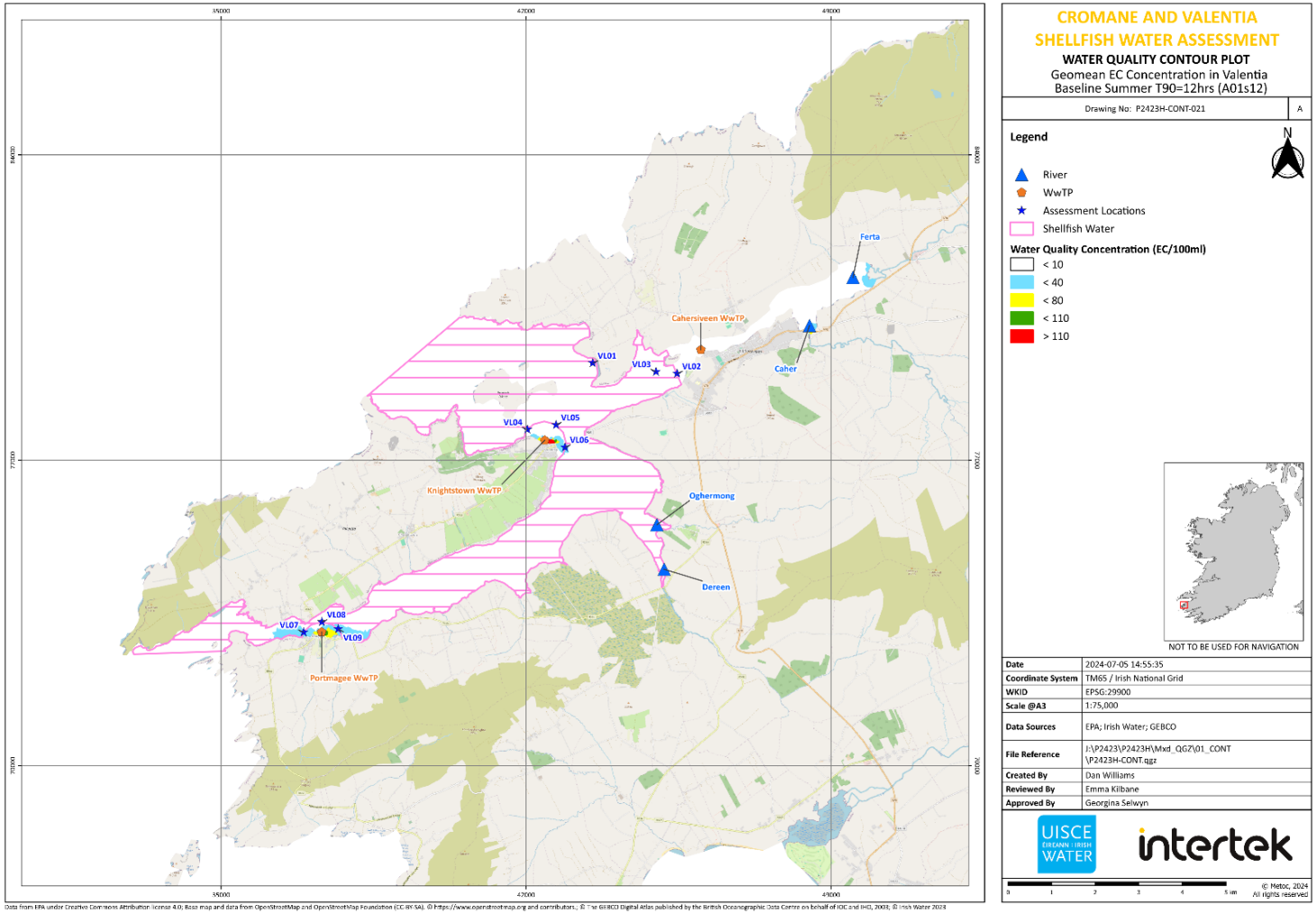
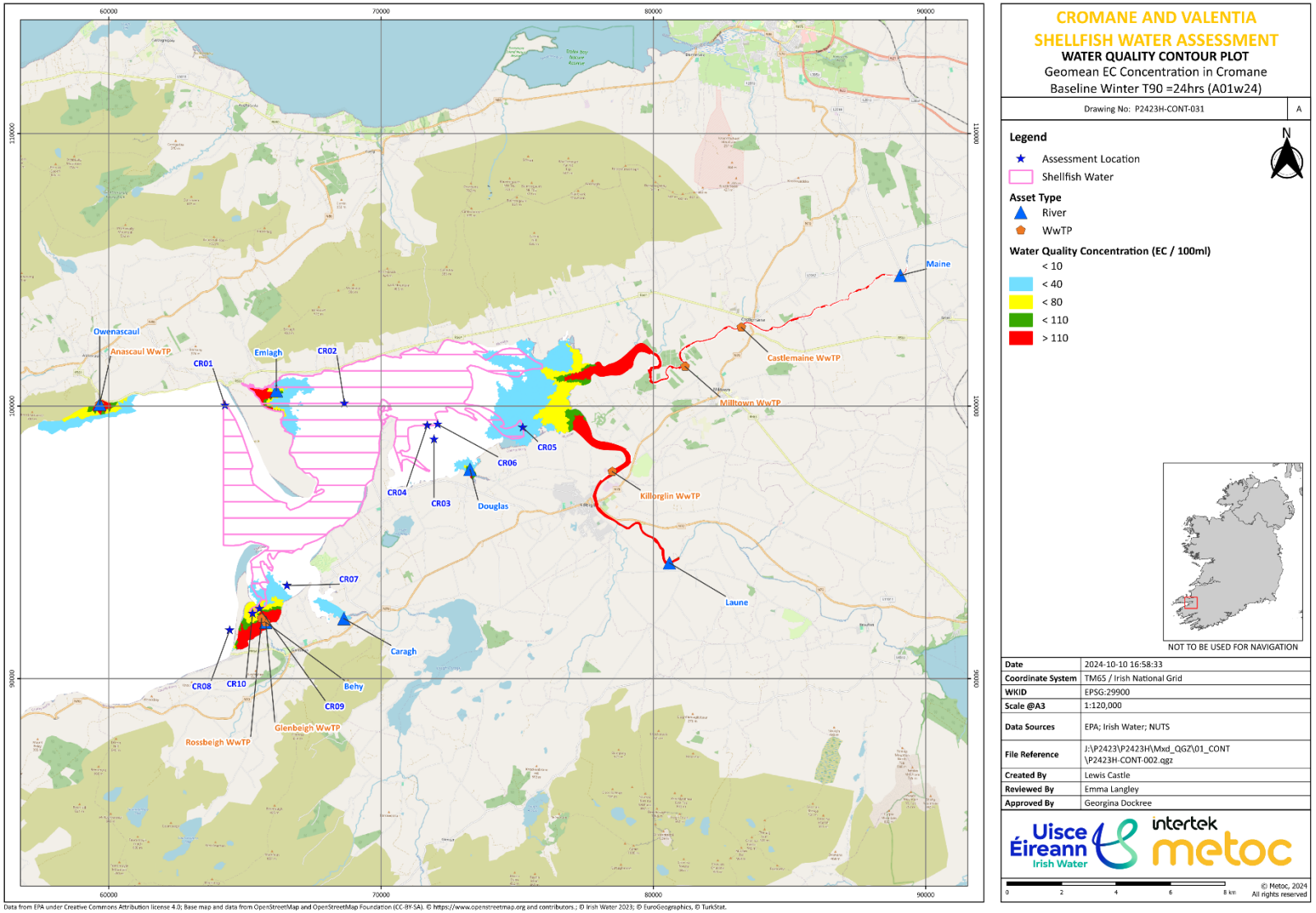


Figure 3-9 Contour Plot of Cromane Area for Baseline Scenario Geomean: Winter (T90 = 24 hours)



CROMANE AND VALENTIA
SHELLFISH WATER ASSESSMENT
WATER QUALITY CONTOUR PLOT
Geomean EC Concentration in Cromane
Baseline Winter T90 =24hrs (A01w24)

Drawing No: P2423H-CONT-031	A

Legend
- Assessment Location
- Shellfish Water

Asset Type
- River
- WwTP

Water Quality Concentration (EC / 100ml)
- < 10
- < 40
- < 80
- < 110
- > 110

N

NOT TO BE USED FOR NAVIGATION

Date	2024-10-10 16:58:33
Coordinate System	TM65 / Irish National Grid
WKID	EPSG:29900
Scale @A3	1:120,000
Data Sources	EPA; Irish Water; NUTS
File Reference	J:\P2423\P2423H\Mxd_QGZ\01_CONT \P2423H-CONT-002.qgz
Created By	Lewis Castle
Reviewed By	Emma Langley
Approved By	Georgina Dockree

Uisce Éireann Irish Water
intertek metoc

0 2 4 6 8 km

Figure 3-10 Contour Plot of Cromane Area for Baseline Scenario Geomean: Summer (T90 = 12 hours)

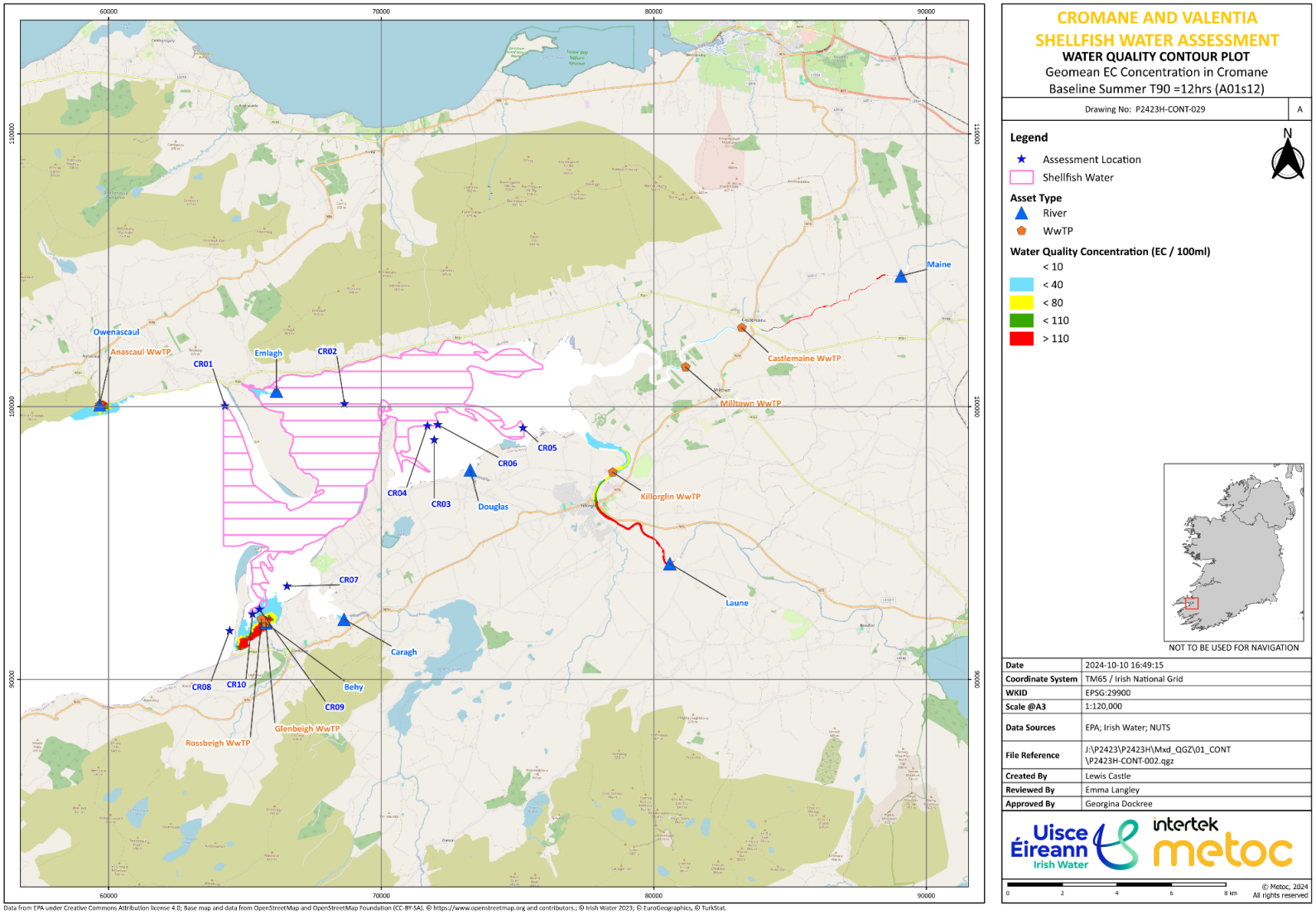
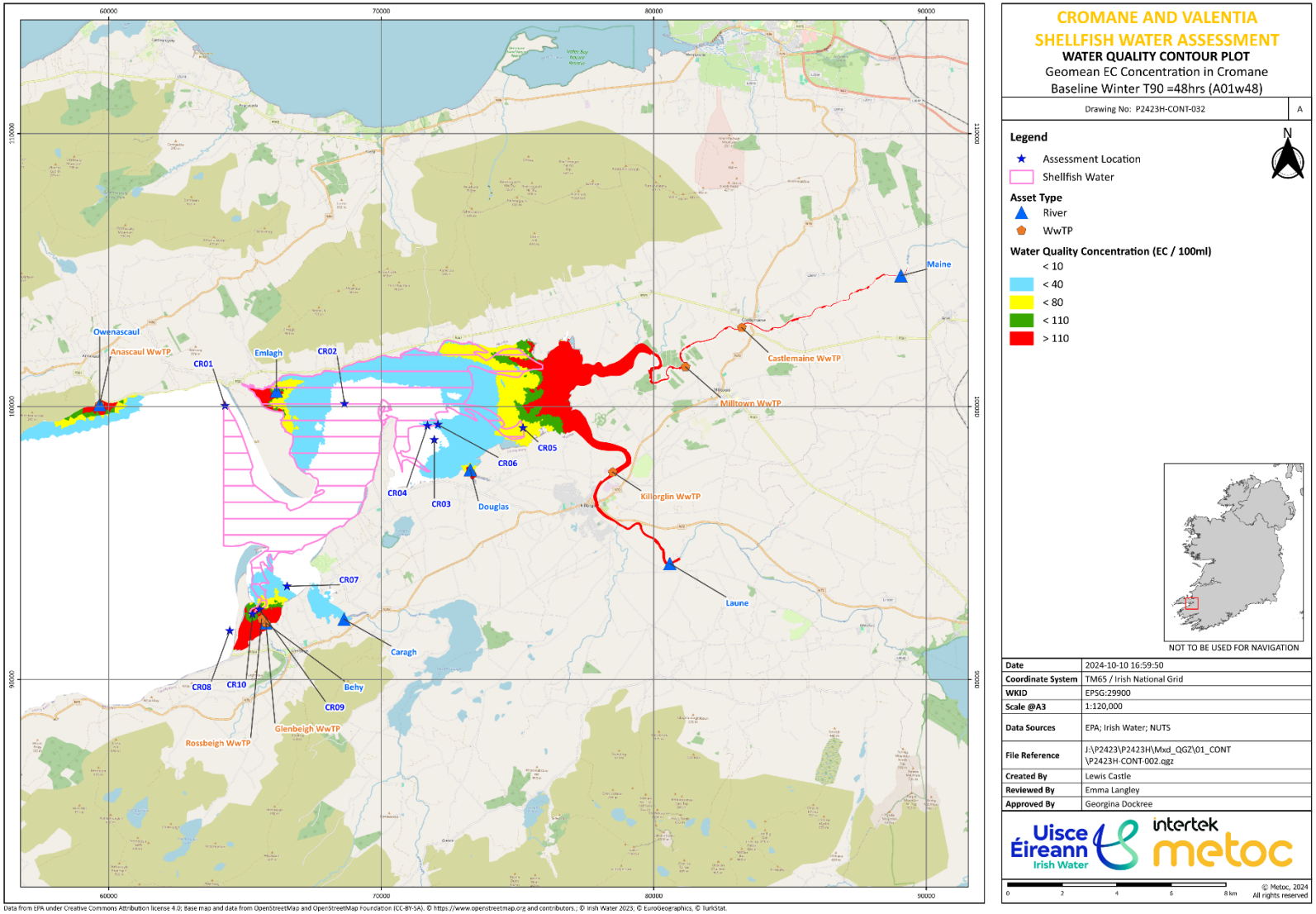


Figure 3-11 Contour Plot of Cromane Area for Baseline Scenario Geomean: Winter (T90 = 48 hours) – Sensitivity Test



CROMANE AND VALENTIA
SHELLFISH WATER ASSESSMENT
WATER QUALITY CONTOUR PLOT
Geomean EC Concentration in Cromane
Baseline Winter T90 =48hrs (A01w48)

Drawing No: P2423H-CONT-032 | A

Legend

- Assessment Location
- Shellfish Water

Asset Type

- River
- WwTP

Water Quality Concentration (EC / 100ml)

- < 10
- < 40
- < 80
- < 110
- > 110

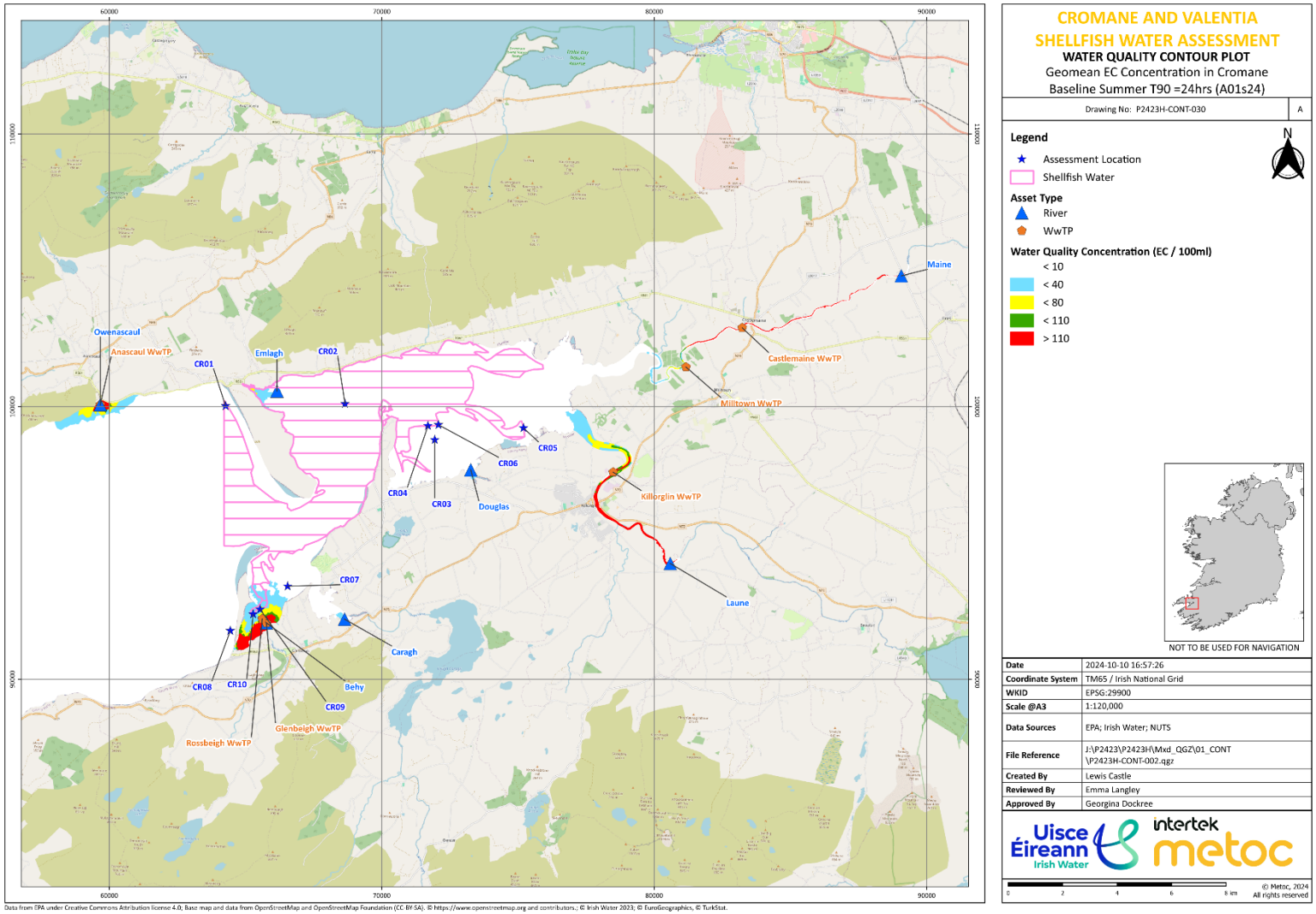
N

NOT TO BE USED FOR NAVIGATION

Date	2024-10-10 16:59:50
Coordinate System	TM65 / Irish National Grid
WKID	EPSG:29900
Scale @A3	1:120,000
Data Sources	EPA; Irish Water; NUTS
File Reference	J:\P2423\P2423H\Mxd_QGZ\01_CONT \P2423H-CONT-002.qgz
Created By	Lewis Castle
Reviewed By	Emma Langley
Approved By	Georgina Dockree

0 2 4 6 8 km

Figure 3-12 Contour Plot of Cromane Area for Baseline Scenario Geomean: Summer (T90 = 24 hours) – Sensitivity Test



CROMANE AND VALENTIA
SHELLFISH WATER ASSESSMENT
WATER QUALITY CONTOUR PLOT
Geomean EC Concentration in Cromane
Baseline Summer T90 =24hrs (A01s24)

Drawing No: P2423H-CONT-030	A

Legend
- Assessment Location
- Shellfish Water

Asset Type
- River
- WwTP

Water Quality Concentration (EC / 100ml)
- < 10
- < 40
- < 80
- < 110
- > 110

N

NOT TO BE USED FOR NAVIGATION

Date	2024-10-10 16:57:26
Coordinate System	TM65 / Irish National Grid
WKID	EPSG:29900
Scale @A3	1:120,000
Data Sources	EPA; Irish Water; NUTS
File Reference	J:\P2423\P2423H\Mxd_QGZ\01_CONT \P2423H-CONT-002.qgz
Created By	Lewis Castle
Reviewed By	Emma Langley
Approved By	Georgina Dockree

Uisce Éireann Irish Water | intertek metoc

0 2 4 6 8 km

3.1.2 Source Apportionment

In addition to the contour plots, the proportional contributions to impact for each individual source (source apportionment) has been calculated at each of the 19 assessment locations, ten locations in the Cromane area and nine locations in the Valentia area.

The source apportionment tables should be viewed in the context of the total impact (concentration) at these sites, for example a source may be significant contributor but to a low impact which does not exceed the relevant threshold. To facilitate this, the 97%-ile and geomean concentration for each assessment location is included.

It should be noted that source apportionment is presented for the 0-concentration threshold (that is over the full model period) in this study, as concentration does not exceed both thresholds (97%-ile and geomean) at the majority of the assessment locations.

Table 3-1 to Table 3-6 present the source apportionment results for the following scenarios, respectively:

- Baseline winter T_{90} = 24 hours for Valentia area (A01w24).
- Baseline summer T_{90} = 12 hours for Valentia area (A01s12).
- Baseline winter T_{90} = 24 hours for Cromane area (A01w24).
- Baseline summer T_{90} = 12hours for Cromane area (A01s12).
- Baseline winter T_{90} = 48 hours for Cromane area (A01w48).
- Baseline summer T_{90} = 24 hours for Cromane area (A01s24).

The modelled 97%-ile concentration does not exceed the 1500 EC/100 ml threshold under any scenario at any of the assessment locations, with the exception of CR09 under winter conditions.

The modelled geomean concentration does not the exceed the 110 EC/100 ml threshold under the Baseline winter or summer scenarios at any of the assessment locations. The winter sensitivity test using the higher decay rate shows that the geomean threshold was exceeded at one location (CR09) in Cromane.

For Valentia, all three WwTPs, i.e. Cahersiveen, Portmagee and Knightstown WwTPs, are the major contributors to the assessment locations for the winter and summer Baseline scenarios. However, the impacts on the Designated SFW are small and water quality standards are met at all assessment locations, so any upgrades to these WwTPs would have very little benefit on the overall water quality at the SFW.

For Cromane, the assessment point with the highest concentrations is CR09, where the concentration exceeds the 97%ile threshold in winter. The winter sensitivity test (T_{90} of 48 hours) also exceeds the geomean threshold of 110 EC/100 ml at the CR09 assessment point, although it is below the threshold under the Baseline scenario. The Glenbeigh WwTP is the largest Uisce Éireann asset that impacts on the water quality, however diffuse sources are also important, in particular the rivers Behy, Emlagh, Douglas and Laune. The impact of Uisce Éireann discharges is higher in the summer than the winter, primarily due to higher river flows (and loads) in winter.

Table 3-1 Source Apportionment for the Assessment Locations at Valentia – Baseline Scenario Winter (T_{90} 24 hours)

Assessment Location	VL01	VL02	VL03	VL04	VL05	VL06	VL07	VL08	VL09
Geomean (EC/100ml)	0	1	0	5	3	13	24	7	34
97%-ile (EC/100ml)	0	3	1	22	22	70	137	26	375
Pass / Fail Criteria?	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Source									
Cahersiveen WwTP	24.96%	49.62%	49.89%	0.02%	0.11%	0.02%	0.00%	0.00%	0.03%
Portmagee WwTP	4.94%	0.00%	0.02%	0.00%	0.00%	0.00%	99.97%	98.38%	99.65%
Knightstown WwTP	38.10%	28.84%	30.46%	99.98%	99.87%	99.98%	0.03%	1.61%	0.14%
Ferta River	5.28%	3.38%	3.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%
Caher River	6.80%	17.96%	16.19%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%
Derren River	4.95%	0.01%	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%
Oghermong River	5.09%	0.19%	0.26%	0.00%	0.02%	0.00%	0.00%	0.00%	0.03%
All Cromane's WwTPs	4.94%	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%
All Cromane's rivers	4.94%	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Table 3-2 Source Apportionment for the Assessment Locations at Valentia – Baseline Scenario Summer (T_{90} 12 hours)

Assessment Location	VL01	VL02	VL03	VL04	VL05	VL06	VL07	VL08	VL09
Geomean (EC/100ml)	0	0	0	4	2	12	18	4	28
97%-ile (EC/100ml)	0	1	1	25	26	92	138	22	411
Pass / Fail Criteria?	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Source									
Cahersiveen WwTP	28.77%	82.01%	78.17%	0.00%	0.06%	0.00%	0.00%	0.00%	0.23%
Portmagee WwTP	4.91%	0.00%	0.22%	0.00%	0.00%	0.00%	99.99%	98.21%	98.05%
Knightstown WwTP	36.84%	16.87%	19.79%	100.00%	99.94%	100.00%	0.01%	1.79%	0.33%
Ferta River	4.91%	0.08%	0.26%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%
Caher River	4.92%	1.04%	0.69%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%
Derren River	4.91%	0.00%	0.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%
Oghermong River	4.91%	0.00%	0.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%
All Cromane's WwTPs	4.91%	0.00%	0.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%
All Cromane's rivers	4.91%	0.00%	0.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%
Total	**100.00 %**	**100.00 %**	**100.00 %**	**100.00 %**	**100.00 %**	**100.00 %**	**100.00 %**	**100.00 %**	**100.00 %**

Table 3-3 Source Apportionment for the Assessment Locations at Cromane – Baseline Scenario Winter (T_{90} 24 hours)

Assessment Location	CR01	CR02	CR03	CR04	CR05	CR06	CR07	CR08	CR09	CR10
Geomean (EC/100ml)	0	1	1	2	23	3	5	0	90	63
97%-ile (EC/100ml)	0	6	4	7	89	8	105	0	1545	307
Pass / Fail Criteria?	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Fail	Pass
Source										
Anascaul WwTP	0.28%	0.03%	2.03%	0.00%	0.00%	0.00%	0.01%	0.01%	0.03%	0.00%
Castlemaine WwTP	0.00%	0.00%	2.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
Glenbeigh WwTP	8.79%	7.82%	3.66%	0.75%	0.02%	0.40%	32.85%	32.98%	34.23%	34.70%
Killorglin WwTP	0.34%	0.85%	2.83%	1.33%	1.99%	1.34%	0.02%	0.01%	0.03%	0.00%
Milltown WwTP	0.02%	0.05%	2.05%	0.03%	0.03%	0.03%	0.00%	0.00%	0.03%	0.00%
Rossbeigh WwTP	0.05%	0.04%	2.04%	0.00%	0.00%	0.00%	0.12%	0.21%	0.28%	0.23%
Behy River	16.33%	14.53%	5.05%	1.40%	0.03%	0.74%	61.00%	61.25%	63.55%	64.45%
Caragh River	1.51%	1.36%	2.35%	0.14%	0.00%	0.08%	3.75%	4.52%	0.83%	0.38%
Douglas River	0.49%	0.75%	18.93%	22.50%	1.13%	25.29%	0.10%	0.04%	0.07%	0.01%
Emlagh River	52.18%	20.23%	7.08%	5.79%	0.35%	4.20%	0.90%	0.36%	0.37%	0.10%
Maine River	4.57%	15.60%	7.66%	8.41%	8.20%	7.97%	0.33%	0.16%	0.13%	0.03%
Laune River	15.37%	38.70%	38.23%	59.64%	88.25%	59.95%	0.93%	0.46%	0.34%	0.09%
Owenascaul River	0.08%	0.01%	2.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
All Valentia's WwTPs	0.00%	0.00%	2.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
All Valentia's rivers	0.00%	0.00%	2.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Table 3-4 Source Apportionment for the Assessment Locations at Cromane – Baseline Scenario Summer (T_{90} 12 hours)

Assessment Location	CR01	CR02	CR03	CR04	CR05	CR06	CR07	CR08	CR09	CR10
Geomean (EC/100ml)	0	0	0	0	0	0	0	0	17	7
97%-ile (EC/100ml)	0	0	0	0	3	0	3	0	179	29
Pass / Fail Criteria?	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Source										
Anascaul WwTP	2.92%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
Castlemaine WwTP	0.00%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
Glenbeigh WwTP	74.44%	62.26%	26.16%	28.51%	1.14%	18.54%	90.05%	89.47%	87.85%	90.41%
Killorglin WwTP	0.01%	1.90%	3.67%	5.23%	26.59%	6.46%	0.00%	0.07%	0.19%	0.00%
Milltown WwTP	0.00%	0.01%	1.94%	0.00%	0.01%	0.00%	0.00%	0.07%	0.19%	0.00%
Rossbeigh WwTP	0.21%	0.18%	2.02%	0.11%	0.00%	0.07%	0.19%	0.30%	0.76%	0.49%
Behy River	7.45%	6.23%	4.36%	2.85%	0.11%	1.85%	9.01%	9.02%	8.96%	9.04%
Caragh River	0.41%	0.36%	2.12%	0.21%	0.01%	0.14%	0.73%	0.38%	0.28%	0.06%
Douglas River	0.01%	0.61%	37.57%	42.45%	8.55%	48.25%	0.00%	0.07%	0.19%	0.00%
Emlagh River	14.46%	23.48%	4.02%	5.74%	2.88%	6.83%	0.02%	0.09%	0.20%	0.00%
Laune River	0.01%	4.99%	6.50%	14.90%	60.71%	17.86%	0.00%	0.07%	0.19%	0.00%
Maine River	0.00%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
Owenascaul River	0.07%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
All Valentia's WwTPs	0.00%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
All Valentia's rivers	0.00%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Table 3-5 Source Apportionment for the Assessment Locations at Cromane – Baseline Scenario Winter (T_{90} 48 hours)

Assessment Location	CR01	CR02	CR03	CR04	CR05	CR06	CR07	CR08	CR09	CR10
Geomean (EC/100ml)	1	6	8	10	62	12	11	1	139	110
97%-ile (EC/100ml)	1	32	16	20	155	23	153	1	1688	404
Pass / Fail Criteria?	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Fail	Pass
Source										
Anascaul WwTP	1.06%	0.25%	2.03%	0.00%	0.00%	0.00%	0.10%	0.17%	0.03%	0.00%
Castlemaine WwTP	0.00%	0.01%	2.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
Glenbeigh WwTP	5.41%	3.94%	2.97%	0.61%	0.03%	0.40%	29.79%	30.24%	33.25%	34.22%
Killorglin WwTP	0.42%	0.58%	2.65%	0.96%	1.39%	0.98%	0.08%	0.06%	0.05%	0.01%
Milltown WwTp	0.06%	0.10%	2.08%	0.07%	0.06%	0.07%	0.01%	0.01%	0.03%	0.00%
Rossbeigh WwTp	0.03%	0.02%	2.03%	0.00%	0.00%	0.00%	0.11%	0.18%	0.25%	0.21%
Behy River	10.05%	7.31%	3.79%	1.14%	0.06%	0.75%	55.33%	56.15%	61.73%	63.55%
Caragh River	0.92%	0.68%	2.20%	0.11%	0.01%	0.07%	3.36%	4.19%	0.80%	0.47%
Douglas River	0.64%	0.70%	9.89%	11.61%	0.61%	13.38%	0.25%	0.18%	0.12%	0.04%
Emlagh River	30.92%	10.61%	4.75%	3.24%	0.33%	2.60%	1.53%	1.21%	0.53%	0.21%
Laune River	21.34%	29.08%	33.38%	48.22%	69.36%	49.15%	3.88%	3.11%	1.33%	0.55%
Maine River	28.83%	46.66%	26.11%	34.02%	28.15%	32.58%	5.53%	4.45%	1.75%	0.72%
Owenascaul River	0.31%	0.07%	2.03%	0.00%	0.00%	0.00%	0.03%	0.05%	0.03%	0.00%
All Valentia's WwTPs	0.00%	0.00%	2.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
All Valentia's rivers	0.00%	0.00%	2.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Table 3-6 Source Apportionment for the Assessment Locations at Cromane – Baseline Scenario Summer (T_{90} 24 hours)

Assessment Location	CR01	CR02	CR03	CR04	CR05	CR06	CR07	CR08	CR09	CR10
Geomean (EC/100ml)	0	0	0	0	2	0	1	0	45	29
97%-ile (EC/100ml)	0	0	1	1	16	1	13	0	345	96
Pass / Fail Criteria?	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Source										
Anascaul WwTP	7.28%	0.08%	1.94%	0.00%	0.00%	0.00%	0.00%	0.09%	0.19%	0.00%
Castlemaine WwTP	0.00%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
Glenbeigh WwTP	68.34%	63.17%	29.57%	30.50%	2.05%	21.30%	89.99%	89.29%	87.97%	90.51%
Killorglin WwTP	0.11%	2.15%	5.13%	6.12%	16.55%	7.18%	0.00%	0.08%	0.19%	0.00%
Milltown WwTP	0.00%	0.03%	1.95%	0.02%	0.03%	0.02%	0.00%	0.07%	0.19%	0.00%
Rossbeigh WwTP	0.18%	0.17%	2.02%	0.09%	0.01%	0.07%	0.20%	0.29%	0.60%	0.36%
Behy River	6.84%	6.32%	4.70%	3.05%	0.21%	2.13%	9.00%	9.00%	8.98%	9.06%
Caragh River	0.45%	0.42%	2.15%	0.23%	0.01%	0.15%	0.74%	0.49%	0.30%	0.07%
Douglas River	0.06%	0.49%	22.05%	26.66%	3.44%	30.71%	0.00%	0.08%	0.20%	0.00%
Emlagh River	16.10%	16.79%	3.38%	2.82%	1.24%	3.03%	0.06%	0.15%	0.20%	0.00%
Laune River	0.47%	10.35%	17.42%	30.50%	76.45%	35.39%	0.01%	0.08%	0.20%	0.00%
Maine River	0.00%	0.02%	1.95%	0.01%	0.02%	0.01%	0.00%	0.07%	0.19%	0.00%
Owenascaul River	0.18%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
All Valentia's WwTPs	0.00%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
All Valentia's rivers	0.00%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

3.2 Future Scenarios

3.2.1 Contour Plots

Figure 3-13 Figure 3-18 to present the 97%-ile contour plots , and Figure 3-19 to Figure 3-24 present the geomean plots for the following scenarios:

- Future winter T_{90} = 24 hours for Valentia area (A02w24)
- Future summer T_{90} = 12 hours for Valentia area (A02s12)
- Future winter T_{90} = 24 hours for Cromane area (A02w24)
- Future summer T_{90} = 12hours for Cromane area (A02s12)
- Future sensitivity winter T_{90} = 48 hours for Cromane area (A02w48)
- Future sensitivity summer T_{90} = 24 hours for Cromane area (A02w24)

Figure 3-13 and Figure 3-14 show the 97%-ile concentration contour plots for the combined total impact from all modelled sources for the Future scenario (winter T_{90}=24 hours and summer T_{90}=12 hours respectively) in Valentia. Figure 3-15 and Figure 3-16 present the same for Cromane.

For the majority of the SFW area, the 97%-ile concentration does not exceed the threshold of 1500 EC/100 ml. The impacts are generally less than 500 EC/100 ml across most of the SFW, in all scenarios. Similar to the Baseline scenario, there are some localised areas of water quality concentrations greater than 1500 EC/100 ml within the Portmagee Channel, and upstream of the Cromane SFW where multiple sources of both WwTP and rivers outflow (Callanafersy West). The local area around each discharge (river and WwTP) has high EC concentrations which exceed the 1500 EC/100 ml threshold. However, these high concentrations quickly reduce within a short distance from the discharge point, so overall, the Designated SFW area meets the 97%-ile standards, apart from in the immediate vicinity of the River Emlagh discharge in Cromane under the winter scenario.

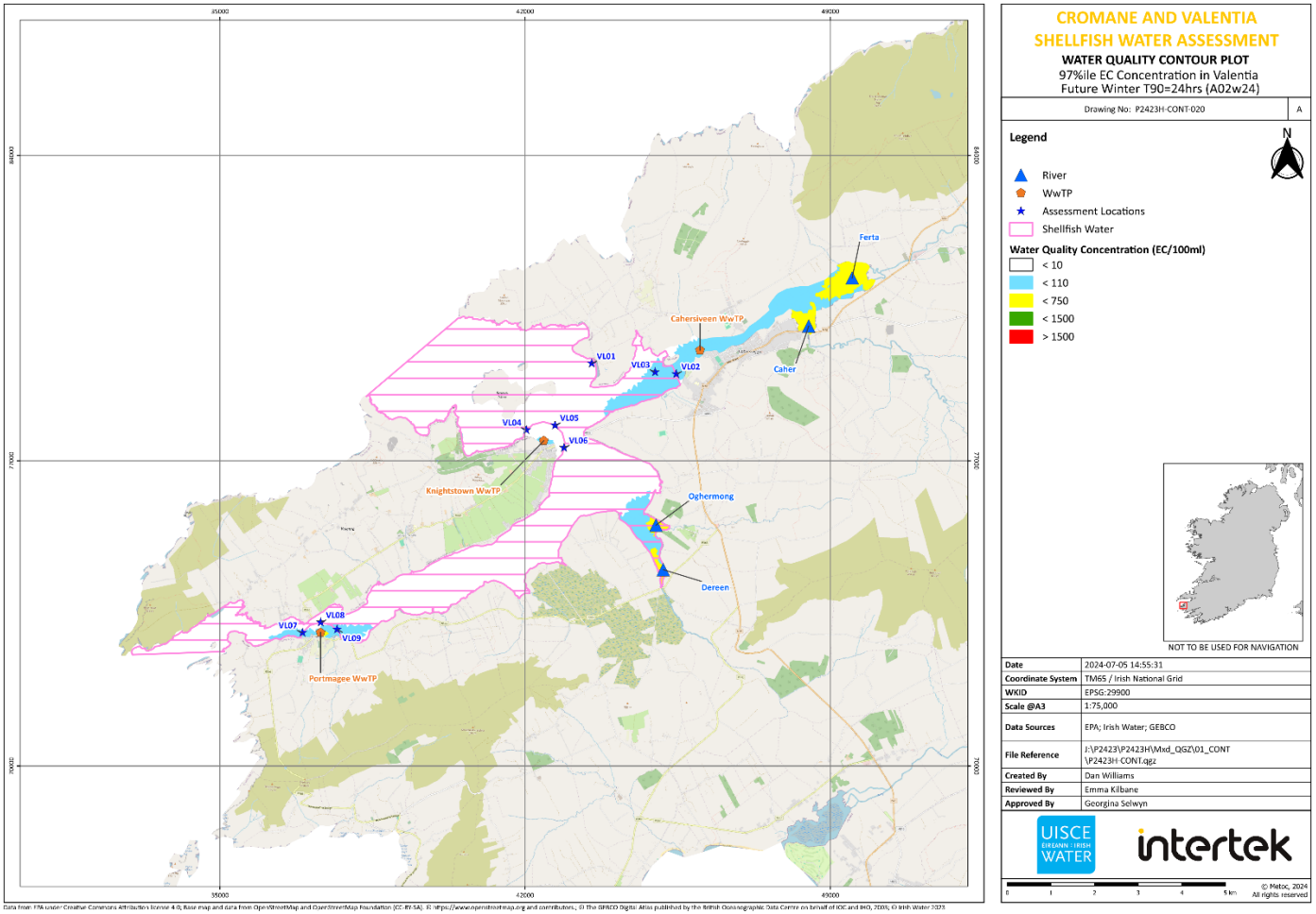
The results of the sensitivity tests undertaken to see the impact of using a higher T_{90} (48 hours for winter and 24 hours for summer) are shown in Figure 3-17 and Figure 3-18. The winter sensitivity test results show a larger area which exceeds the 97%-ile threshold, when compared to the Future runs using a lower T_{90}. There is little difference in the summer results, regardless of the T_{90} used. Overall, the sensitivity test results indicates that the increased area of impact does not extend into the SFW, and so does not change the SFW quality apart from in the immediate vicinity of the River Emlagh discharge where exceedance occurs under both the Baseline and Future scenarios in winter.

Figure 3-19 and Figure 3-20 show the geomean concentration contour plots for the combined total impact from all modelled sources for the Future scenario (winter T_{90}=24 hours and summer T_{90}=12 hours respectively) in Valentia. Figure 3-21 and Figure 3-22 present the same for Cromane.

The geomean concentration does not exceed 110 EC/100 ml under any scenario, except for in the vicinity of the River Emlagh discharge (Cromane) and the River Oghermong (Valentia) under winter conditions, and impacts are generally less than 50 EC/100 ml in the majority of both SFWs. However, there are some localised areas of water quality concentrations greater than 110 EC/100 ml upstream of the Cromane SFW where multiple sources of both WwTP and rivers outflow (Callanafersy West). The local area around each discharge (river and WwTP) has high EC concentrations which exceed 110 EC/100 ml. However, these high concentrations quickly reduce within a short distance from the discharge point, so overall, the Designated SFW area meets the geomean standard, apart from in two scenarios previously stated. The results from the Future scenarios show little difference to the geomean concentration compared to Baseline scenarios.

The results of the sensitivity tests undertaken to see the impact of using a higher T_{90} (48 hours for winter and 24 hours for summer) are shown in Figure 3-23 and Figure 3-24 . The results for the winter Future sensitivity scenario show a larger area in the vicinity of the River Emlagh discharge that exceeds the geomean threshold, compared to the scenario where a lower T_{90} was applied. There is also an area in the north-east of the designated SFW where concentrations exceed the geomean threshold when the higher winter T_{90} is applied.

Figure 3-13 Contour Plot of Valentia Area for Future Scenario 97%-ile: Winter (T_{90} = 24 hours)



CROMANE AND VALENTIA
SHELLFISH WATER ASSESSMENT
WATER QUALITY CONTOUR PLOT
97%ile EC Concentration in Valentia
Future Winter T90=24hrs (A02w24)

Drawing No: P2423H-CONT-020 | A

Legend

- River
- WwTP
- Assessment Locations
- Shellfish Water

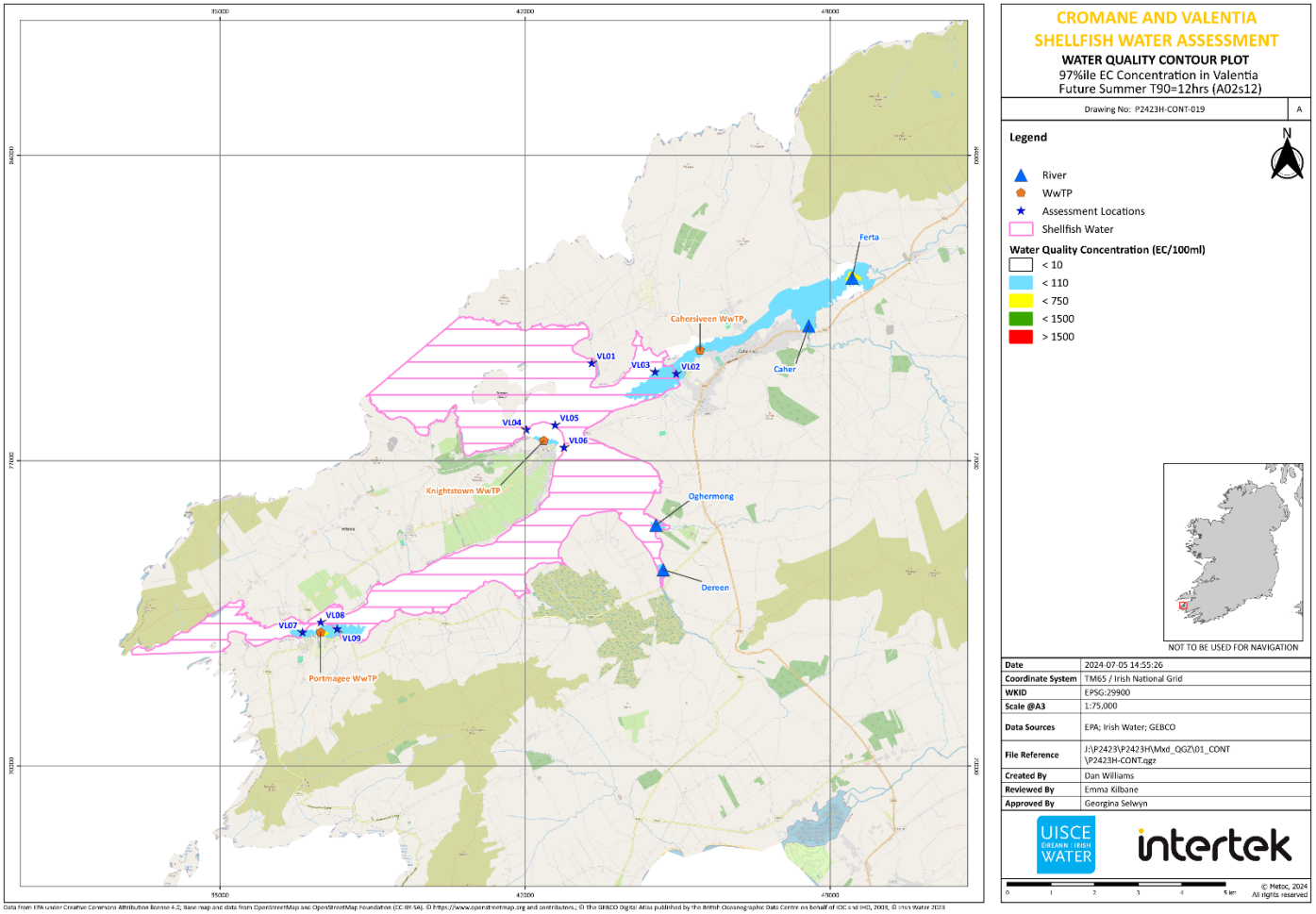
Water Quality Concentration (EC/100ml)

- < 10
- < 110
- < 750
- < 1500
- > 1500

NOT TO BE USED FOR NAVIGATION

Date	2024-07-05 14:55:31
Coordinate System	TM65 / Irish National Grid
WKID	EPSG:29900
Scale @A3	1:75,000
Data Sources	EPA; Irish Water; GEBCO
File Reference	J:\P2423\P2423H\Mxd_QGZ\01_CONT \P2423H-CONT.qgz
Created By	Dan Williams
Reviewed By	Emma Kilbane
Approved By	Georgina Selwyn

Figure 3-14 Contour Plot of Valentia Area for Future Scenario 97%-ile: Summer (T_{90} = 12 hours)



CROMANE AND VALENTIA
SHELLFISH WATER ASSESSMENT
WATER QUALITY CONTOUR PLOT
97%ile EC Concentration in Valentia
Future Summer T90=12hrs (A02s12)

Drawing No: P2423H-CONT-019 | A

Legend

- River
- WwTP
- Assessment Locations
- Shellfish Water

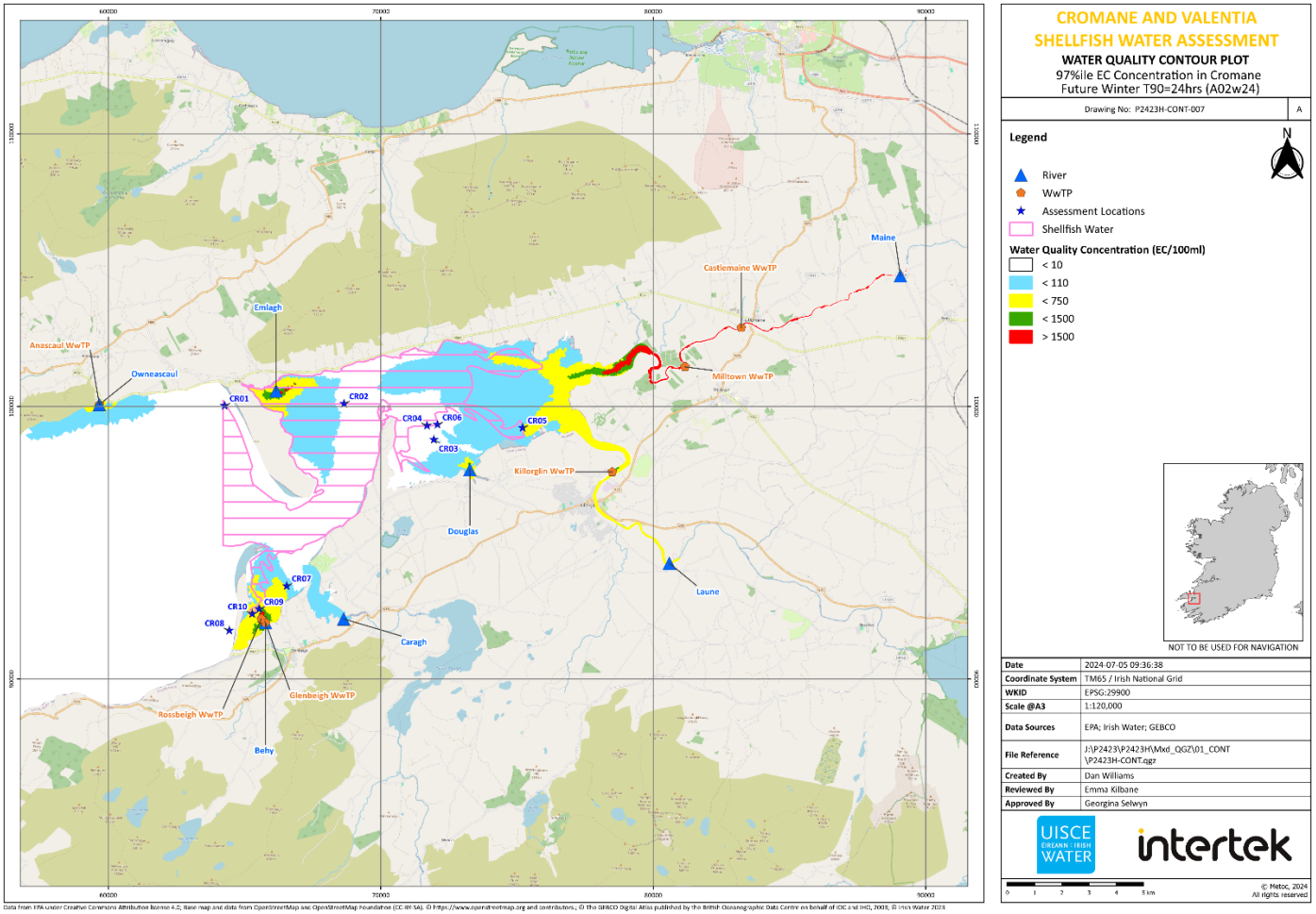
Water Quality Concentration (EC/100ml)

- < 10
- < 110
- < 750
- < 1500
- > 1500

NOT TO BE USED FOR NAVIGATION

Date	2024-07-05 14:55:26
Coordinate System	TM65 / Irish National Grid
WKID	EPSG:29900
Scale @A3	1:75,000
Data Sources	EPA; Irish Water; GEBCO
File Reference	J:\P2423\P2423H\Mxd_QGZ\01_CONT \P2423H-CONT.qgz
Created By	Dan Williams
Reviewed By	Emma Kilbane
Approved By	Georgina Selwyn

Figure 3-15 Contour Plot of Cromane Area for Future Scenario 97%-ile: Winter (T_{90} = 24 hours)



CROMANE AND VALENTIA
SHELLFISH WATER ASSESSMENT
WATER QUALITY CONTOUR PLOT
97%ile EC Concentration in Cromane
Future Winter T90=24hrs (A02w24)

Drawing No: P2423H-CONT-007 | A

Legend

- River
- WwTP
- Assessment Locations
- Shellfish Water

Water Quality Concentration (EC/100ml)

- < 10
- < 110
- < 750
- < 1500
- > 1500

N

NOT TO BE USED FOR NAVIGATION

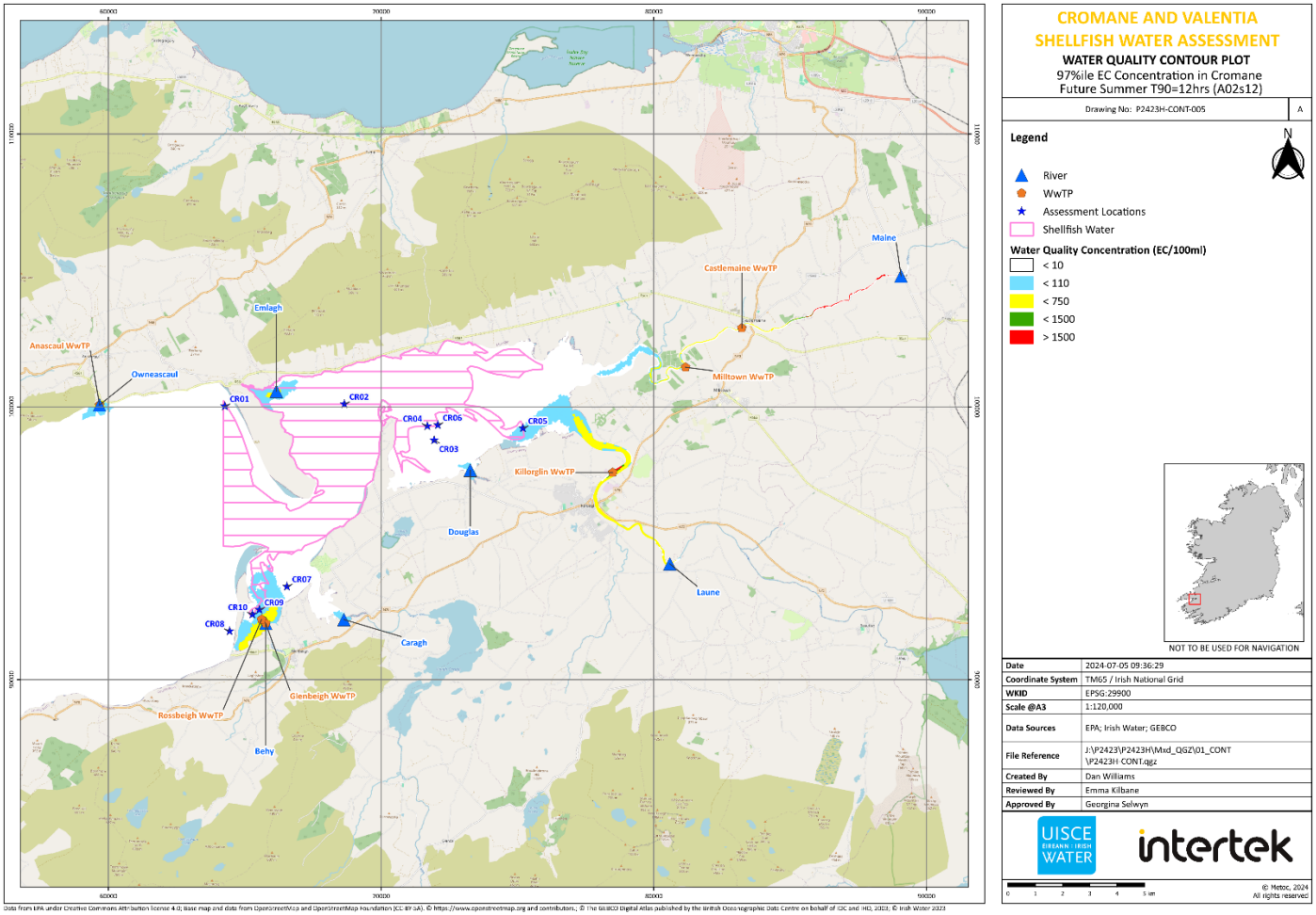
Date	2024-07-05 09:36:38
Coordinate System	TM65 / Irish National Grid
WKID	EPSG:29900
Scale @A3	1:120,000
Data Sources	EPA; Irish Water; GEBCO
File Reference	J:\P2423\P2423H\Mxd_QGZ\01_CONT \P2423H-CONT.qgz
Created By	Dan Williams
Reviewed By	Emma Kilbane
Approved By	Georgina Selwyn

UISCE ÉIREANN IRISH WATER

intertek

0 1 2 3 4 5 km

Figure 3-16 Contour Plot of Cromane Area for Future Scenario 97%-ile: Summer (T_{90} = 12 hours)



CROMANE AND VALENTIA
SHELLFISH WATER ASSESSMENT
WATER QUALITY CONTOUR PLOT
97%ile EC Concentration in Cromane
Future Summer T90=12hrs (A02s12)

Drawing No: P2423H-CONT-005 | A

Legend

- River
- WwTP
- Assessment Locations
- Shellfish Water

Water Quality Concentration (EC/100ml)

- < 10
- < 110
- < 750
- < 1500
- > 1500

NOT TO BE USED FOR NAVIGATION

Date	2024-07-05 09:36:29
Coordinate System	TM65 / Irish National Grid
WKID	EPSG:29900
Scale @A3	1:120,000
Data Sources	EPA; Irish Water; GEBCO
File Reference	J:\P2423\P2423H\Mxd_QGZ\01_CONT \P2423H CONT.qgz
Created By	Dan Williams
Reviewed By	Emma Kilbane
Approved By	Georgina Selwyn

UISCE ÉIREANN - IRISH WATER

0 1 2 3 4 5 km

Figure 3-17 Contour Plot of Cromane Area for Future Scenario 97%-ile: Winter (T_{90} = 48 hours) – Sensitivity Test

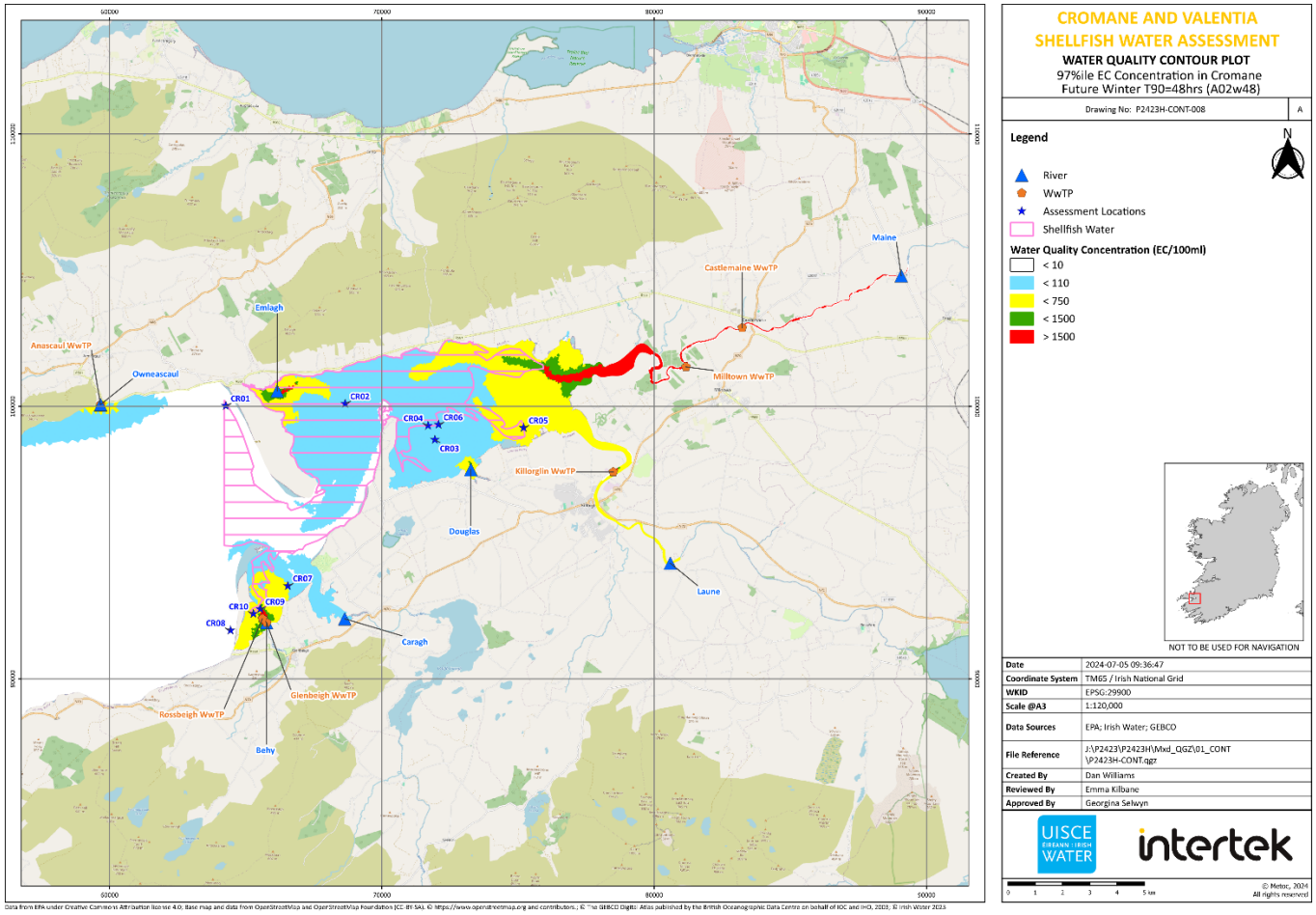


Figure 3-18 Contour Plot of Cromane Area for Future Scenario 97%-ile: Summer (T_{90} = 24 hours) – Sensitivity Test

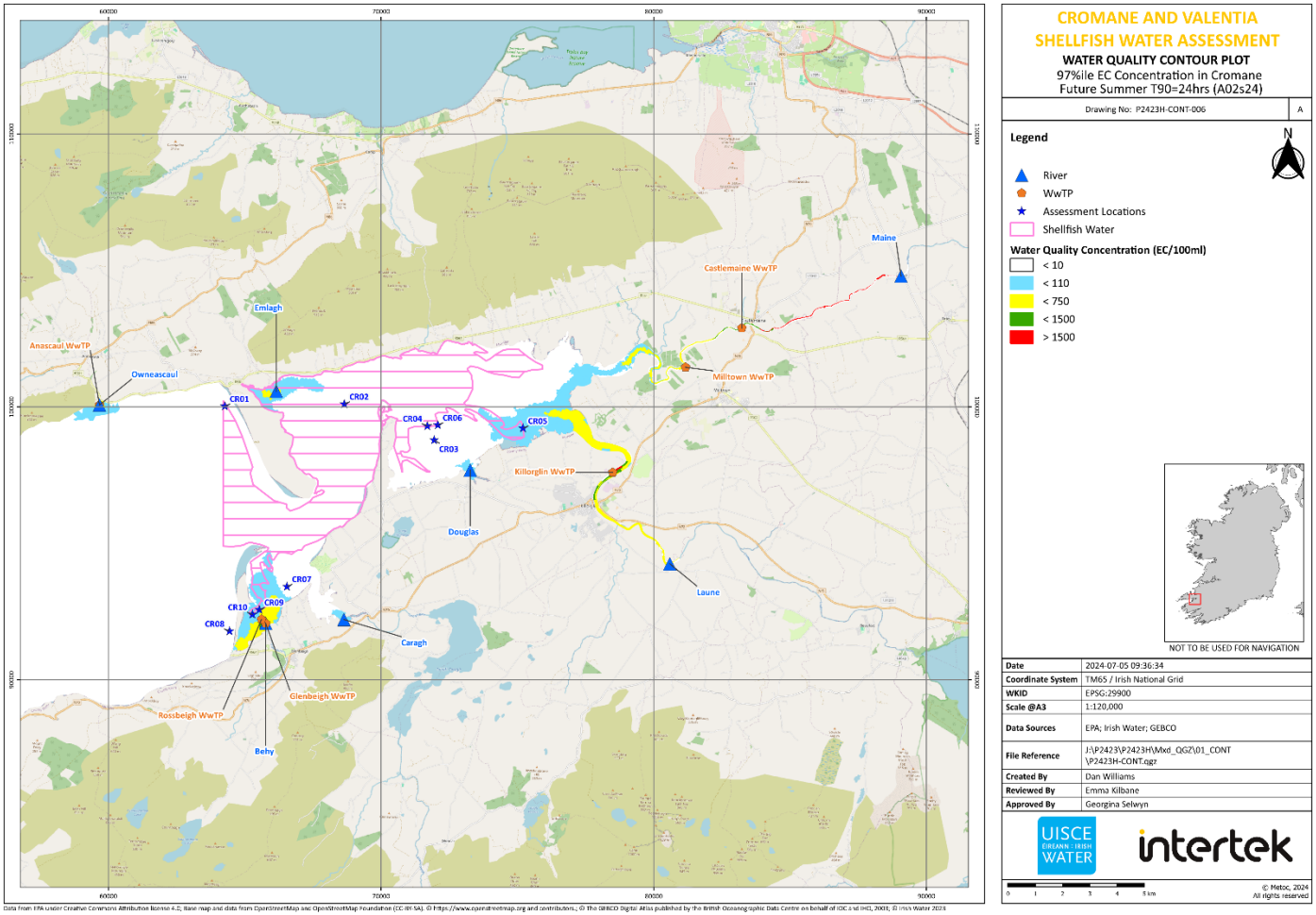


Figure 3-19 Contour Plot of Valentia Area for Future Scenario Geomean: Winter (T_{90} = 24 hours)

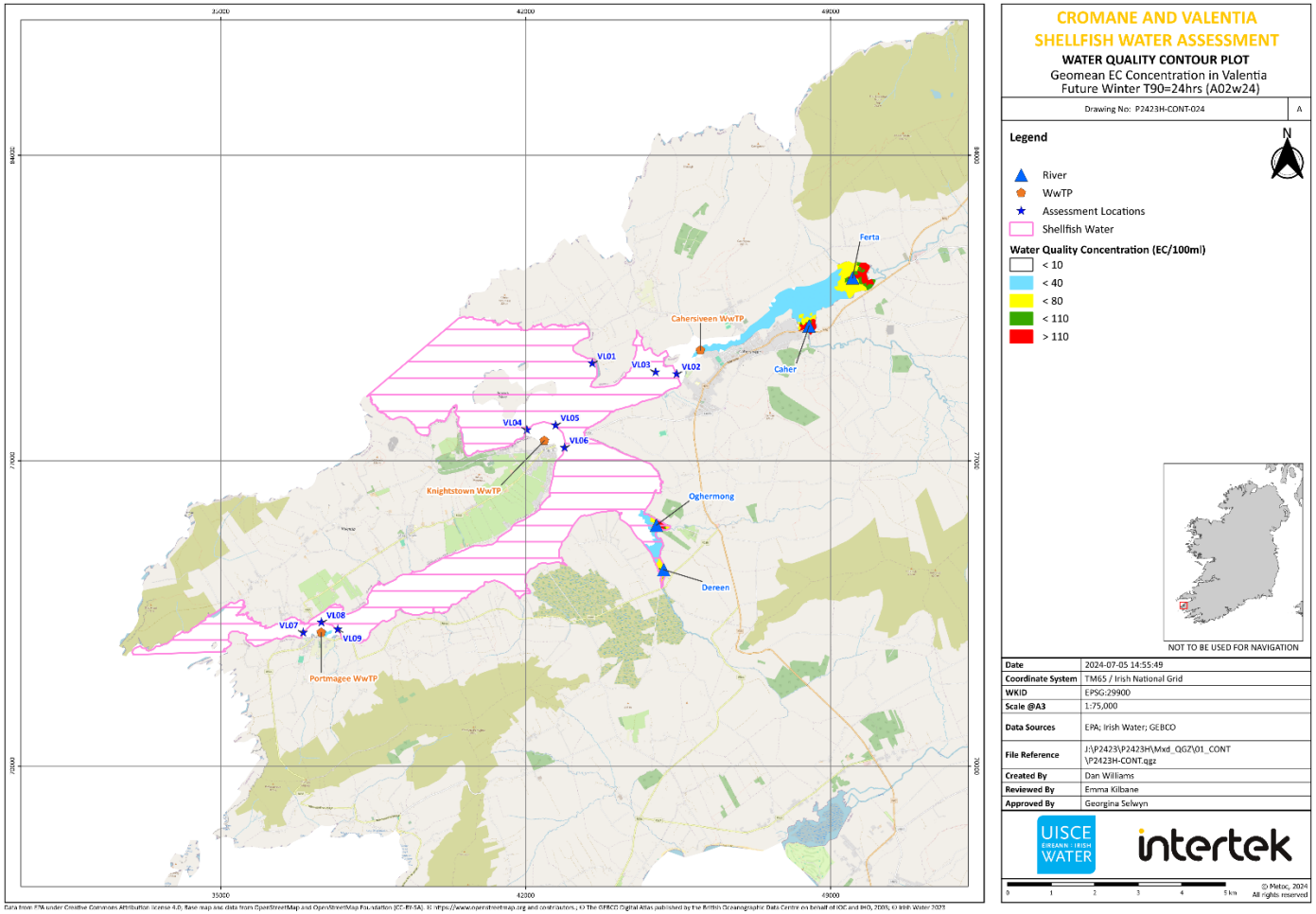
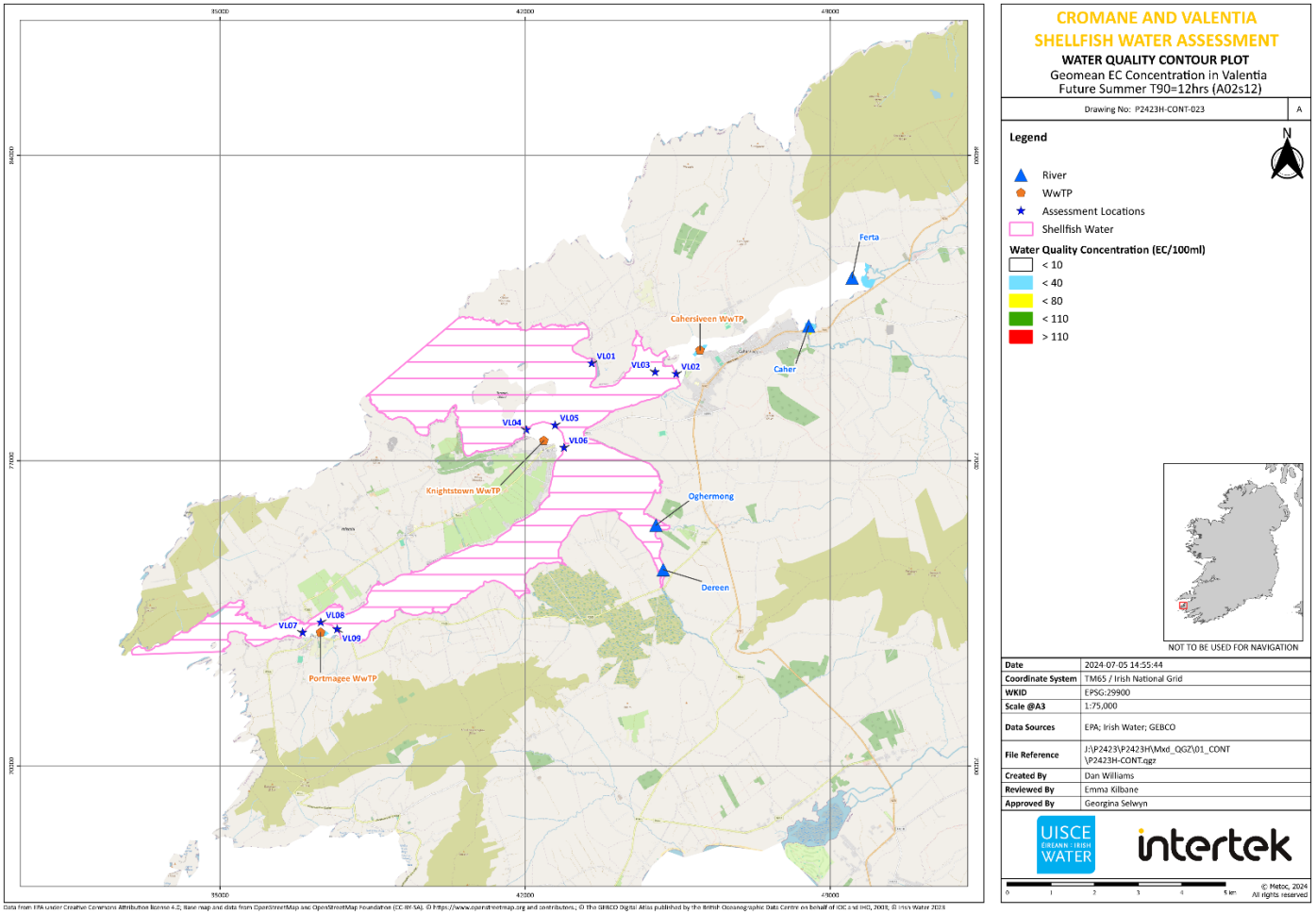


Figure 3-20 Contour Plot of Valentia Area for Future Scenario Geomean: Summer (T_{90} = 12 hours)



CROMANE AND VALENTIA
SHELLFISH WATER ASSESSMENT
WATER QUALITY CONTOUR PLOT
Geomean EC Concentration in Valentia
Future Summer T90=12hrs (A02s12)

Drawing No: P2423H-CONT-023 | A

Legend

- River
- WwTP
- Assessment Locations
- Shellfish Water

Water Quality Concentration (EC/100ml)

- < 10
- < 40
- < 80
- < 110
- > 110

NOT TO BE USED FOR NAVIGATION

Date	2024-07-05 14:55:44
Coordinate System	TM65 / Irish National Grid
WKID	EPSG:29900
Scale @A3	1:75,000
Data Sources	EPA; Irish Water; GEBCO
File Reference	J:\P2423\P2423H\Mxd_QGZ\01_CONT \P2423H-CONT.qgz
Created By	Dan Williams
Reviewed By	Emma Kilbane
Approved By	Georgina Selwyn

Figure 3-21 Contour Plot of Cromane Area for Future Scenario Geomean: Winter (T_{90} = 24 hours)

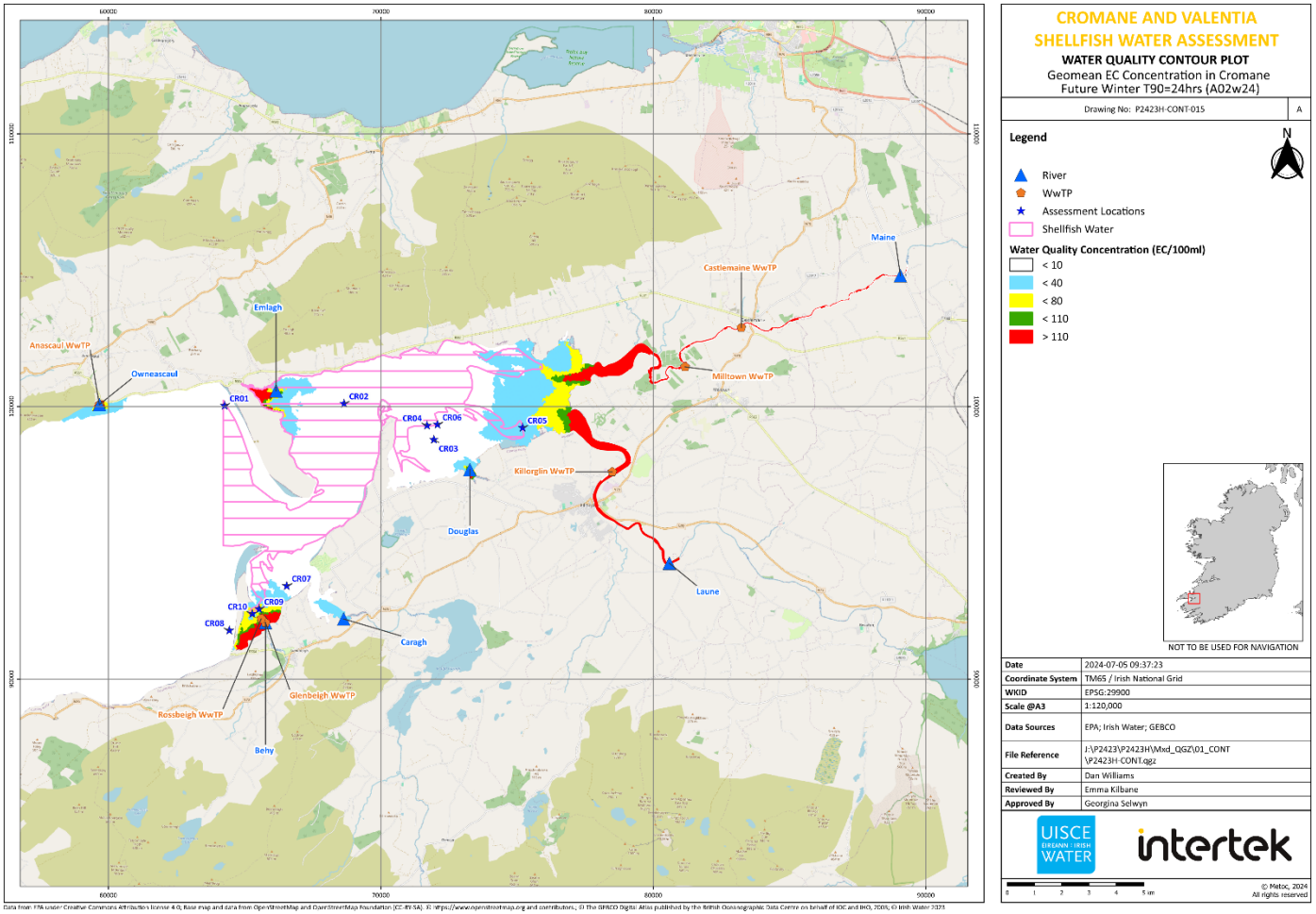


Figure 3-22 Contour Plot of Cromane Area for Future Scenario Geomean: Summer (T_{90} = 12 hours)

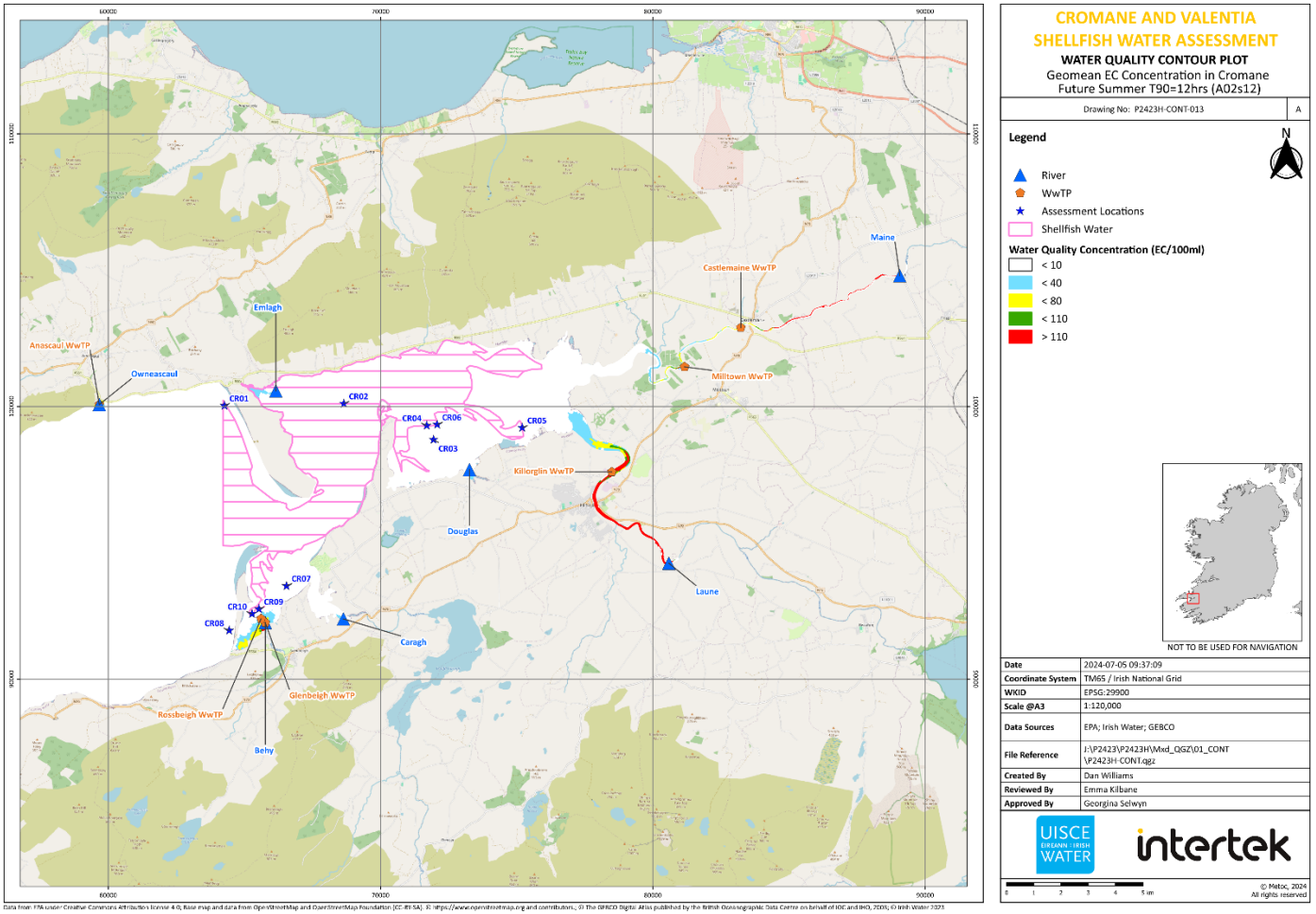
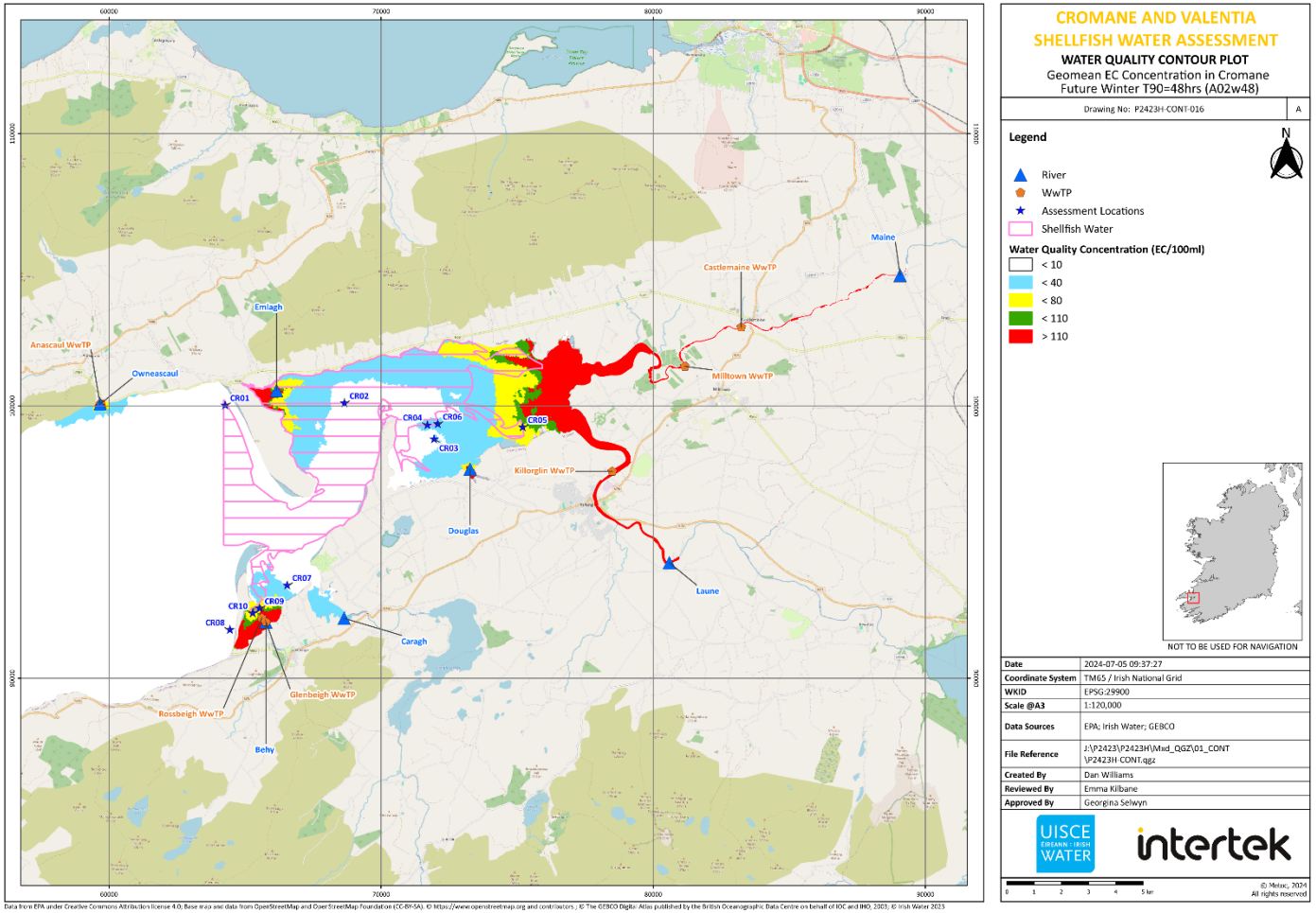


Figure 3-23 Contour Plot of Cromane Area for Future Scenario Geomean: Winter (T_{90} = 48 hours) – Sensitivity Test



CROMANE AND VALENTIA
SHELLFISH WATER ASSESSMENT
WATER QUALITY CONTOUR PLOT
Geomean EC Concentration in Cromane
Future Winter T90=48hrs (A02w48)

Drawing No: P2423H-CONT-016	A

Legend

N

- River
- WwTP
- Assessment Locations
- Shellfish Water

Water Quality Concentration (EC/100ml)

- < 10
- < 40
- < 80
- < 110
- > 110

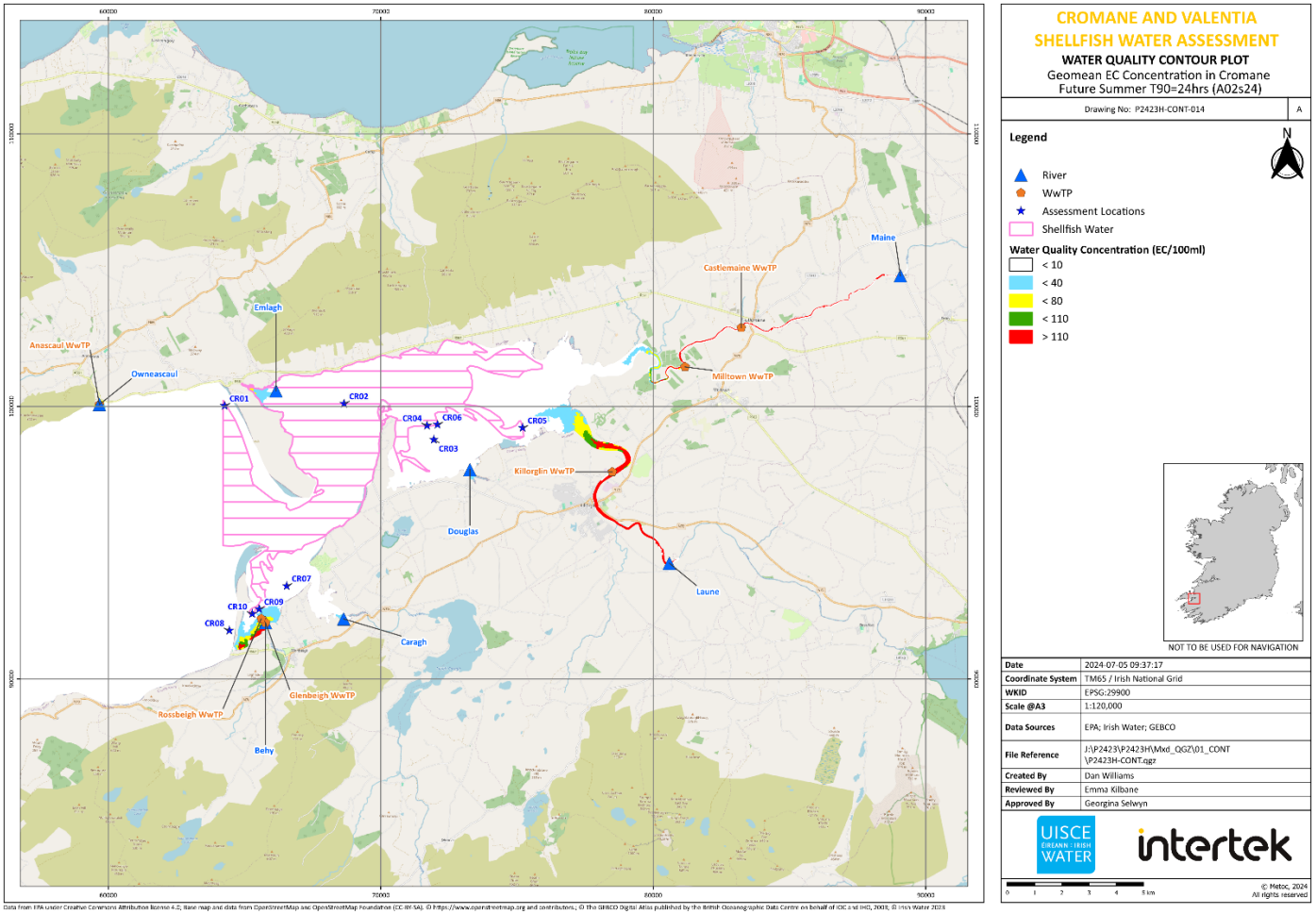
NOT TO BE USED FOR NAVIGATION

Date	2024-07-05 09:37:27
Coordinate System	TM65 / Irish National Grid
WKID	EPSG:29900
Scale @A3	1:120,000
Data Sources	EPA; Irish Water; GEBCO
File Reference	J:\P2423\P2423H\Mxd_QGZ\01_CONT \P2423H-CONT.qgz
Created By	Dan Williams
Reviewed By	Emma Kilbane
Approved By	Georgina Selwyn

UISCE ÉIREANN · IRISH WATER
intertek

0 1 2 3 4 5 km

Figure 3-24 Contour Plot of Cromane Area for Future Scenario Geomean: Summer (T90 = 24 hours) – Sensitivity Test



CROMANE AND VALENTIA
SHELLFISH WATER ASSESSMENT
WATER QUALITY CONTOUR PLOT
Geomean EC Concentration in Cromane
Future Summer T90=24hrs (A02s24)

Drawing No: P2423H-CONT-014 | A

Legend

- River
- WwTP
- Assessment Locations
- Shellfish Water

Water Quality Concentration (EC/100ml)

- < 10
- < 40
- < 80
- < 110
- > 110

NOT TO BE USED FOR NAVIGATION

Date	2024-07-05 09:37:17
Coordinate System	TM65 / Irish National Grid
WKID	EPSG:29900
Scale @A3	1:120,000
Data Sources	EPA; Irish Water; GEBCO
File Reference	J:\P2423\P2423H\Mxd_QGZ\01_CONT \P2423H-CONT.qgz
Created By	Dan Williams
Reviewed By	Emma Kilbane
Approved By	Georgina Selwyn

3.2.2 Source Apportionment

In addition to the contour plots, the proportional contributions to impact for each individual source (source apportionment) has been calculated at each of the 19 assessment locations.

The source apportionment tables should be viewed in the context of the total impact (concentration) at these sites, for example a source may be significant contributor but to a low impact which does not exceed the relevant threshold. To facilitate this, the 97%-ile and geomean concentrations for each assessment location are included.

Similar to the Baseline scenario, source apportionment is calculated at the 0 threshold concentration as concentrations do not exceed both thresholds (97%-ile and geomean) at the majority of the assessment locations.

Table 3-7 to Table 3-12 present the source apportionment results for the following scenarios:

- Future winter T_{90} = 24 hours for the Valentia area (A02w24)
- Future summer T_{90} = 12 hours for the Valentia area (A02s12)
- Future winter T_{90} = 24 hours for the Cromane area (A02w24)
- Future summer T_{90} = 12hours for the Cromane area (A02s12)
- Future sensitivity winter T_{90} = 48 hours for the Cromane area (A02w48)
- Future sensitivity summer T_{90} = 24 hours for the Cromane area (A02s24)

Both the 97%-ile and geomean concentrations do not exceed their relevant threshold concentrations, i.e. 1500 EC/100 ml for 97%ile and 110 EC/100 ml for geomean, under any Future scenario and at any of the assessment locations.

For Valentia, the three WwTPs, i.e. Cahersiveen, Portmagee and Knightstown WwTPs, are still the major contributors to impact under both summer and winter Future scenarios. The reduction in the final effluent concentration for Portmagee and Knightstown WwTPs significantly reduce impacts at nearby assessment locations, while the slight increase in concentration for Cahersiveen WwTP slightly increase its local impact. It should be noted that water quality standards are met at all assessment locations under both Baseline and Future scenarios.

For Cromane, the Glenbeigh WwTP has a reduced proportional impact compared to the Baseline scenaro due to the reduction in discharge concentration. Under the Future scenarios, Killorglin WwTP is the largest Uisce Éireann asset to impact water quality, although impacts are dominated by river sources, in particular the Behy, Emlagh, Douglas and Laune rivers.

It should be noted that the geomean standard at the CR09 assessment point is now met under the Future scenario under all conditions due to the improvement of Glenbeigh WwTP (reduction in concentration). In contrast, under the Baseline winter sensitivity test scenario (T_{90} of 48 hours), the geomean standard at this point was predicted to be exceeded.

Table 3-7 Source Apportionment for the Assessment Location at Valentia Area Future Scenario Winter (T_{90} 24 hours)

Assessment Location	VL01	VL02	VL03	VL04	VL05	VL06	VL07	VL08	VL09
Geomean (EC/100ml)	0	5	3	0	0	1	4	1	6
97%-ile (EC/100ml)	2	18	12	1	1	2	18	4	50
Pass / Fail Criteria?	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Source									
Cahersiveen WwTP	59.17%	95.53%	95.65%	12.21%	38.16%	13.88%	0.00%	0.08%	0.04%
Portmagee WwTP	4.94%	0.00%	0.02%	0.00%	0.00%	0.00%	99.99%	99.77%	99.73%
Knightstown WwTP	5.19%	0.36%	0.25%	87.61%	61.16%	85.92%	0.00%	0.11%	0.04%
Ferta River	5.13%	0.81%	0.82%	0.01%	0.03%	0.01%	0.00%	0.00%	0.03%
Caher River	5.73%	3.19%	3.12%	0.04%	0.13%	0.04%	0.00%	0.00%	0.03%
Derren River	4.95%	0.01%	0.02%	0.01%	0.07%	0.02%	0.00%	0.01%	0.03%
Oghermong River	5.00%	0.11%	0.09%	0.11%	0.44%	0.13%	0.00%	0.03%	0.04%
All Cromane's WwTPs	4.94%	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%
All Cromane's rivers	4.94%	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Table 3-8 Source Apportionment for the Assessment Location at Valentia Area Future Scenario Summer (T_{90} 12 hours)

Assessment Location	VL01	VL02	VL03	VL04	VL05	VL06	VL07	VL08	VL09
Geomean (EC/100ml)	0	4	2	0	0	1	2	1	6
97%-ile (EC/100ml)	1	20	10	1	1	3	16	3	45
Pass / Fail Criteria?	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Source									
Cahersiveen WwTP	59.80%	99.81%	98.03%	2.13%	11.52%	0.72%	0.00%	0.07%	0.23%
Portmagee WwTP	4.91%	0.00%	0.22%	0.00%	0.00%	0.00%	100.00%	99.23%	98.12%
Knightstown WwTP	5.82%	0.12%	0.43%	97.87%	88.47%	99.28%	0.00%	0.70%	0.26%
Ferta River	4.91%	0.01%	0.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%
Caher River	4.91%	0.07%	0.25%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%
Derren River	4.91%	0.00%	0.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%
Oghermong River	4.91%	0.00%	0.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%
All Cromane's WwTPs	4.91%	0.00%	0.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%
All Cromane's rivers	4.91%	0.00%	0.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Table 3-9 Source Apportionment for the Assessment Location at Cromane Area Future Scenario Winter (T_{90} 24 hours)

Assessment Location	CR01	CR02	CR03	CR04	CR05	CR06	CR07	CR08	CR09	CR10
Geomean (EC/100ml)	0	1	2	3	28	3	4	0	64	44
97%-ile (EC/100ml)	0	7	4	8	107	8	73	0	1077	214
Pass / Fail Criteria?	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Anascaul WwTP	0.01%	0.00%	2.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
Castlemaine WwTP	0.01%	0.03%	2.04%	0.01%	0.01%	0.01%	0.00%	0.00%	0.03%	0.00%
Glenbeigh WwTP	1.04%	0.95%	2.21%	0.07%	0.00%	0.04%	4.95%	4.51%	5.43%	5.52%
Killorglin WwTP	3.94%	9.22%	10.50%	13.69%	19.32%	13.69%	0.30%	0.14%	0.13%	0.03%
Milltown WwTP	0.11%	0.36%	2.15%	0.18%	0.17%	0.17%	0.01%	0.00%	0.03%	0.00%
Rossbeigh WwTP	1.98%	0.68%	2.19%	0.09%	0.00%	0.05%	1.47%	5.47%	2.10%	2.23%
Behy River	18.15%	16.72%	5.23%	1.33%	0.03%	0.70%	84.41%	77.85%	87.91%	89.17%
Caragh River	1.54%	1.43%	2.34%	0.12%	0.00%	0.06%	4.62%	5.35%	1.06%	0.52%
Douglas River	0.48%	0.72%	17.19%	20.29%	0.94%	22.97%	0.12%	0.05%	0.08%	0.02%
Emlagh River	51.16%	19.69%	6.73%	5.05%	0.30%	3.65%	1.09%	0.42%	0.46%	0.13%
Laune River	15.07%	35.28%	34.19%	51.82%	72.44%	51.78%	1.15%	0.55%	0.43%	0.12%
Maine River	4.48%	14.22%	6.98%	7.24%	6.79%	6.81%	0.40%	0.19%	0.15%	0.04%
Owenascaul River	0.08%	0.01%	2.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
All Valentia's WwTPs	0.00%	0.00%	2.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
All Valentia's rivers	1.98%	0.68%	2.19%	0.09%	0.00%	0.05%	1.47%	5.47%	2.10%	2.23%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Table 3-10 Source Apportionment for the Assessment Location at Cromane Area Future Scenario Summer (T_{90} 12 hours)

Assessment Location	CR01	CR02	CR03	CR04	CR05	CR06	CR07	CR08	CR09	CR10
Geomean (EC/100ml)	0	0	0	0	1	0	0	0	5	2
97%-ile (EC/100ml)	0	0	0	0	20	0	1	0	46	6
Pass / Fail Criteria?	Pass	pas	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Source										
Anascaul WwTP	0.17%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
Castlemaine WwTP	0.00%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
Glenbeigh WwTP	33.08%	27.58%	11.37%	7.54%	0.08%	4.20%	51.49%	51.42%	47.80%	49.86%
Killorglin WwTP	0.27%	11.79%	17.28%	36.86%	79.18%	39.79%	0.00%	0.08%	0.20%	0.00%
Milltown WwTP	0.00%	0.03%	1.94%	0.01%	0.02%	0.01%	0.00%	0.07%	0.19%	0.00%
Rossbeigh WwTP	3.35%	2.84%	3.17%	1.08%	0.01%	0.62%	4.05%	4.88%	11.00%	9.80%
Behy River	26.58%	22.17%	9.52%	6.06%	0.07%	3.38%	41.38%	41.34%	38.45%	40.07%
Caragh River	1.42%	1.22%	2.50%	0.46%	0.00%	0.25%	2.98%	1.46%	0.60%	0.26%
Douglas River	0.03%	0.35%	32.08%	32.46%	3.74%	36.39%	0.00%	0.07%	0.19%	0.00%
Emlagh River	34.85%	31.67%	5.55%	7.97%	1.75%	7.38%	0.09%	0.15%	0.21%	0.01%
Laune River	0.04%	2.35%	4.95%	7.57%	15.15%	7.99%	0.00%	0.07%	0.19%	0.00%
Maine River	0.00%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
Owenascaul River	0.21%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
All Valentia's WwTPs	0.00%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
All Valentia's rivers	0.00%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Table 3-11 Source Apportionment for the Assessment Location at Cromane Area Future Scenario Winter (T_{90} 48 hours)

Assessment Location	CR01	CR02	CR03	CR04	CR05	CR06	CR07	CR08	CR09	CR10
Geomean (EC/100ml)	1	6	8	11	71	13	8	0	100	78
97%-ile (EC/100ml)	1	35	18	22	180	26	106	1	1176	282
Pass / Fail Criteria?	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Source										
Anascaul WwTP	0.02%	0.01%	2.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
Castlemaine WwTP	0.05%	0.08%	2.07%	0.06%	0.05%	0.06%	0.01%	0.01%	0.03%	0.00%
Glenbeigh WwTP	0.64%	0.46%	2.13%	0.06%	0.00%	0.04%	4.46%	4.45%	5.38%	5.58%
Killorglin WwTP	4.97%	6.51%	8.80%	10.33%	14.23%	10.49%	1.11%	0.93%	0.41%	0.18%
Milltown WwTP	0.42%	0.66%	2.35%	0.45%	0.36%	0.43%	0.10%	0.08%	0.06%	0.01%
Rossbeigh WwTP	0.13%	0.09%	2.05%	0.01%	0.00%	0.01%	0.61%	0.94%	1.34%	1.27%
Behy River	11.19%	8.10%	3.84%	1.12%	0.06%	0.74%	75.95%	76.79%	87.02%	90.24%
Caragh River	0.94%	0.69%	2.19%	0.10%	0.01%	0.07%	4.13%	5.33%	1.02%	0.66%
Douglas River	0.64%	0.68%	9.21%	10.58%	0.53%	12.23%	0.31%	0.23%	0.15%	0.06%
Emlagh River	30.81%	10.40%	4.55%	2.92%	0.29%	2.35%	1.84%	1.55%	0.65%	0.29%
Laune River	21.20%	27.79%	30.73%	43.69%	59.92%	44.34%	4.71%	3.95%	1.65%	0.75%
Maine River	28.66%	44.46%	23.97%	30.67%	24.56%	29.25%	6.72%	5.66%	2.18%	0.98%
Owenascaul River	0.33%	0.08%	2.03%	0.00%	0.00%	0.00%	0.04%	0.07%	0.03%	0.00%
All Valentia's WwTPs	0.00%	0.00%	2.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
All Valentia's rivers	0.00%	0.00%	2.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Table 3-12 Source Apportionment for the Assessment Location at Cromane Area Future Scenario Summer (T_{90} 24 hours)

Assessment Location	CR01	CR02	CR03	CR04	CR05	CR06	CR07	CR08	CR09	CR10
Geomean (EC/100ml)	0	0	0	0	5	0	0	0	11	7
97%-ile (EC/100ml)	0	0	0	1	56	1	3	0	82	21
Pass / Fail Criteria?	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Anascaul WwTP	0.44%	0.01%	1.94%	0.00%	0.00%	0.00%	0.00%	0.08%	0.19%	0.00%
Castlemaine WwTP	0.00%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
Glenbeigh WwTP	26.40%	25.21%	10.72%	6.90%	0.13%	4.14%	51.10%	50.99%	49.23%	51.14%
Killorglin WwTP	3.78%	19.89%	29.55%	46.62%	71.51%	49.01%	0.14%	0.22%	0.22%	0.01%
Milltown WwTP	0.04%	0.20%	2.01%	0.11%	0.10%	0.11%	0.00%	0.08%	0.19%	0.00%
Rossbeigh WwTP	2.48%	2.39%	2.92%	0.80%	0.02%	0.49%	4.15%	4.65%	8.28%	7.40%
Behy River	21.22%	20.26%	9.00%	5.54%	0.11%	3.33%	41.06%	40.99%	39.60%	41.10%
Caragh River	1.39%	1.32%	2.47%	0.40%	0.01%	0.24%	3.22%	1.97%	0.68%	0.31%
Douglas River	0.16%	0.43%	15.64%	18.77%	1.45%	21.49%	0.01%	0.09%	0.20%	0.00%
Emlagh River	42.27%	23.00%	3.91%	3.43%	0.64%	3.00%	0.27%	0.43%	0.24%	0.02%
Laune River	1.28%	7.25%	12.14%	17.42%	26.02%	18.18%	0.04%	0.12%	0.20%	0.00%
Maine River	0.00%	0.02%	1.94%	0.01%	0.01%	0.01%	0.00%	0.07%	0.19%	0.00%
Owenascaul River	0.55%	0.01%	1.94%	0.00%	0.00%	0.00%	0.00%	0.08%	0.19%	0.00%
All Valentia's WwTPs	0.00%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
All Valentia's rivers	0.00%	0.00%	1.94%	0.00%	0.00%	0.00%	0.00%	0.07%	0.19%	0.00%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

4. CONCLUSIONS

Intertek Metoc have carried out a detailed Stage 4A assessment of the impact on bacterial water quality in the Cromane and Valentia Designated SFWs from Uisce Éireann WwTP discharges and river discharges. The assessment included both Baseline and Future scenarios. Default T_{90} values have been applied in the model and the sensitivity to decay rates for Cromane has also been assessed, to reflect the impact of salinity and turbidity on bacteria die-off in the water. In total, six model scenarios for both Baseline and Future conditions were undertaken:

- Baseline, Future winter T_{90} = 24 hours for the Valentia area.
- Baseline, Future summer T_{90} = 12 hours for the Valentia area.
- Baseline, Future winter T_{90} = 24 hours for the Cromane area.
- Baseline, Future summer T_{90} = 12hours for the Cromane area.
- Baseline, Future sensitivity winter T_{90} = 48 hours for the Cromane area.
- Baseline, Future sensitivity summer T_{90} = 24 hours for the Cromane area.

The key conclusions taken from the Baseline scenario are as follows:

- In the Valentia area, the 97%-ile water quality standard is predicted to be met in the whole Designated SFW, under both winter and summer conditions. The geomean standard is predicted to be met in the Designated SFW, apart from in the immediate vicinity of the discharge locations of Oghermong and Dereen rivers in winter. The geomean concentration also exceeds 110 EC/100 ml in the immediate vicinity of the Knightstown WwTP discharge in summer and winter, although this is outside of the Designated SFW.
- In the Cromane area, both the 97%-ile and geomean standards are predicted to be met across the designated SFW for both summer and winter, apart from in the immediate vicinity of the River Emlagh where both standards are exceeded in winter.
- T_{90} sensitivity runs indicate that the maximum impact is sensitive to the bacteria die-off rate, however, increased T_{90} values have little effect on the exceedance of both thresholds within the Designated SFW, and in fact only cause exceedance during Baseline winter conditions in small areas (Laune and Maine estuaries and close to the Glenbeigh / Rossbeigh WwTP outfalls).
- For Valentia, both the 97%-ile and geomean standards are met at all assessment locations. The three WwTPs, i.e. Cahersiveen, Portmagee and Knightstown WwTPs, are the major contributors to total impact in both the winter and summer Baseline scenarios, although the total impact is low. As water quality standards are met at all assessment locations, any upgrades to these WwTPs would have very little benefit on the overall water quality at the SFW.
- For Cromane, the CR09 assessment location has the highest impacts – the 97%ile concentration exceeds the 1500 EC/100 ml threshold in both the Baseline and sensitivity test winter scenarios. The geomean concentration is also exceeded under the higher T_{90} (48 hours) in winter. Of Uisce Éireann assets, the Glenbeigh WwTP is the largest impactor to water quality at CR09, however river sources, in particular the Behy, Emlagh, Douglas and Laune rivers, are also important contributors, particularly in winter.

The key conclusions taken from the Future scenario are as follows:

- In the Valentia area the modelled 97%-ile and geomean concentration across the Designated SFW is less than the 1500 EC/100 ml and 110 EC/100 ml thresholds in both summer and winter. The reduction of EC concentration at the Portmagee and Knightstown WwTPs result in an improvement in the water quality compared to the Baseline scenario for both summer and

winter conditions, as the geomean threshold which is exceeded in the Baseline is met under the Future scenario.

- In the Cromane area, similar to the Baseline scenario, the modelled 97%ile and geomean concentrations for the SFW is less than the thresholds, apart from in the immediate vicinity of the River Emlagh discharge where both thresholds are exceeded in winter.
- The modelled 97%-ile and geomean concentrations do not exceed either the threshold at any of the assessment locations in both Valentia and Cromane SFWs. CR09 continues to be the assessment location which is impacted the most by the modelled sources, in particular the River Behy, Glenbeigh WwTP and Rossbeigh WwTP.
- The sensitivity tests to increase T_{90} values for summer and winter show an increase in the 97%- ile and geomean concentrations. Both the 97%-ile and the geomean thresholds are exceeded in winter in the vicinity of the River Emlagh discharge and in the north-east region of the Cromane SFW.

REFERENCES

1 Intertek. (2024). Cromane and Valentia Calibration and Validation Report (P2423_R3297_Rev1), Revision 1, September 2024

2 Uisce Éireann. (2022). Technical Standards – Marine Modelling Document No: IRISH WATER-TEC-100-015, Revision: 3.00, effective date: 02/03/2022