Greater Dublin Drainage Project Addendum

Environmental Impact Assessment Report Addendum: Volume 3A Part A of 6

Chapter 8A Marine Water Quality

Uisce Éireann

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Contents

8. Marine Water Quality

8.1 Introduction

As detailed in Chapter 1A (Introduction) in Volume 2A Part A of this Environmental Impact Assessment Report (EIAR) Addendum, we have reviewed Chapter 8 (Marine Water Quality) in Volume 3 Part A of the EIAR submitted with the original 2018 planning application, in the light of:

- Changes to the baseline environment;
- The requirement for updated surveys; and
- Changes to the law, policy, and industry standards and guidance in the intervening period.

Table 8.1 includes a summary of the project elements which were incorporated into the planning design for the Greater Dublin Drainage Project (hereafter referred to as the Proposed Project) following direction at the Oral Hearing in 2019 and the subsequent planning conditions applied to the 2018 planning application submission. A full description is included in Chapter 4A (Description of the Proposed Project) in Volume 2A Part A of the EIAR Addendum. The remaining elements of the Proposed Project included in the 2018 planning application remain unchanged.

Table 8.1: Updated Proposed Project Elements

Updated Element	Outline Description of Updated Element
Ultraviolet (UV) Treatment	• UV Treatment is to be included in the treatment process at the proposed wastewater treatment plant (WwTP) in the northern section of the WwTP site. • The UV treatment system will be designed for the expected flows at the plant and will be installed on the final effluent line. UV treatment will be in operation 24 hours a day, 365 days a year. • The UV system will consist of a minimum of three and a maximum of four treatment units located below or partially below ground level with an above-ground Motor Control Centre (MCC) (in a kiosk) along with minor maintenance and control equipment (e.g. shut-off button, frame for supporting, retracting and cleaning of UV lamps etc.).
River Mayne Culvert Extension	• Extension of the River Mayne Culvert on the proposed access road to the WwTP by 4m (from 21m to 25m) to cater for the full width of the future north south link road.

This Chapter of the EIAR Addendum contains, where necessary, an updated assessment of the impact of the proposed outfall pipeline route (marine section) which is an element of the Proposed Project on the water quality of the receiving marine environment. This Addendum Chapter should be read in conjunction with Chapter 8 (Marine Water Quality) in Volume 3 Part A of the EIAR submitted with the original 2018 planning application.

8.1.1 Legislative Requirements

This Section of Chapter 8 (Marine Water Quality) in Volume 3 Part A of the EIAR submitted with the original 2018 planning application was reviewed in order to determine if there have been any updates to the regulatory and legislative framework since the 2018 submission that define the water quality requirements pertaining specifically to the proposed outfall pipeline route (marine section) discharge point and covers the:

- Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy (hereafter referred to as the Water Framework Directive (WFD));
- Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment (hereafter referred to as the Urban Waste Water Treatment Directive (UWWTD));
- Directive 2006/113/EC of the European Parliament and of the Council of 12 December 2006 on the quality required of shellfish waters (hereafter referred to as the Shellfish Waters Directive);
- Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC (hereafter referred to as the Bathing Waters Directive); and

- Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (hereafter referred to as the Marine Strategy Framework Directive).

8.1.2 Water Framework Directive

There have been no updates to the WFD since the submission of the 2018 planning application. However, the national transposing regulations have been updated, as relevant, by S.I. No. 77/2019 - European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (hereafter referred to as the Surface Water Amendment Regulations) and S.I. No. 166/2022 - European Union (Water Policy) (Amendment) Regulations 2022.

The Surface Water Amendment Regulations came into effect in 2019, and the updated water quality standards for the general physico-chemical conditions supporting the biological elements in transitional and coastal waters are listed in Table 8.8.2.

Table 8.8.2: Environmental Quality Objectives from the Surface Water Amendment Regulations

Parameter	Transitional	Coastal
Biochemical Oxygen Demand (BOD) (mg/l O_2)[1]		
	Good status ≤ 4.0 (95th percentile)	n/a
	High status ≤ 3.0 (95th percentile)	n/a
Dissolved Inorganic Nitrogen (DIN) (mg/l N)[2]		
0 psu3	n/a	Good status ≤ 2.60
0 psu	n/a	High status ≤ 1.0
34.5 psu	n/a	Good status ≤ 0.25
34.5 psu	n/a	High status ≤ 0.17
Molybdate Reactive Phosphorus (MRP) (mg/l P)[4]		
0 – 17 psu	Good status ≤ 0.06 (median)	n/a
0 – 17 psu	High status ≤ 0.03 (median)	n/a
17 - 35 psu	Good status ≤ 0.04 (median)	n/a
17 - 35 psu	High status ≤ 0.025 (median)	n/a

[1] milligrams per litre of Oxygen.
[2] milligrams per litre of Nitrogen.
[3] psu: The practical salinity unit defines salinity in terms of a conductivity ratio of a sample to that of a solution of 32.4336g of Potassium Chloride (KCl) at 15ºC in 1kg of solution. A sample of seawater at 15°C with a conductivity equal to this KCl solution has a salinity of exactly 35 psu.
[4] milligrams per litre of Phosphorus

8.1.3 Urban Wastewater Treatment Directive

On 26 October 2022, following consultation with stakeholders and the general public, the European Commission published its proposal for a revised Urban Wastewater Treatment Directive (the Recast Directive). The Recast Directive proposes to bring in changes to increase the standard of wastewater treatment required across the EU, and support the transition towards a circular economy and energy neutrality by 2040. The Recast Directive proposes amongst other matters, to add the objective of nutrient recovery, and tighten phosphorus removal requirements for sewage works. The Recast Directive is still in draft form and likely to be subject to further debate and revision before it is adopted and comes into force on a phased basis. Precisely what will be required and by when is therefore unknown at this point in time. Uisce Éireann has, as part of its site selection process, sought to ensure that the site selected for the Wastewater Treatment Plant (WwTP) (at Clonshagh) is sized so as to allow for such expansion or adaptation as may be required in the future. The Proposed Project site will likely be sufficient to accommodate any additional treatment infrastructure required to meet the requirements of the Recast Directive. Once those requirements are known and in force, a separate planning application, supported by an EIAR and Natura Impact Statement as needed, will be made for any consequential works required to the Proposed Project including the WwTP.

8.1.4 Waste Water Discharge (Authorisation) Regulations 2007

The system for the licensing or certification of wastewater discharges from areas served by local authority sewer networks was brought into effect with the introduction of S.I. No. 684/2007 - Waste Water Discharge (Authorisation) Regulations 2007, as amended by S.I. No. 231/2010 - Waste Water Discharge (Authorisation) (Amendment) Regulations 2010, and further amended by S.I. No. 652/2016 - Waste Water Discharge (Authorisation) (Environmental Impact Assessment) Regulations 2016.

These regulations have been updated by S.I. No. 214 of 2020 - European Union (Waste Water Discharge) Regulations 2020, and may now be collectively cited as the European Union (Waste Water Discharge) Regulations 2007 to 2020.

The proposed WwTP will require a wastewater discharge licence to be granted by the Environmental Protection Agency (EPA) under the European Union (Waste Water Discharge) Regulations 2007 to 2020, prior to commissioning. Wastewater discharges from the proposed WwTP must comply with this licence.

8.1.5 Shellfish Waters Directive

There have been no updates to the Shellfish Waters Directive or to the national transposing regulations since the submission of the 2018 planning application.

8.1.6 Bathing Waters Directive

There have been no updates to the Bathing Waters Directive or to the national transposing regulations since the submission of the 2018 planning application.

8.1.7 Blue Flag Status

In 2022, three beaches in the study area were awarded a Blue Flag Award (previously only one beach was awarded a Blue Flag when submitting the 2018 planning application (i.e. Velvet Strand)). These are as follows:

- Velvet Strand in Portmarnock;
- Balcarrick Beach in Donabate; and
- South Beach in Rush.

8.1.8 Marine Strategy Framework Directive

There have been no updates to the Marine Strategy Framework Directive or to the national transposing regulations since the submission of the 2018 planning application.

8.2 Methodology

This Section sets out any updates to the methodology adopted in the assessment of the impact of the proposed outfall pipeline route (marine section) on the water quality of the receiving marine environment.

8.2.1 Evolution of Water Quality Modelling

8.2.1.1 Alternative Site Assessment

No elements of the Proposed Project incorporated into the planning design following direction at the Oral Hearing in 2019 and the subsequent planning conditions applied to the 2018 planning application submission necessitated an update to the original 2011 study (MarCon 2011) identifying the preferable location(s) for the proposed outfall discharge location.

8.2.1.2 Alternative Site Assessment – Near Field Mixing

No elements of the Proposed Project incorporated into the planning design following direction at the Oral Hearing in 2019 and the subsequent planning conditions applied to the 2018 planning application submission necessitated an update to the original 2013 study (MarCon 2013) determining the relative merits between the preferable locations(s) for the proposed outfall discharge location.

8.2.1.3 Water Quality Modelling for Environmental Impact Assessment Report

No elements of the Proposed Project incorporated into the planning design following direction at the Oral Hearing in 2019 and the subsequent planning conditions applied to the 2018 planning application submission necessitated an update to the model extent used to assess the impacts of the proposed outfall on the marine environment.

8.2.2 Model Development

There have been no updates to the seabed bathymetry for the model as no additional INFOMAR bathymetry in the area of interest has been processed since the submission of the 2018 planning application. The North Bull Wall in Dublin Port has been included in this version of the model domain.

8.2.3 Hydrodynamic Model Calibration

There has been no change to the hydrodynamic model calibration since the submission of the 2018 planning application as the results presented in the original Model Calibration Report (MarCon 2015) showed that the numerical model had been successfully calibrated and validated against field measurements providing a sufficiently accurate representation of the hydrodynamics within the study region.

8.2.4 Solute Transport Calibration

There has been no change to the solute transport model calibration since the submission of the 2018 planning application as the results presented in the original Model Calibration Report (MarCon 2015) showed that the numerical model had been successfully calibrated and validated against field measurements providing a sufficiently accurate representation of solute transport within the study region.

The calibrated and validated hydrodynamic and solute dispersion model was employed to assess impacts on the receiving waters of Dublin arising from updated information relating to the Operational Phase of the Proposed Project.

8.2.4.1 Construction Phase

There has been no change to the proposed construction methodology for dredging, as assessed in Chapter 8 (Marine Water Quality) in Volume 3 Part A of the EIAR in the 2018 planning application, and therefore, there are no changes to this Section of the EIAR in the 2018 planning application.

8.2.4.2 Operational Phase

The modelling for the Operational Phase of the proposed outfall pipeline route (marine section) has been updated to account for the continuous discharge of secondary treated effluent with the inclusion of Ultraviolet (UV) treatment of Escherichia Coliforms (COLI) and Intestinal Enterococci (IE) (as outlined in Section 8.1) into the receiving waters for:

- Average flow conditions; and
- Flow to full treatment (FFT) conditions.

There has been no change to the scenario to assess the impacts of discharging untreated wastewater over a three-day period, simulating a process failure at the proposed WwTP, and therefore, there are no changes to this Section of the EIAR in the 2018 planning application.

8.2.5 Model Inputs

The updated data inputs to the modelling study are described in the following sections.

8.2.5.1 Hydraulic Flows – Rivers

Of the 15 riverine hydraulic flows defined in the numerical model, only two (River Dodder and River Liffey) have updated information available. Incorporating the updated information, the average flow in the River Dodder has been updated from 1.50 m^3/s to 1.43 m^3/s (metres cubed per second) and the average flow in the River Liffey has been updated from 6.1 m^3/s to 9.1 m^3/s (Intertek 2023).

8.2.5.2 Hydraulic Flows – Wastewater Treatment Plants

The only update to hydraulic flows defined in the numerical model from the WwTPs included in this Section of the EIAR in the 2018 planning application were to Ringsend WwTP (Intertek 2023). The updated information is presented in Table 8.3 (which is an update to Table 8.8 in Chapter 8 (Marine Water Quality) in Volume 3 Part A of the EIAR in the 2018 planning application).

Table 8.3: WwTP Flows Defined in the Numerical Model

WwTP	Flow Rate (m3/s)
Ringsend (existing average)	4.70
Ringsend (proposed upgrade future average)	6.05
Ringsend (proposed upgrade future FFT)	13.8

8.2.5.3 Pollutant Loads – Rivers

Of the 15 riverine inflows defined in the numerical model, 10 have updated water quality sampling information available. This updated information is presented in Table 8.4 (which is an update to Table 8.9 in Chapter 8 (Marine Water Quality) in Volume 3 Part A of the EIAR in the 2018 planning application).

No water quality sampling for Intestinal Enterococci has been undertaken in the inflowing rivers, and therefore, concentrations were estimated.

Table 8.4: Updated River Pollutant Loads Defined in the Numerical Model

River	Dissolved Inorganic Nitrogen (DIN) (mg/l N)	Molybdate Reactive Phosphorus (MRP) (mg/l P)	Biochemical Oxygen Demand (BOD) (mg/l)	Escherichia Coliforms (COLI) (mpn/100ml)[1]	Intestinal Enterococci (IE) (mpn/100ml)
Dodder	1.291	0.031	1.32	2000	600
Camac	1.549	0.048	1.75	2000	600
Liffey	2.468	0.046	1.07	2000	600
Tolka	2.000	0.104	1.56	3880	1164
Mayne	1.938	0.080	1.78	3869	1161
Sluice	0.932	0.068	2.70	3174	952
Ward	3.496	0.140	1.69	6017	1805
Broadmeadow	4.719	0.321	9.87	10306	3092
Turvey	2.895	0.158	3.38	4150	1245
Ballyboghill	3.077	0.153	1.70	4342	1303
Ballough	3.111	0.128	1.76	1971	591
Mill	5.945	0.105	2.79	1722	516
Santry	2.373	0.105	2.81	1239	372
Elm Park	0.000	0.000	0.000	2000	600
Trimlestown	0.000	0.000	0.000	2000	600

[1] mpn/100ml is the most probable number of colony forming units (cfu) /100ml based on the multiple tube method for enumeration

8.2.5.4 Pollutant Loads – Wastewater Treatment Plants

Pollutant loads (including updated information for Intestinal Enterococci) for both the existing Ringsend WwTP and the Ringsend WwTP Upgrade Works were sourced from Uisce Eireann (Intertek 2023). Pollutant loads (including updated information for Intestinal Enterococci) for the proposed discharge of treated wastewater from the proposed WwTP were provided by the Project Team.

Pollutant loads for the remaining WwTPs were updated from the respective annual environmental reports (EPA 2022a; EPA 2022b; EPA 2022c; EPA 2022d; EPA 2022e; EPA 2022f; EPA 2022g). No Intestinal Enterococci sampling has been undertaken in those WwTPs, and therefore, concentrations were estimated.

Table 8.5 (which is an update to Table 8.10 in Chapter 8 (Marine Water Quality) in Volume 3 Part A of the EIAR in the 2018 planning application) summarises the updated average values for Dissolved Inorganic Nitrogen (DIN), Molybdate Reactive Phosphorus (MRP), Biochemical Oxygen Demand (BOD), Escherichia Coliforms (COLI) and Intestinal Enterococci (IE) defined in the numerical model for each of the WwTPs.

Table 8.5: Updated WwTP Pollutant Loads Defined in the Numerical Model

WwTP	Dissolved Inorganic Nitrogen (DIN) (mg/l N)	Molybdate Reactive Phosphorus (MRP) (mg/l P)	Biochemical Oxygen Demand (BOD) (mg/l)	Escherichia Coliforms (COLI) (mpn/100ml)	Intestinal Enterococci (IE) (mpn/100ml)
Barnageeragh	14.373	2.473	3.482	1000	500
Portrane	10.100	2.065	3.585	1000	500
Malahide	12.369	2.565	5.440	1500	750
Swords	10.450	0.862	4.613	100000	50000
Shanganagh	33.153	2.877	6.208	100000	50000
Ringsend (average)	14.000	2.490	20.600	21558	7373
Ringsend (FFT)	14.000	2.490	35.500	21558	7373
Ringsend (future average)	8.000	0.700	12.000	100,000	25,000
Ringsend (future FFT)	8.000	0.700	21.700	100,000	25,000
Proposed Project (average)	50.000	4.800	25.000	20000	10000
Proposed Project (FFT)	50.000	2.070	25.000	20000	10000

8.2.5.5 Ambient Concentrations

There have been no updates to the background ambient concentrations presented in this Section of the EIAR in the 2018 planning application, which are sourced from the EPA sampling records.

8.2.5.6 Bed Sediment Composition

It is not physically possible for the composition of the subsurface seabed sediments in the area of interest to have changed since the submission of the 2018 planning application.

8.2.5.7 Water Quality Standards

Water quality standards have been updated to reflect both the updated legislation and the inclusion of Intestinal Enterococci, and these are presented in Table 8.6 (which is an update to Table 8.14 in Chapter 8 (Marine Water Quality) in Volume 3 Part A of the EIAR in the 2018 planning application). Noting there is no standard for MRP in coastal waters, the MRP standard for transitional waters has been adopted for this assessment, as previously adopted for the EIAR in the 2018 planning application.

Table 8.6: Updated Water Quality Standards for Reporting

Parameter	WFD Waterbody Classification	Status	Value	Standard	Regulations
DIN (mg/l)	Coastal	Good	≤ 2.60	Median	S.I. No. 77/2019 - European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019
MRP (mg/l)	Transitional	Good	≤ 0.04	Median	
BOD (mg/l)	Transitional	Good	≤ 4.00	95%	
COLI (mpn/100ml)	n/a	Excellent	250	95%	S.I. No. 79/2008 - Bathing Water Quality Regulations 2008
IE (mpn/100ml)	n/a	Excellent	100	95%	

8.2.5.8 Decay Coefficients

Decay coefficients have been updated for the inclusion of Intestinal Enterococci and are presented in Table 8.7 (which is an update to Table 8.15 in Chapter 8 (Marine Water Quality) in Volume 3 Part A of the EIAR in the 2018 planning application). The Intestinal Enterococci decay rate is derived from Uisce Eireann's Technical Standards for Marine Modelling (Uisce Éireann 2020).

Table 8.7: Updated Parameter Decay Rates

Parameter	Decay Rate
DIN	6.75 x 10^{-7} counts (c)/ second (sec)
MRP	4.05 x 10^{-7} c/sec
BOD	1.16 x 10^{-7} c/sec
COLI	1.47 x 10^{-5} c/sec
IE	2.66 x 10^{-5} c/sec

8.3 Baseline Environment

This Section sets out any updates to the baseline environment adopted in the assessment of the impact of the proposed outfall pipeline route (marine section) on the water quality of the receiving marine environment.

8.3.1 Hydrography

The region's physical hydrography (geography, water bodies, seabed bathymetry) has not changed since the submission of the 2018 planning application. Therefore, there have been no updates to this Section of the EIAR in the 2018 planning application.

8.3.2 Hydrographic Monitoring

There has been no updated hydrographic monitoring undertaken since the submission of the 2018 planning application, as presented in this Section of the EIAR in the 2018 planning application.

8.3.3 River Catchments

The number, location and names of the river catchments in the study area have not changed since the submission of the 2018 planning application.

8.3.4 Water Quality

8.3.4.1 Water Framework Directive Status Classification

The following WFD water bodies have had an update in the classification of their ecological status since the submission of the 2018 planning application:

- Coastal water body of HA 08 (North-Western Irish Sea) changed from 'High' to 'Good';
- Coastal waters of HA 09 (Irish Sea-Dublin) changed from 'Unassigned' to 'Good';

- Transitional water body of the Rogerstown Estuary changed from ‘Bad’ to ‘Poor’;
- Transitional water body of the Broadmeadow Estuary changed from ‘Poor’ to ‘Moderate’; and
- Transitional water body of the Mayne Estuary changed from ‘Unassigned’ to ‘Moderate’.

8.3.4.2 Bathing Waters

The water quality status of the following bathing water beaches has been updated since the submission of the 2018 planning application:

- Claremont Beach is now classified as achieving ‘Sufficient’ Water Quality based on assessment of bacteriological results for the period 2018 to 2021;
- Sutton, Burrow Beach is classified as achieving ‘Good’ Water Quality based on the assessment of bacteriological results for the period 2018 to 2021.
- Portrane, the Brook Beach is classified as achieving 'Good’ Water Quality based on the assessment of bacteriological results for the period 2018 to 2021;
- Rush North Beach is classified as achieving ‘Excellent’ Water Quality based on the assessment of bacteriological results for the period 2018 to 2021;
- Rush, South Beach is classified as achieving ‘Excellent’ Water Quality based on the assessment of bacteriological results for the period 2018 to 2021; and
- Loughshinny Beach is classified as achieving ‘Sufficient’ Water Quality based on the assessment of bacteriological results for the period 2018 to 2021.

There have been no changes to the status of Portmarnock Velvet Strand (remains as ‘Excellent’) or Donabate Balcarrick Beach (remains as ‘Good’) since the submission of the 2018 planning application.

8.3.4.3 Trophic Status

The trophic status of the Mayne Estuary, Broadmeadow Estuary and Rogerstown Estuary have been updated since the submission of the 2018 planning application from ‘Eutrophic’ to ‘Intermediate’.

There has been no update to the trophic status of the coastal waters since the submission of the 2018 planning application.

8.4 Impact of Proposed Project

This Section sets out any updates to the impacts of the Proposed Project arising from the incorporation of the above updated information to the modelling process.

8.4.1 Construction – Dredging of the Proposed Outfall Pipeline Route (Marine Section) Trench

No changes have been made to the proposed construction methodology for the dredging of the proposed outfall pipeline route (marine section) since the submission of the 2018 planning application, and therefore, there are no changes to this Section of the EIAR in the 2018 planning application.

8.4.2 Proposed Wastewater Treatment Plant – Operational Phase

Following the construction of the proposed WwTP, the only impact on water quality will be due to the treated wastewater discharge. During the Oral Hearing in March 2019, it was outlined that with consideration of all of the embedded mitigation included in the design of the Proposed Project and the additional mitigation measures outlined in the EIAR in the 2018 planning application, the risk of a discharge of untreated sewage to the marine environment as a result of a partial or total failure of the proposed WwTP would not occur.

The predicted results of the proposed discharge for the average daily flow conditions and FFT conditions are presented in this Section.

No changes have been made to the proposed pumping failure scenario since the submission of the 2018 planning application and this is still considered a robust scenario. Therefore, there are no changes to this component of the EIAR in the 2018 planning application.

The modelling results of each parameter (DIN, MRP, BOD, COLI and IE) are presented as the average concentration over the depth of the water column for each scenario at four stages of both a neap tide and spring tide, namely high water, mid ebb, low water and mid flood.

8.4.2.1 Dissolved Inorganic Nitrogen (DIN)

The Surface Water Amendment Regulations set a median concentration limit for DIN at ≤0.17mg/l N in coastal waters to achieve high status, and set a median concentration limit for DIN at ≤0.25mg/l N in coastal waters to achieve good status.

In Diagram 8.1 to Diagram 8.16 below, all coloured areas correspond to where the DIN concentrations in the water were predicted to exceed the high status limit of ≤0.17mg/l N.

8.4.2.1.1 Average Daily Flow

The tidal plots showing the maximum extent of the predicted DIN plume from the proposed outfall pipeline route (marine section) discharge point at high water, mid ebb, low water and mid flood on neap tides are presented in Diagram 8.1 to Diagram 8.4 and on spring tides in Diagram 8.5 to Diagram 8.8.

None of the diagrams show the DIN plume from the proposed outfall pipeline route (marine section) discharge point exceeding the 0.17mg/l N limit required to achieve high status, nor the 0.25mg/l N limit required to achieve good status.

Elevated DIN levels in the transitional waters displayed in the diagrams result from other WwTPs or rivers directly discharging to the affected waters.

The diagrams show that there is predicted to be no impact on the receiving waters from the proposed operation of the proposed outfall pipeline route (marine section) discharge point for average daily discharge conditions, in line with the outcome of the previous modelling scenario undertaken for the 2018 planning application.

8.4.2.1.2 Flow to Full Treatment

The tidal plots showing the maximum extent of the predicted DIN plume from the proposed outfall pipeline route (marine section) discharge point at high water, mid ebb, low water and mid flood on neap tides are presented in Diagram 8.9 to Diagram 8.12 and on spring tides in Diagram 8.13 to Diagram 8.16.

The diagrams show the DIN plume from the proposed outfall pipeline route (marine section) discharge point exceeding the 0.17mg/l N limit required to achieve high status but does not exceed the 0.25mg/l N limit required to achieve good status.

Elevated DIN levels in the transitional waters displayed in the diagrams result from other WwTPs or rivers directly discharging to the affected waters.

The diagrams show that there is predicted to be a Slight impact on the receiving waters, local to the proposed outfall pipeline route (marine section) discharge point for FFT conditions during high and low water conditions only, in line with the outcome of the previous modelling scenario undertaken for the 2018 planning application.

8.4.2.1.3 Process Failure

No changes have been made to the proposed pumping failure scenario since the submission of the 2018 planning application and this is still considered a robust scenario. Therefore, there are no changes to this component of the EIAR in the 2018 planning application.

None of the updated scenarios predicted the likelihood of any significant impact on the receiving waters from the proposed operation of the proposed outfall pipeline route (marine section) discharge point.

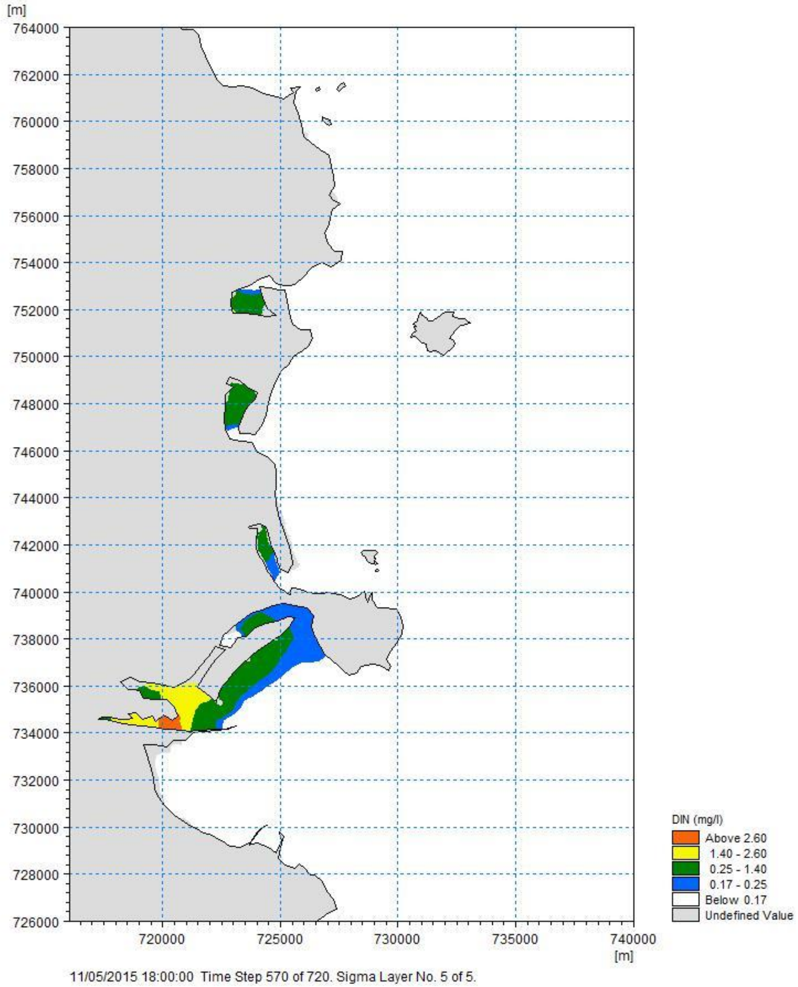

Diagram 8.1: DIN Concentration at High Water on Neap Tide

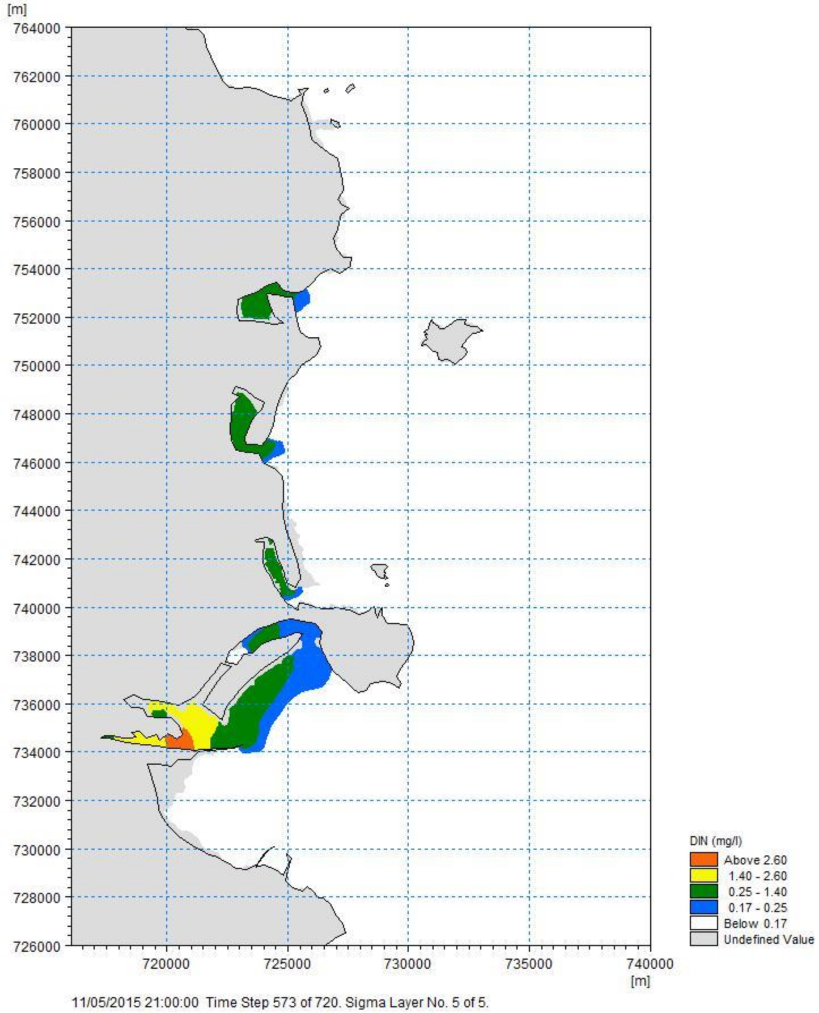

Diagram 8.2: DIN Concentration at Mid Ebb on Neap Tide

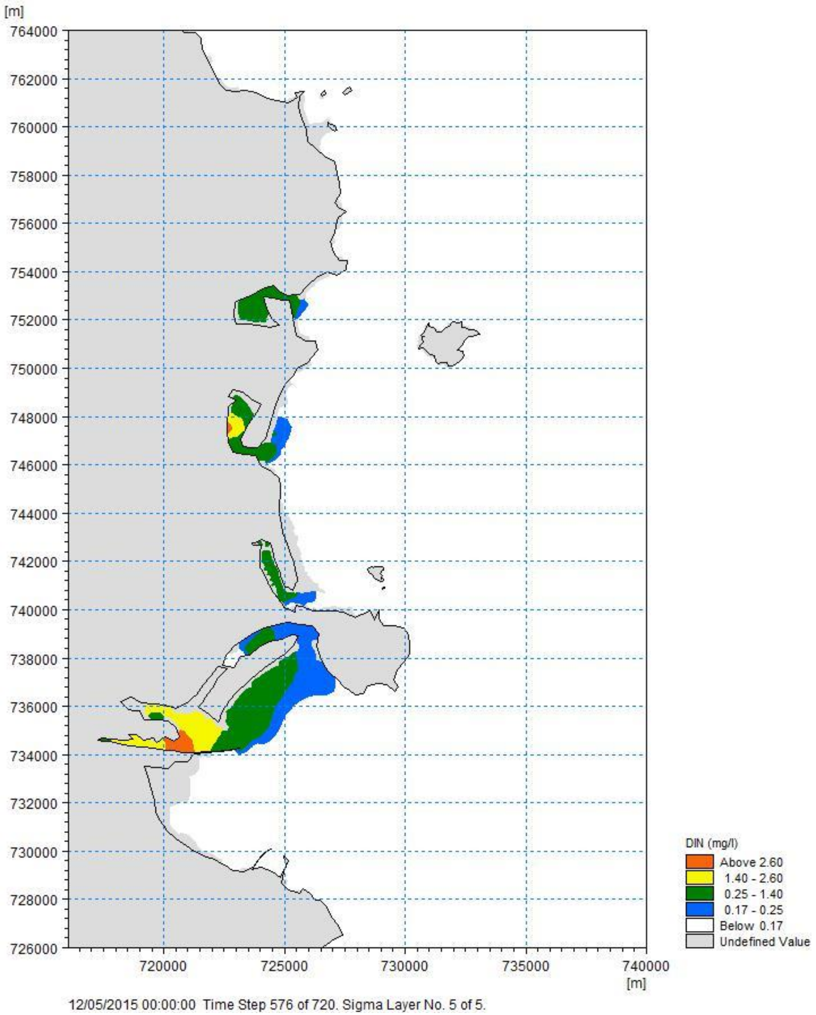

Diagram 8.3: DIN Concentration at Low Water on Neap Tide

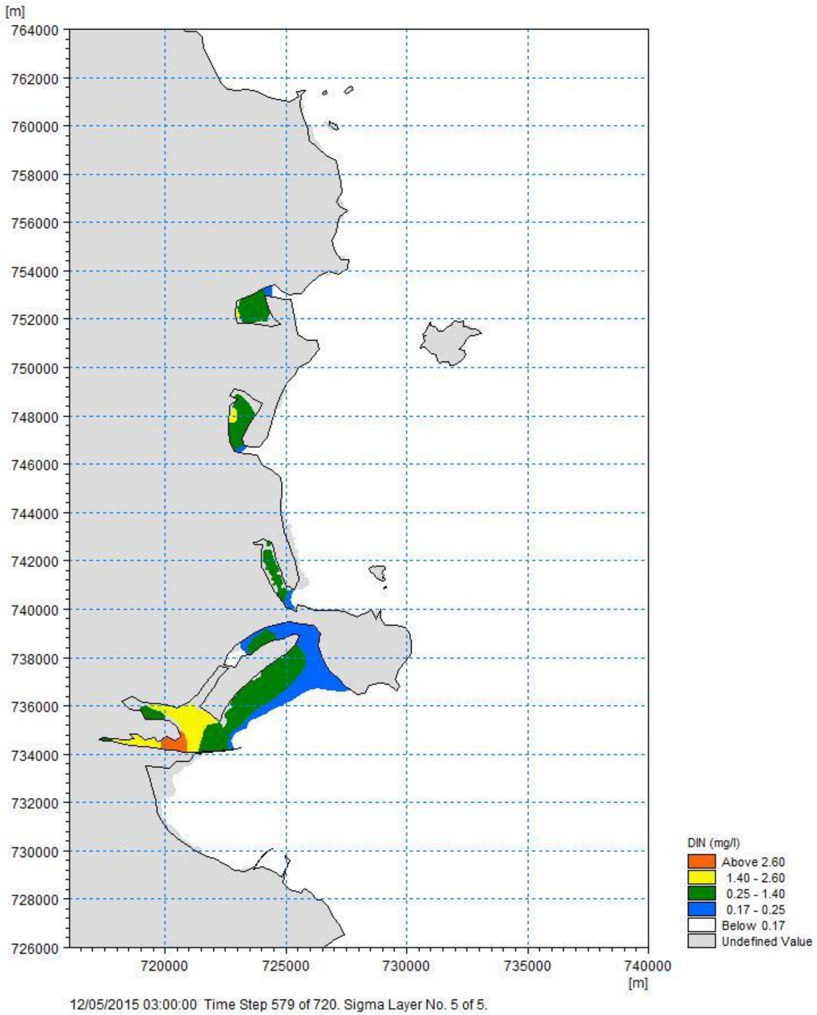

Diagram 8.4: DIN Concentration at Mid Flood on Neap Tide

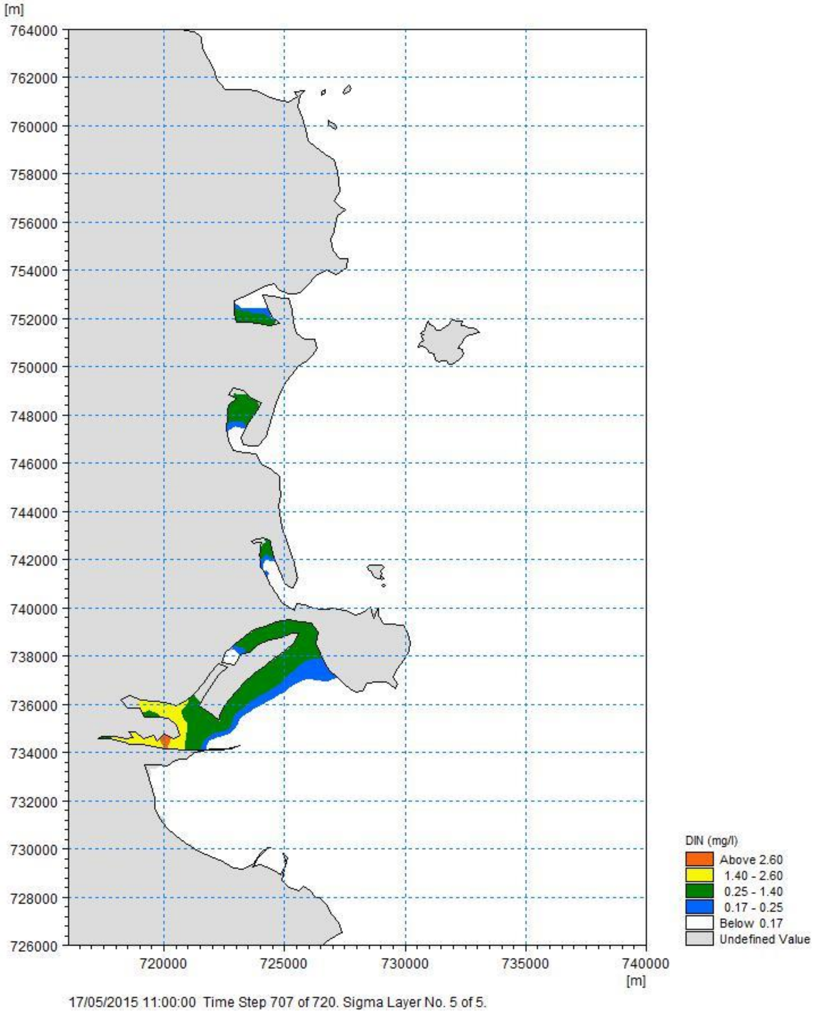

Diagram 8.5: DIN Concentration at High Water on Spring Tide

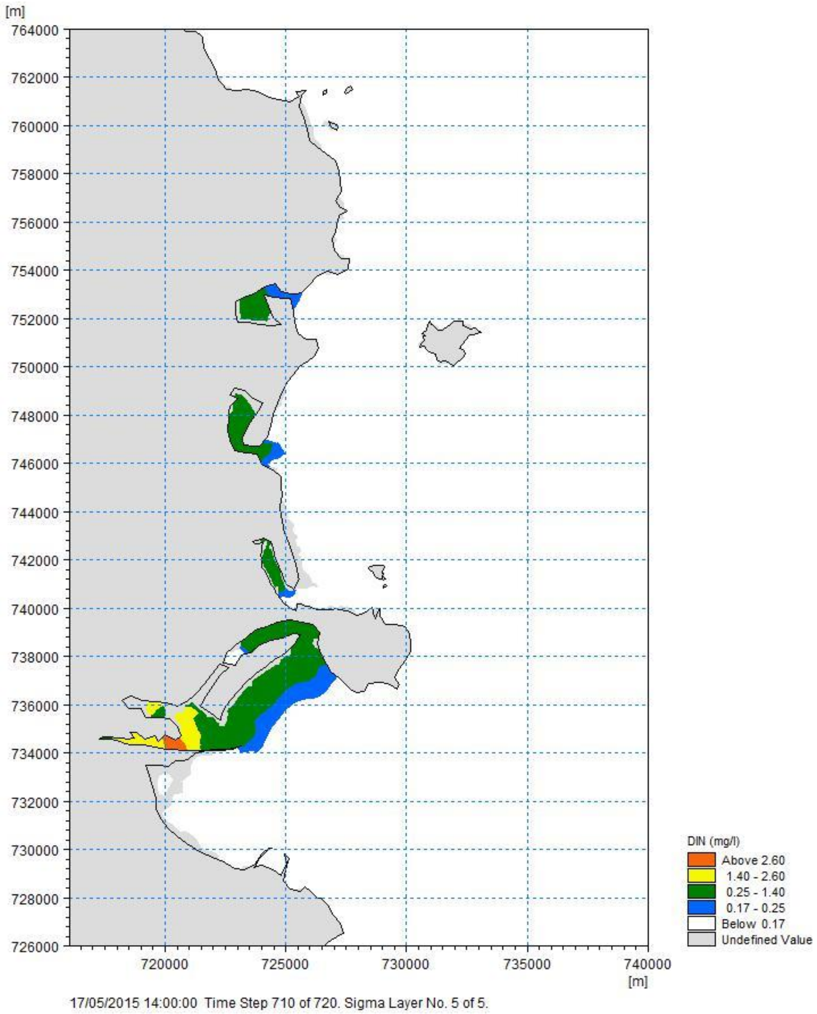

Diagram 8.6: DIN Concentration at Mid Ebb on Spring Tide

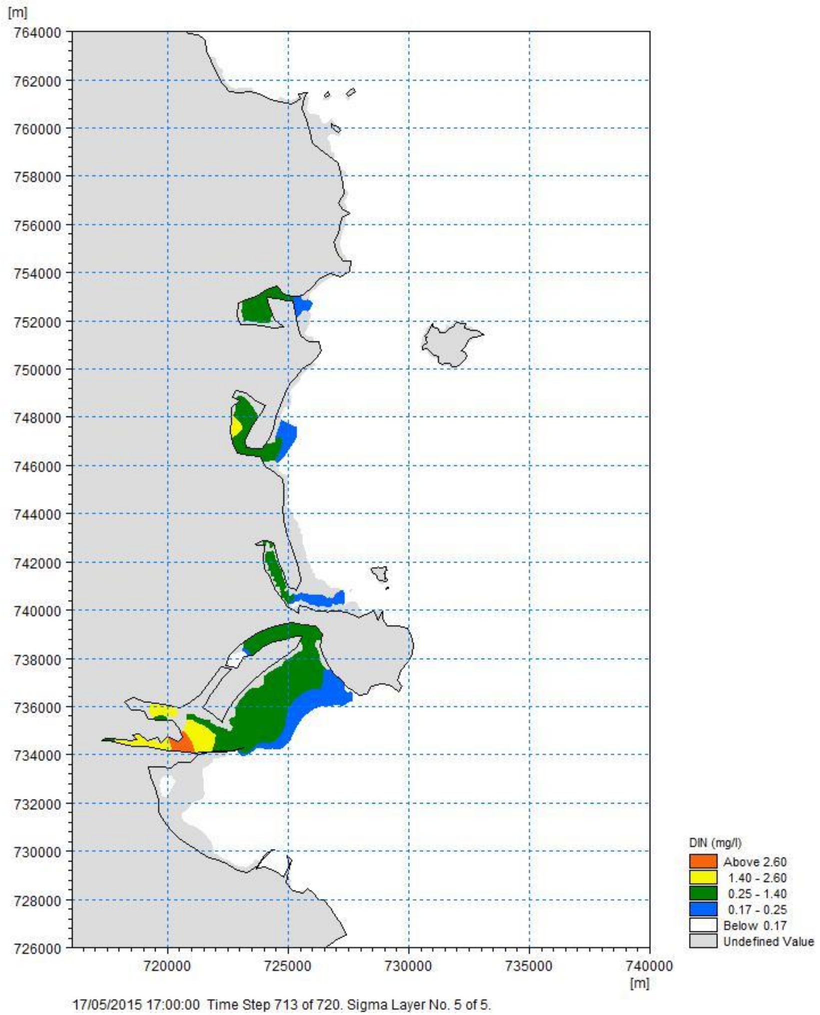

Diagram 8.7: DIN Concentration at Low Water on Spring Tide

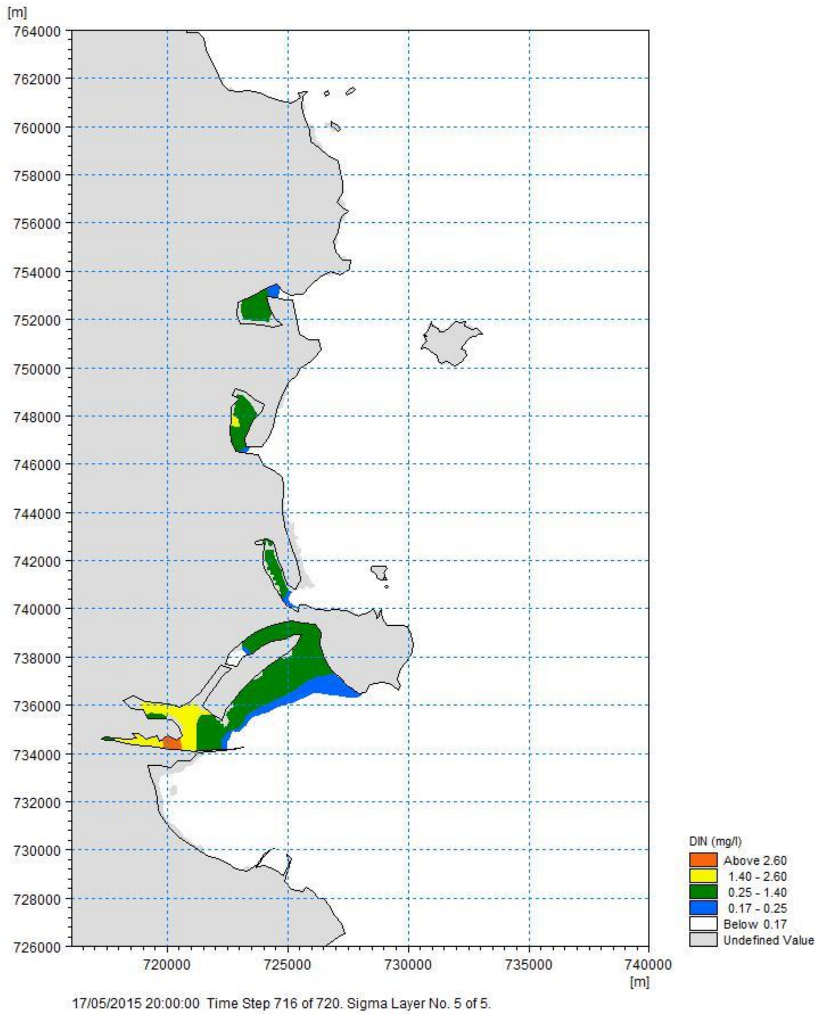

Diagram 8.8: DIN Concentration at Mid Flood on Spring Tide

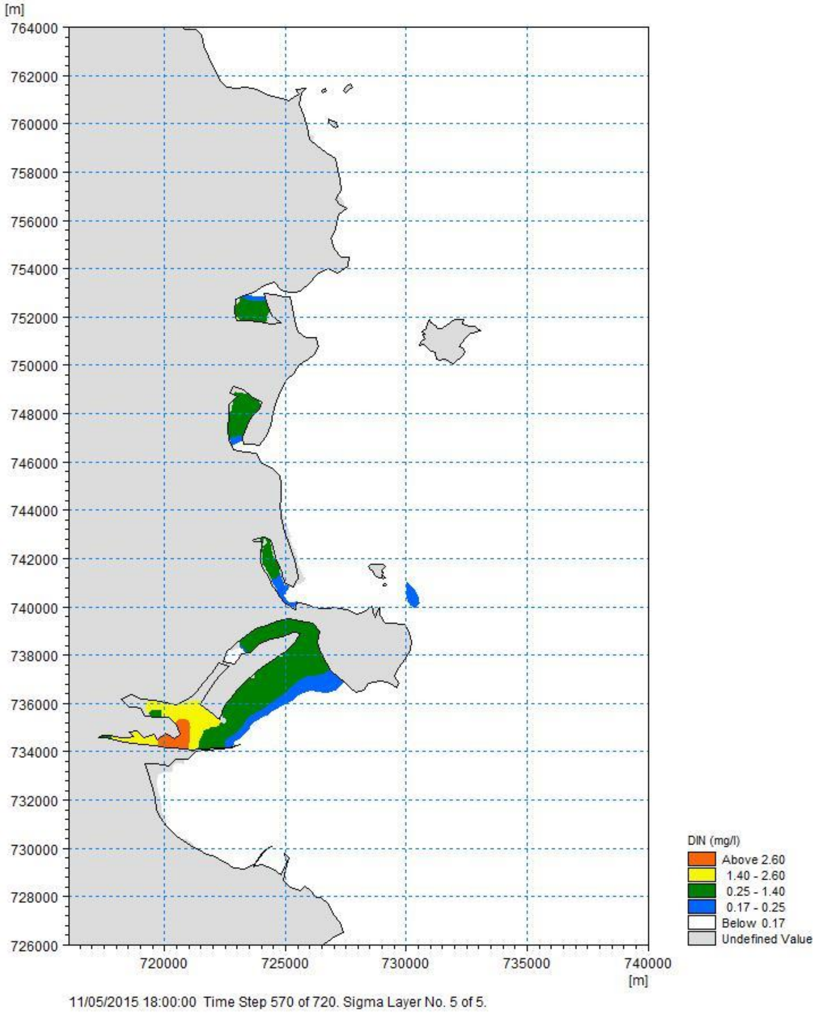

Diagram 8.9: DIN Concentration at High Water on Neap Tide

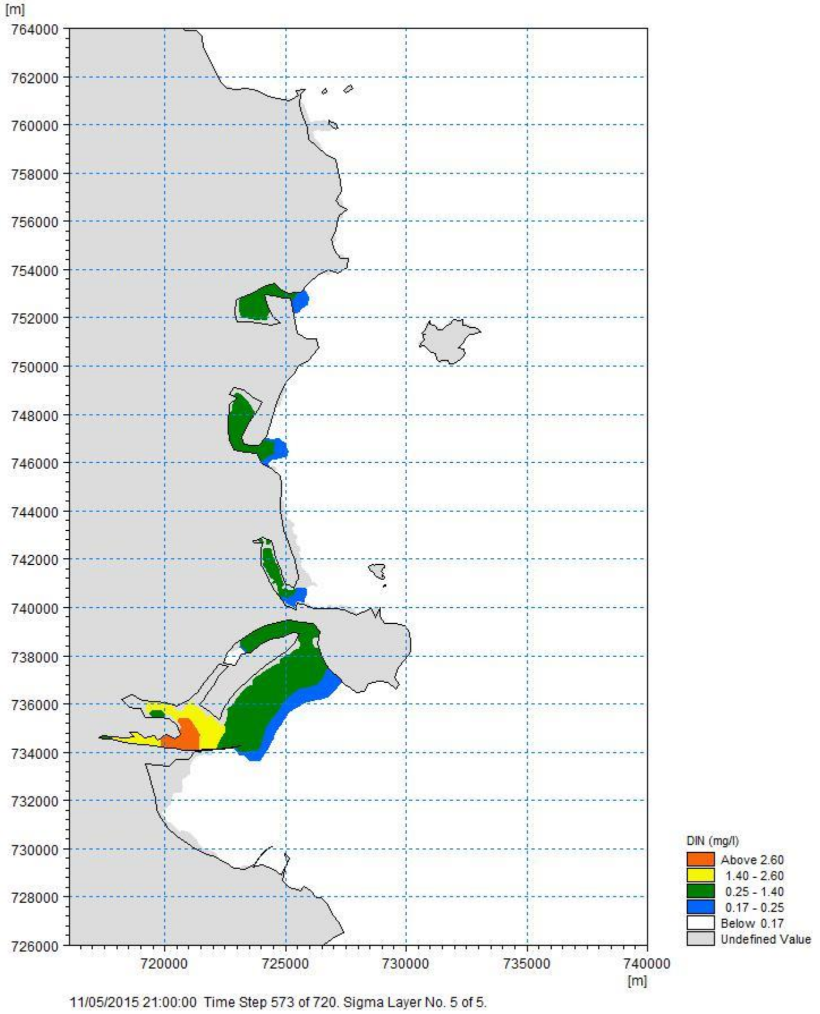

Diagram 8.10: DIN Concentration at Mid Ebb on Neap Tide

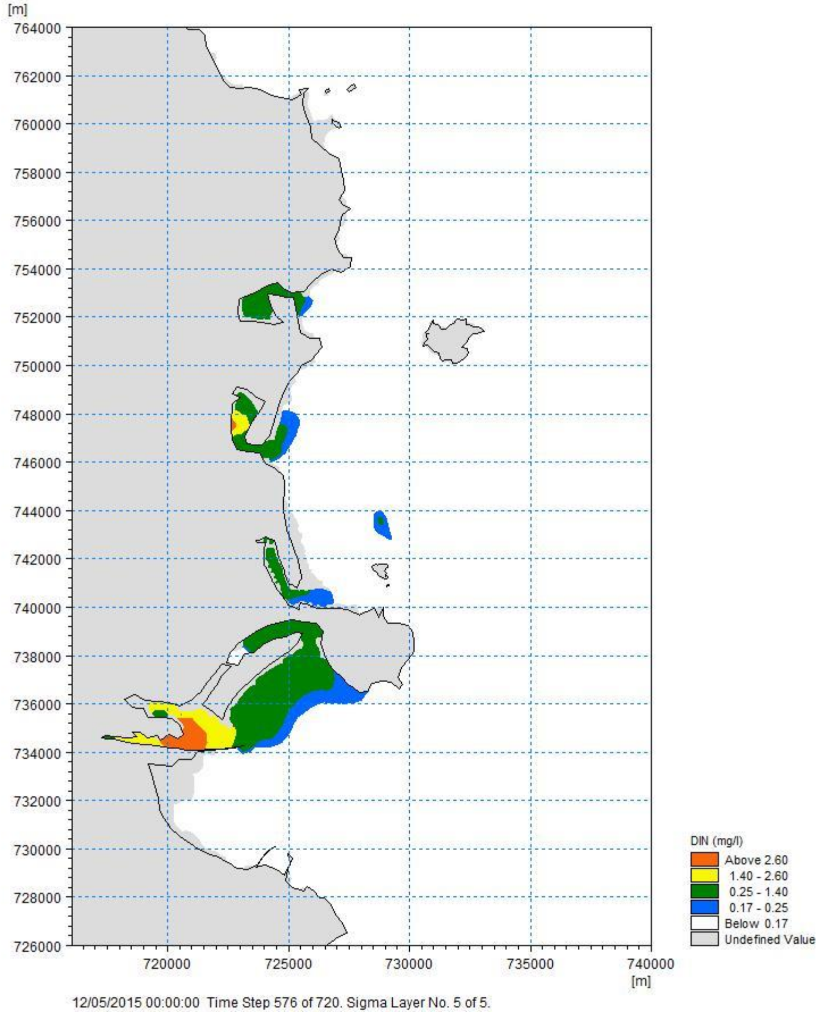

Diagram 8.11: DIN Concentration at Low Water on Neap Tide

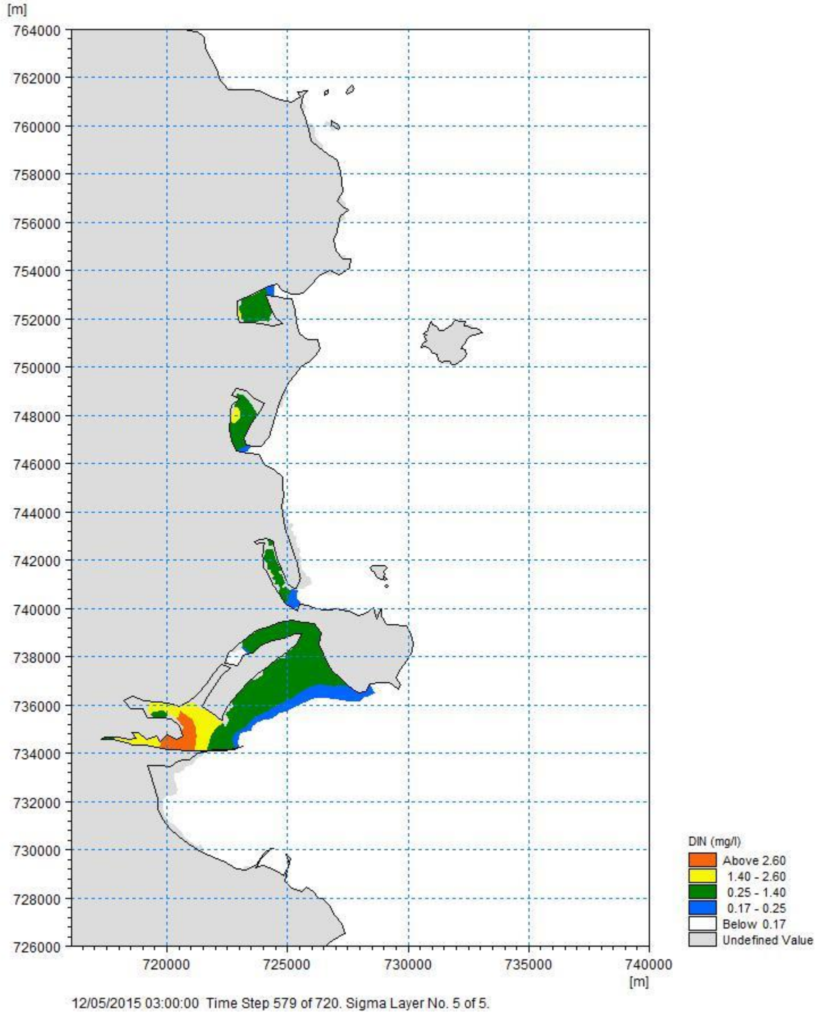

Diagram 8.12: DIN Concentration at Mid Flood on Neap Tide

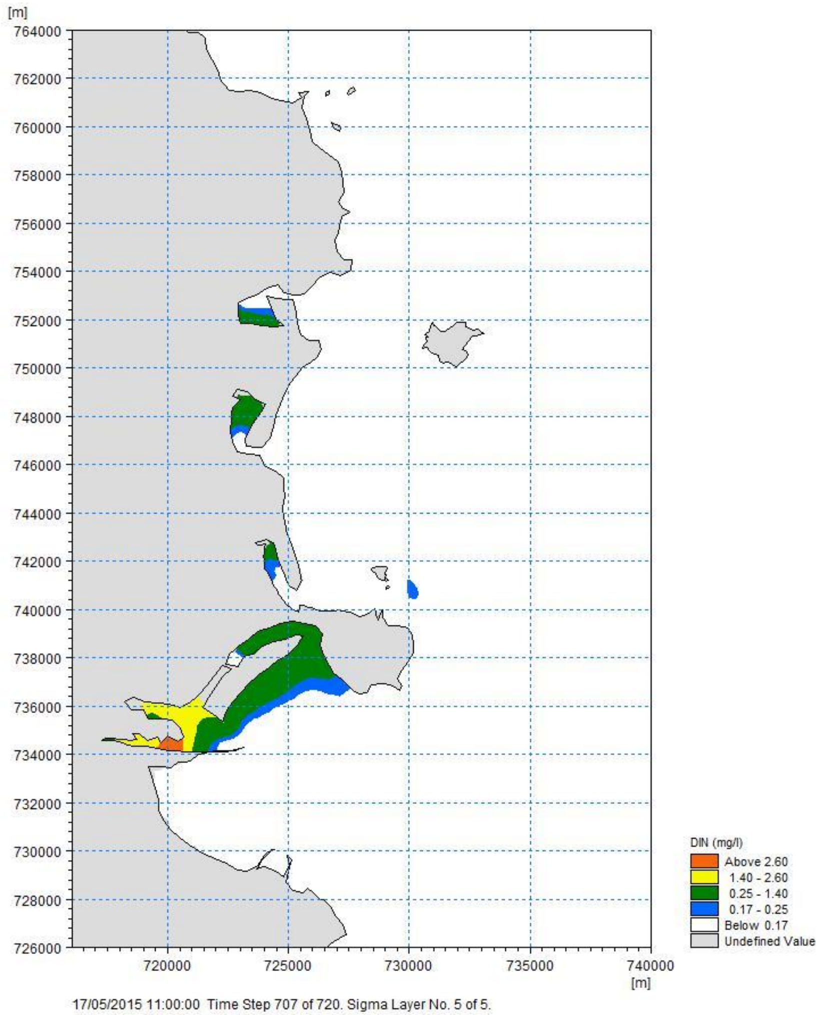

Diagram 8.13: DIN Concentration at High Water on Spring Tide

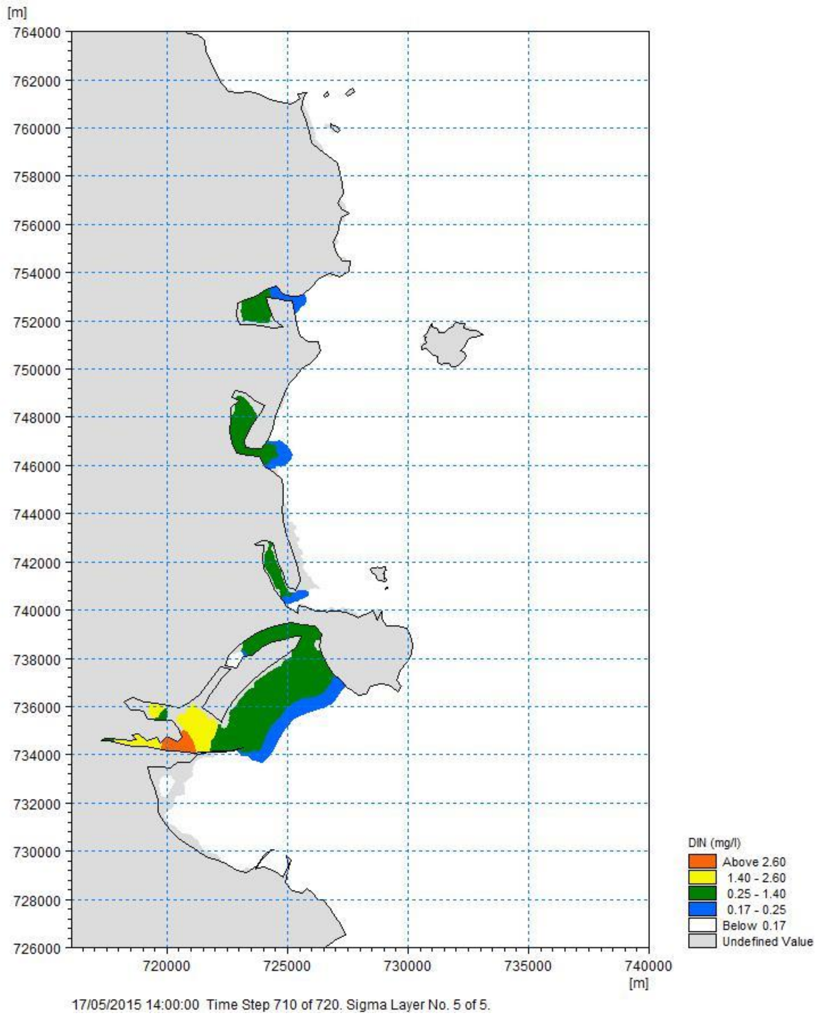

Diagram 8.14: DIN Concentration at Mid Ebb on Spring Tide

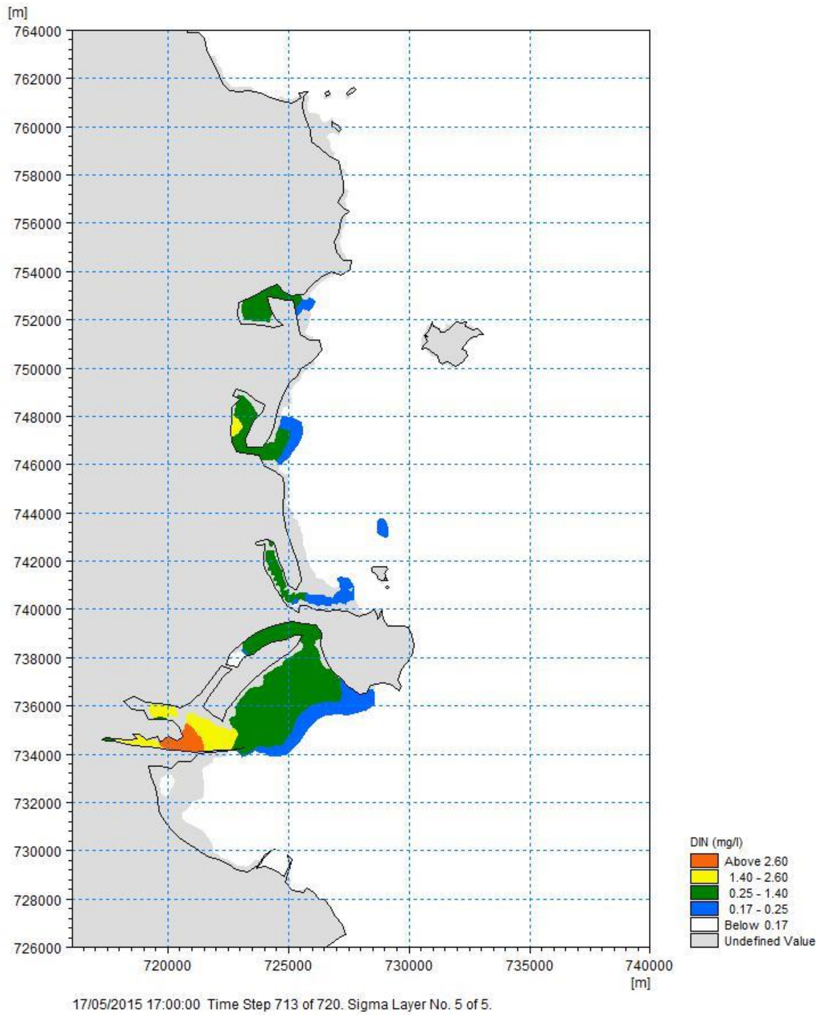

Diagram 8.15: DIN Concentration at Low Water on Spring Tide

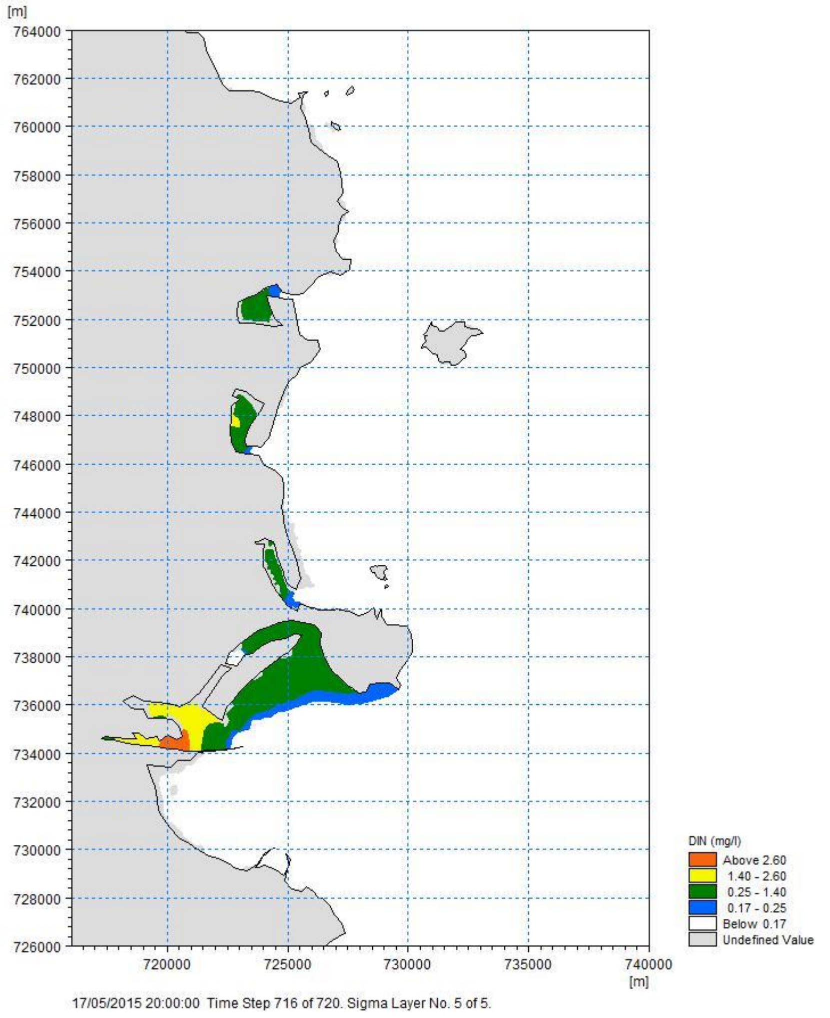

Diagram 8.16: DIN Concentration at Mid Flood on Spring Tide

8.4.2.2 Molybdate Reactive Phosphorus (MRP)

The Surface Water Amendment Regulations do not set a limit for MRP in coastal waters. The transitional waters' median concentration limit of ≤0.04mg/l P required to achieve good status has been applied in the absence of a coastal waters limit.

In Diagram 8.17 to Diagram 8.32 below, all coloured areas correspond to where the MRP concentrations in the water were predicted to exceed the good status limit of ≤0.04mg/l P.

8.4.2.2.1 Average Daily Flow

The tidal plots showing the maximum extent of the predicted MRP plume from the proposed outfall pipeline route (marine section) discharge point at high water, mid ebb, low water and mid flood on neap tides are presented in Diagram 8.17 to Diagram 8.20 and on spring tides in Diagram 8.21 to Diagram 8.24.

None of the diagrams show the MRP plume from the proposed outfall pipeline route (marine section) discharge point exceeding the 0.04mg/l P limit required to achieve good status.

Elevated MRP levels in the transitional waters displayed in the diagrams result from other WwTPs or rivers directly discharging to the affected waters.

The diagrams show that there is predicted to be no impact on the receiving waters from the proposed outfall pipeline route (marine section) discharge point for average daily flow conditions in line with the outcome of the previous modelling scenario undertaken for the 2018 planning application.

8.4.2.2.2 Flow to Full Treatment

The tidal plots showing the maximum extent of the predicted MRP plume from the proposed outfall pipeline route (marine section) discharge point at high water, mid ebb, low water and mid flood on neap tides are presented in Diagram 8.25 to Diagram 8.28 and on spring tides in Diagram 8.29 to Diagram 8.32.

None of the diagrams show the MRP plume from the proposed outfall pipeline route (marine section) discharge point exceeding the 0.04mg/l P limit required to achieve good status.

Elevated MRP levels in the transitional waters displayed in the diagrams result from other WwTPs or rivers directly discharging to the affected waters.

The diagrams show that there is predicted to be a very Slight localised impact on the receiving waters from the proposed operation of the proposed outfall pipeline route (marine section) discharge point, in line with the outcome of the previous modelling scenario undertaken for the 2018 planning application.

8.4.2.2.3 Process Failure

No changes have been made to the proposed pumping failure scenario since the submission of the 2018 planning application and this is still considered a robust scenario. Therefore, there are no changes to this component of the EIAR in the 2018 planning application.

None of the updated scenarios predicted the likelihood of any significant impact on the receiving waters from the proposed operation of the proposed outfall pipeline route (marine section) discharge point.

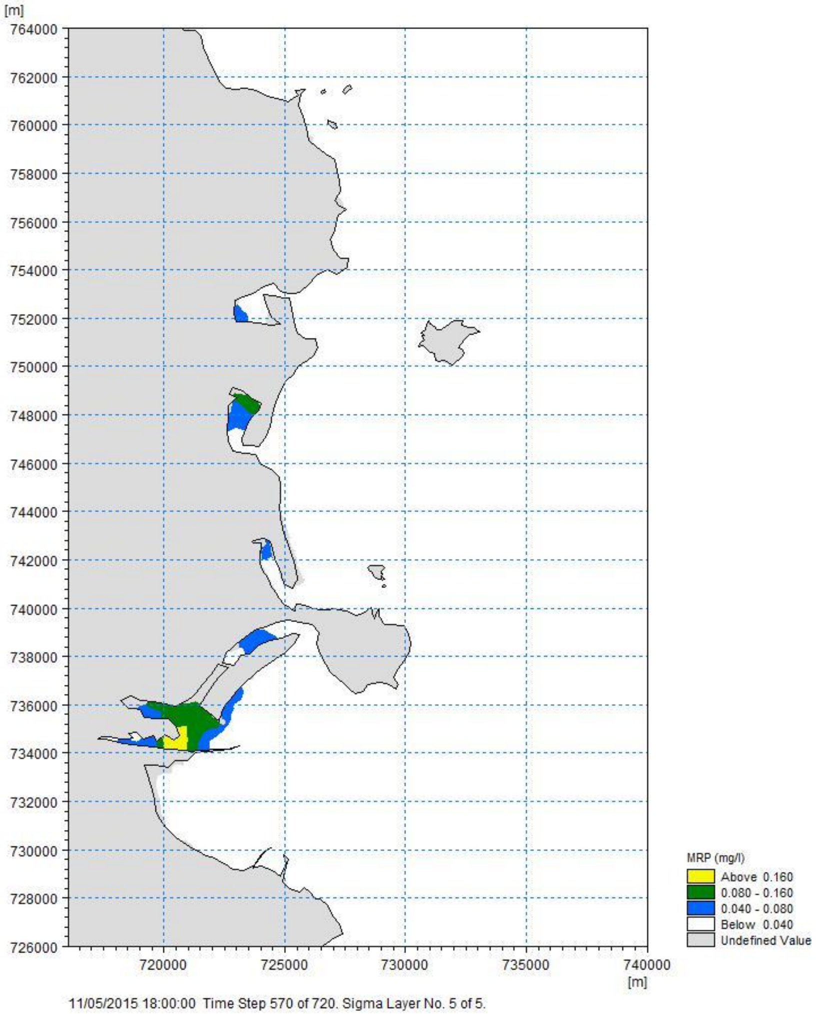

Diagram 8.17: MRP Concentration at High Water on Neap Tide

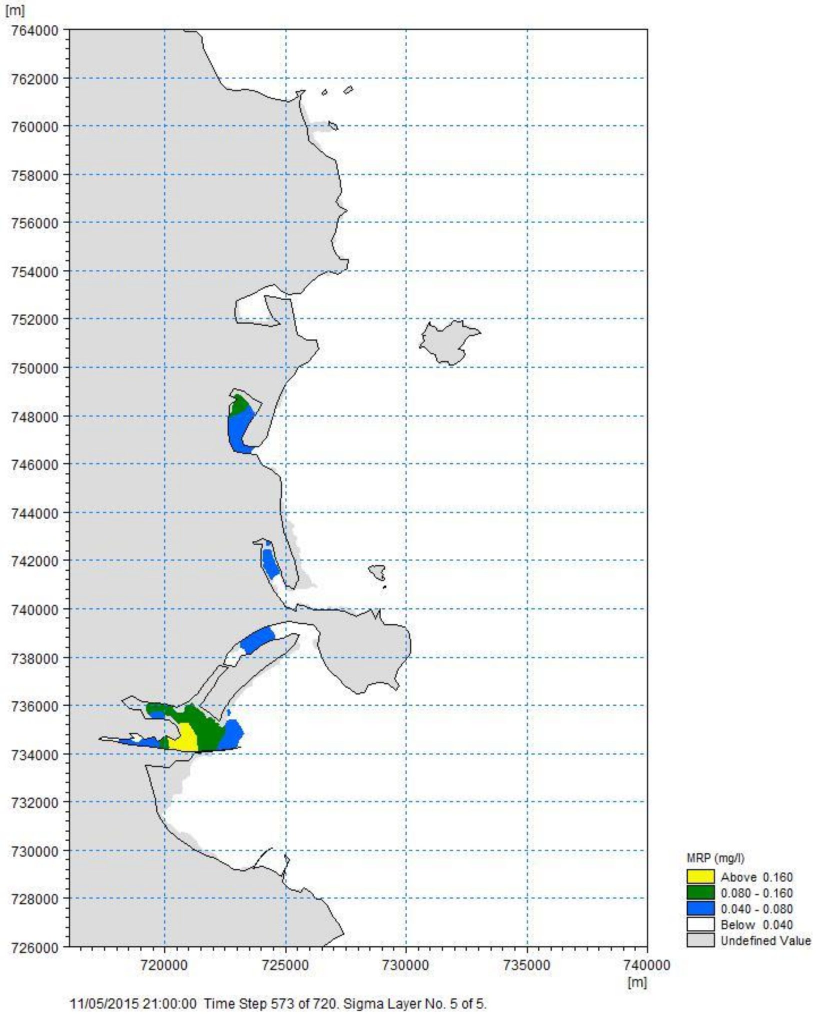

Diagram 8.18: MRP Concentration at Mid Ebb on Neap Tide

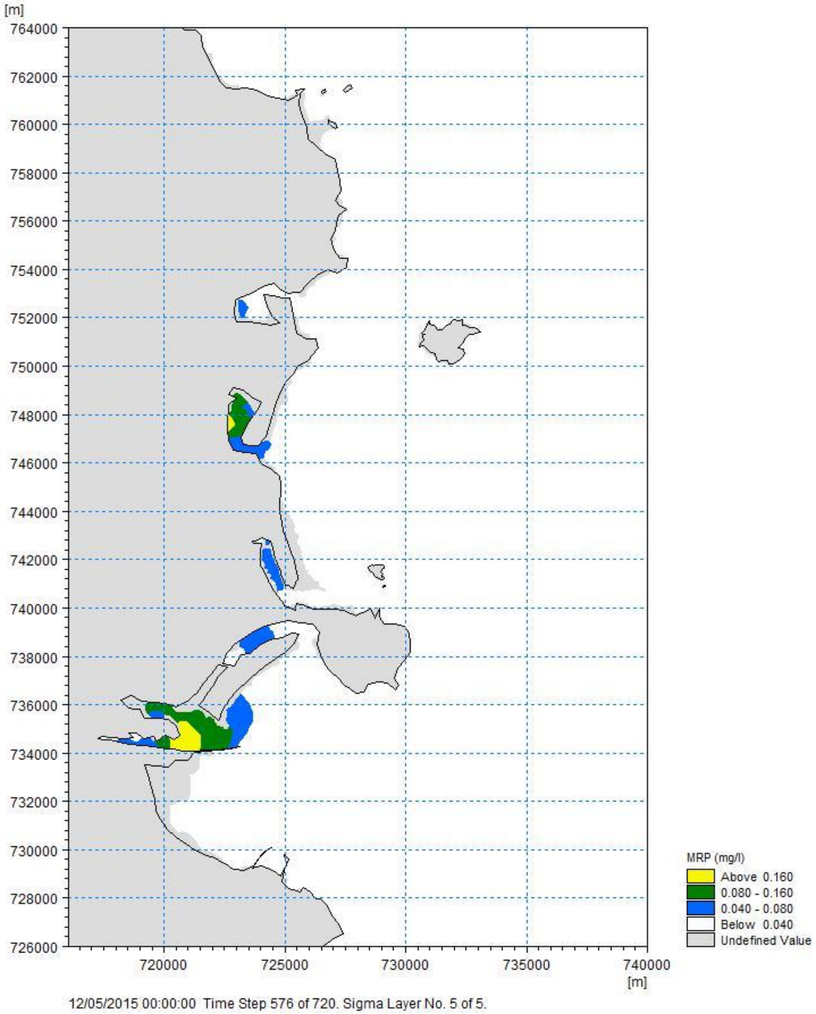

Diagram 8.19: MRP Concentration at Low Water on Neap Tide

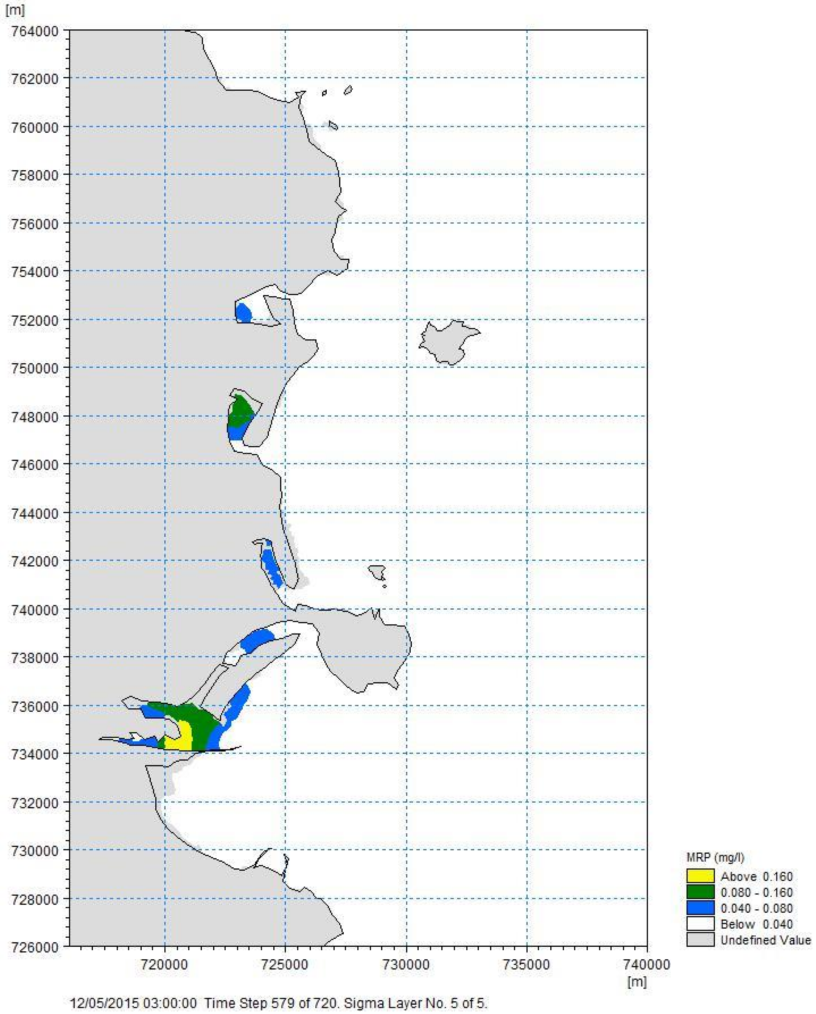

Diagram 8.20: MRP Concentration at Mid Flood on Neap Tide

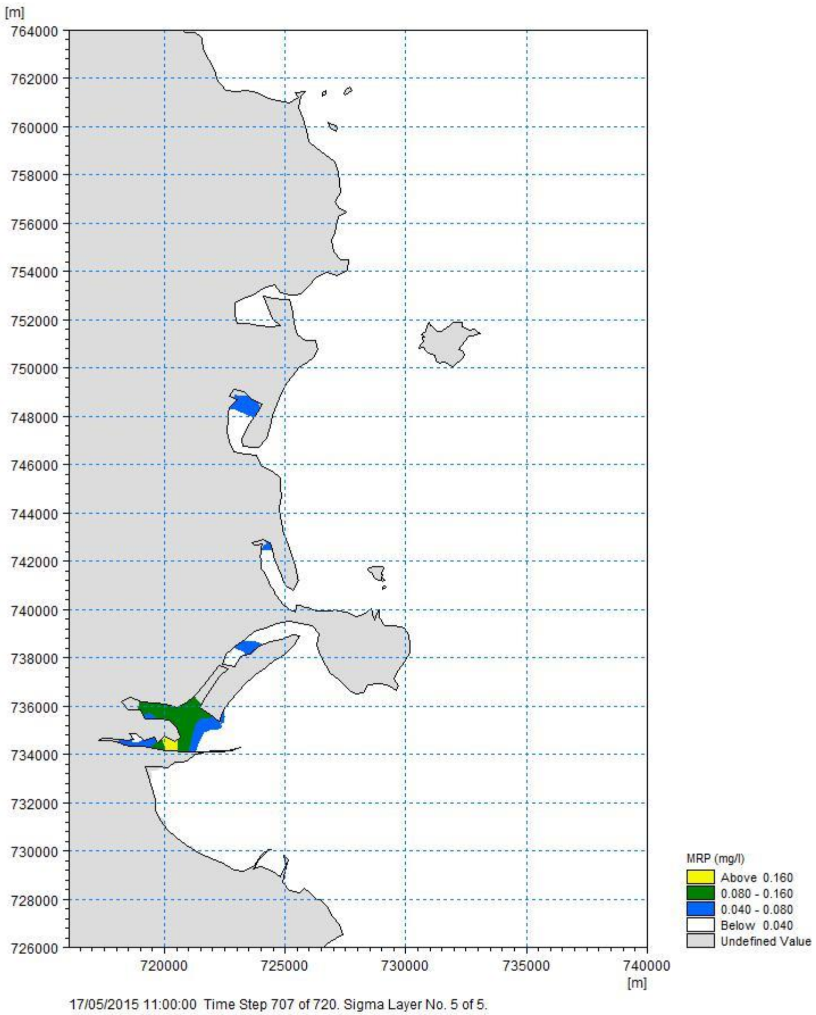

Diagram 8.21: MRP Concentration at High Water on Spring Tide

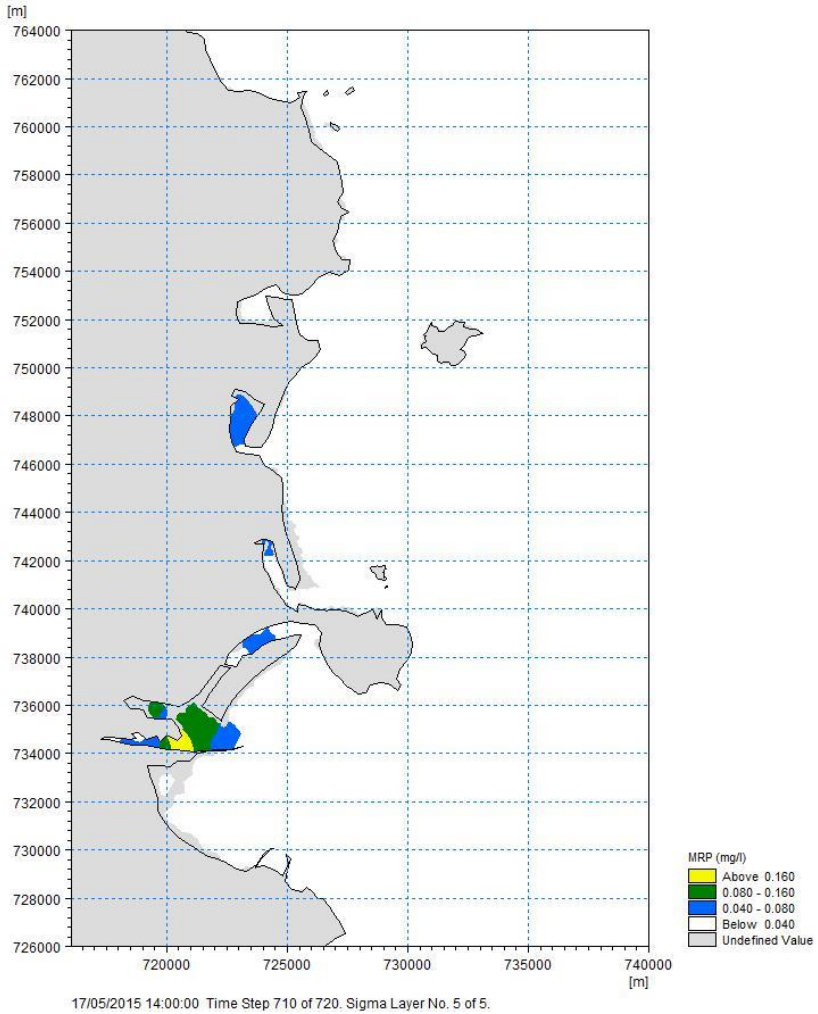

Diagram 8.22: MRP Concentration at Mid Ebb on Spring Tide

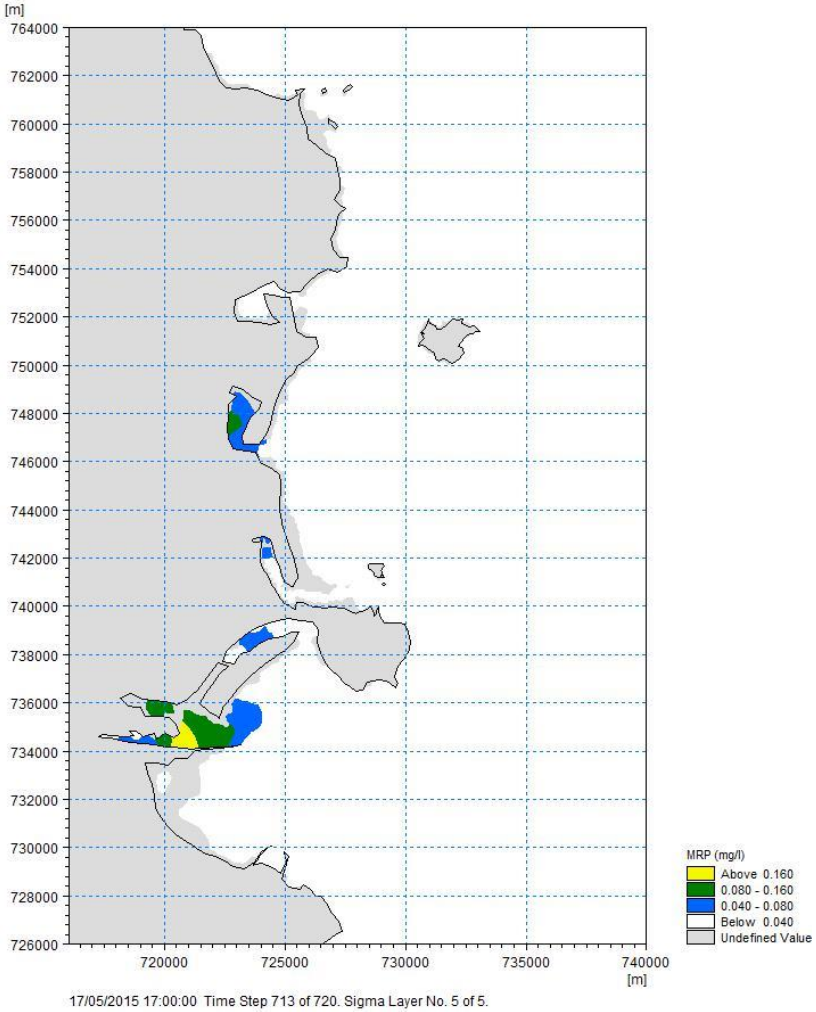

Diagram 8.23: MRP Concentration at Low Water on Spring Tide

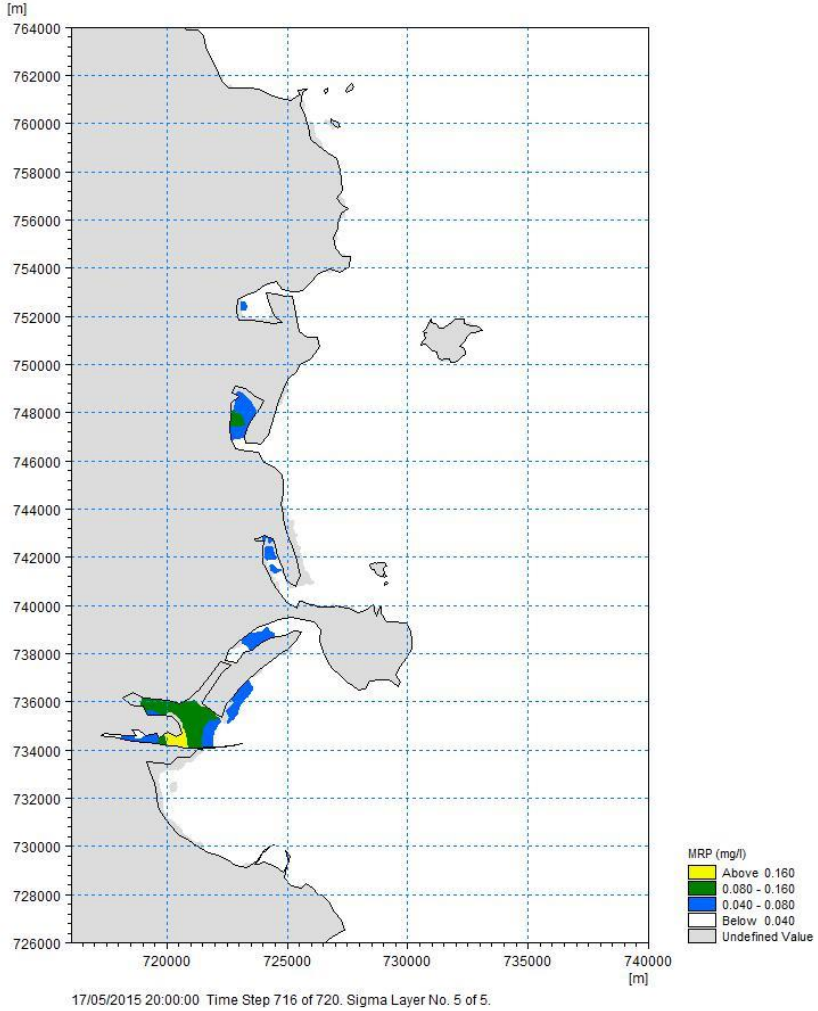

Diagram 8.24: MRP Concentration at Mid Flood on Spring Tide

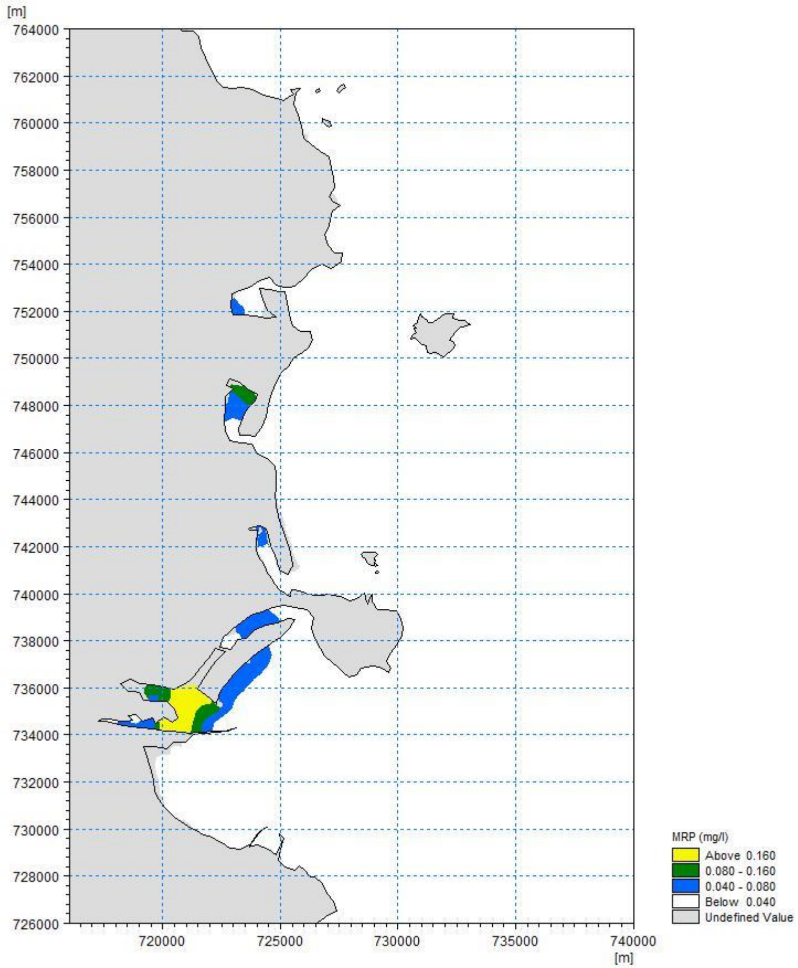

Diagram 8.25: MRP Concentration at High Water on Neap Tide

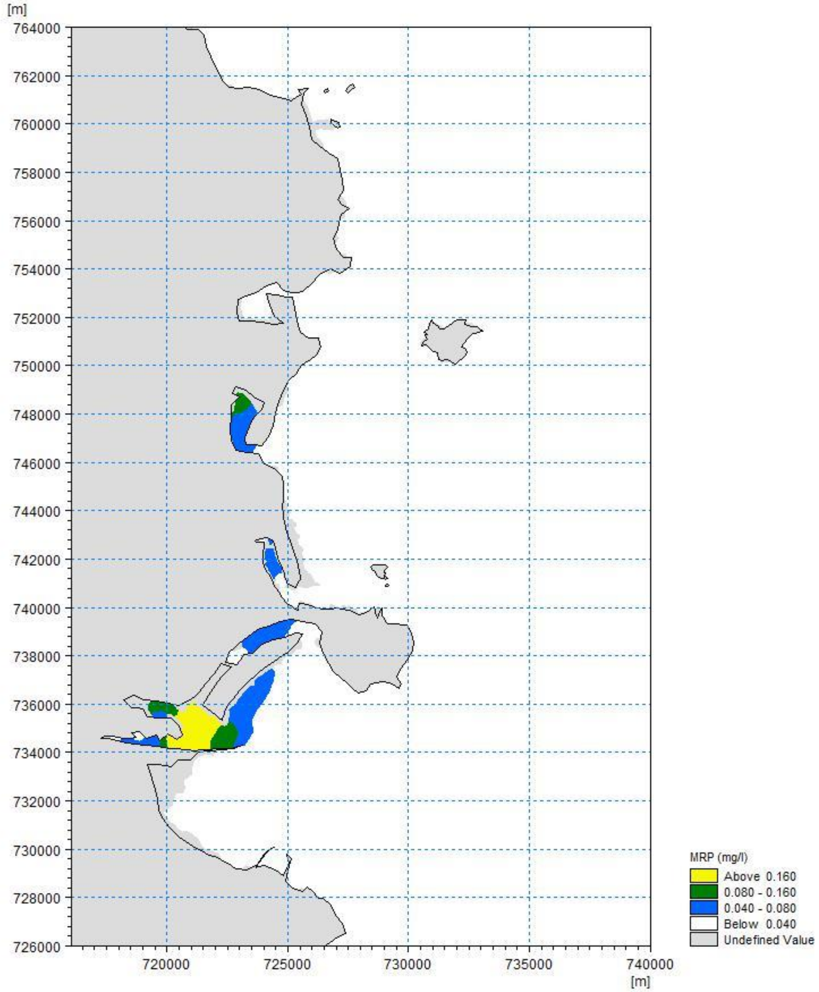

Diagram 8.26: MRP Concentration at Mid Ebb on Neap Tide

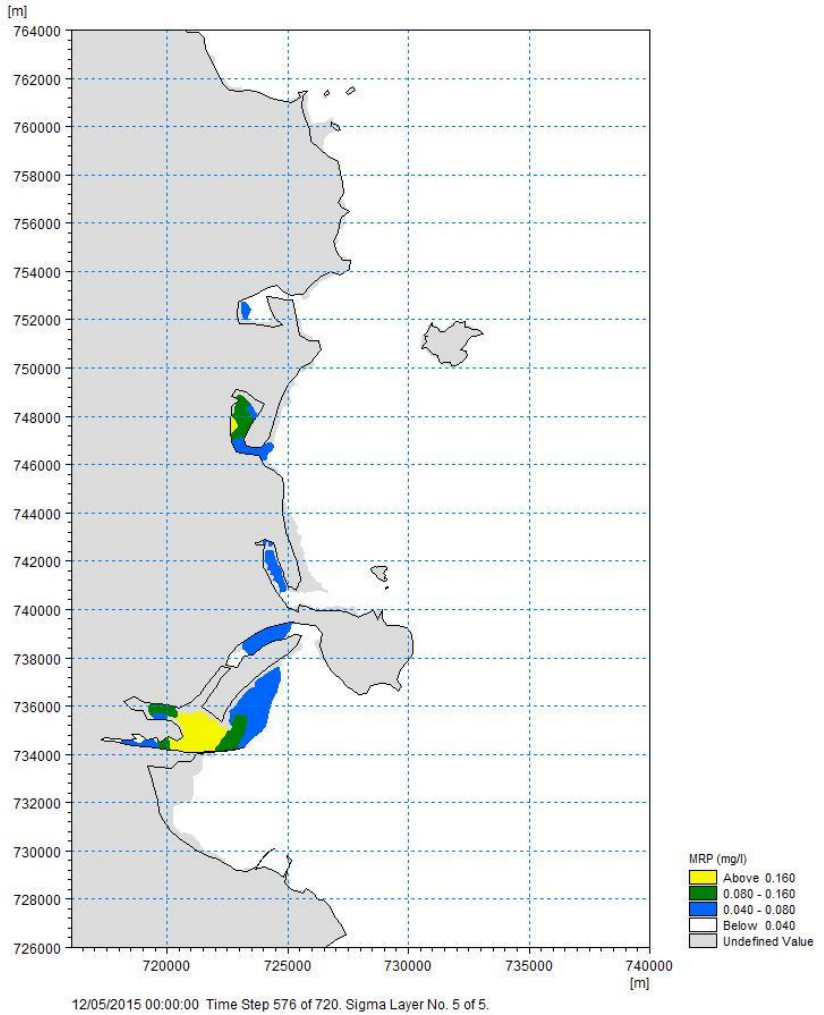

Diagram 8.27: MRP Concentration at Low Water on Neap Tide

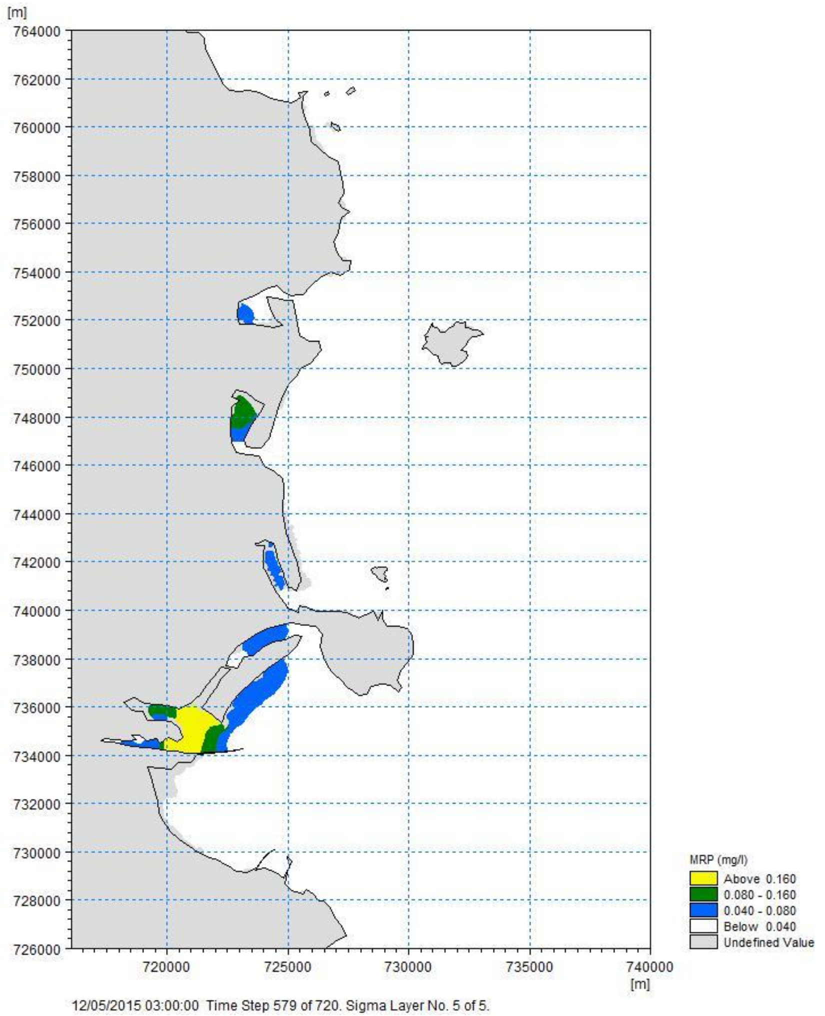

Diagram 8.28: MRP Concentration at Mid Flood on Neap Tide

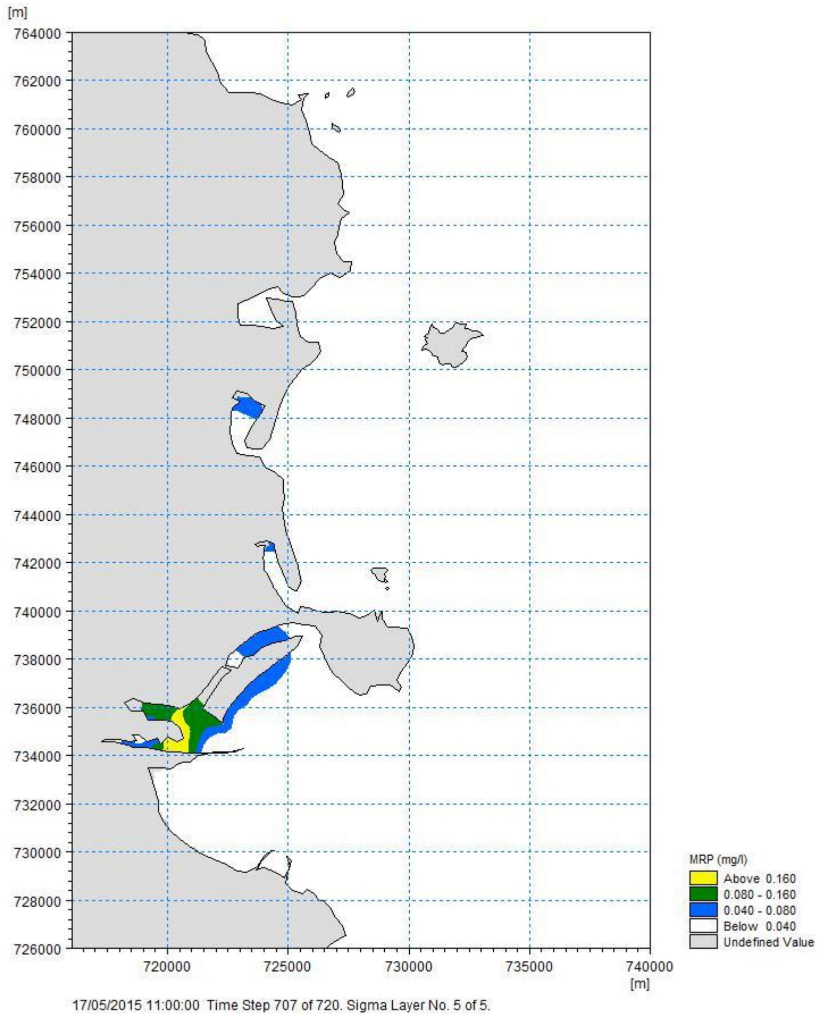

Diagram 8.29: MRP Concentration at High Water on Spring Tide

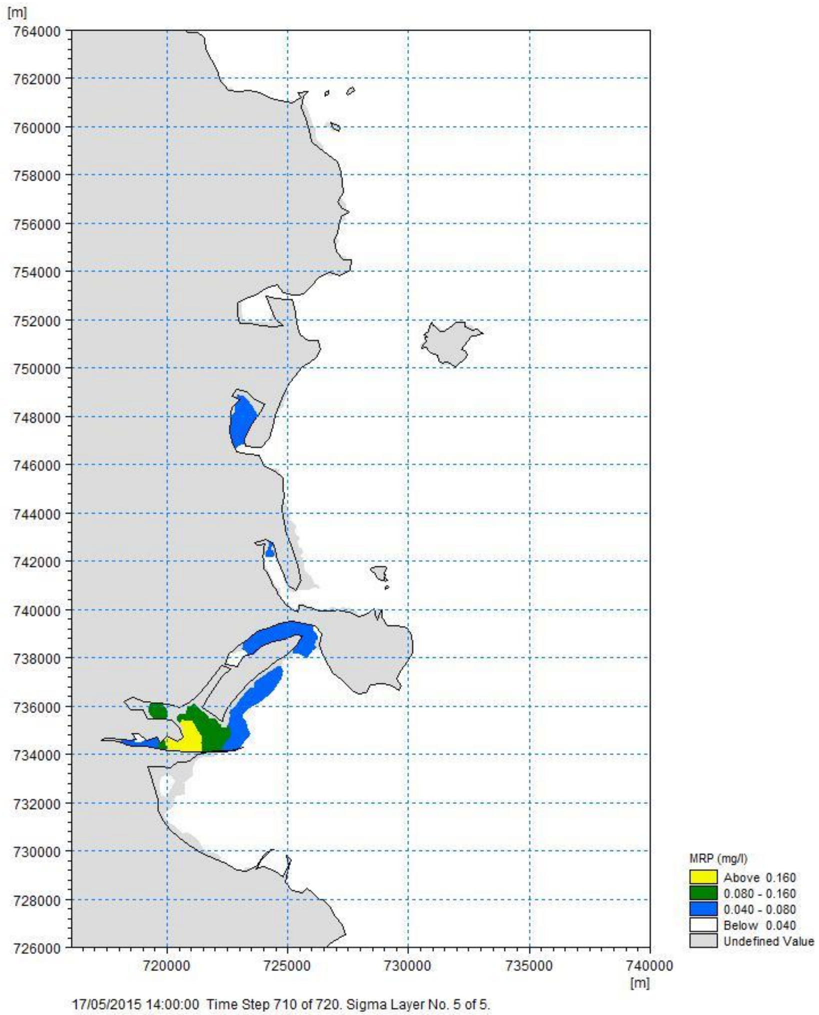

Diagram 8.30: Concentration at Mid Ebb on Spring Tide

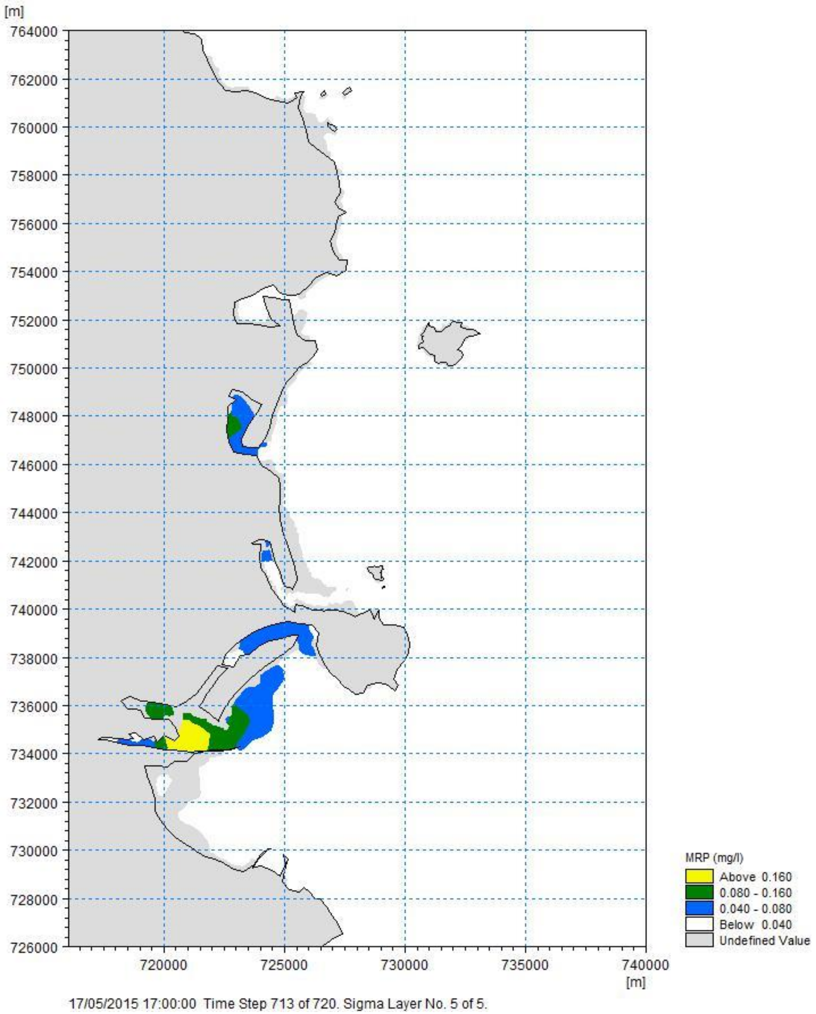

Diagram 8.31: MRP Concentration at Low Water on Spring Tide

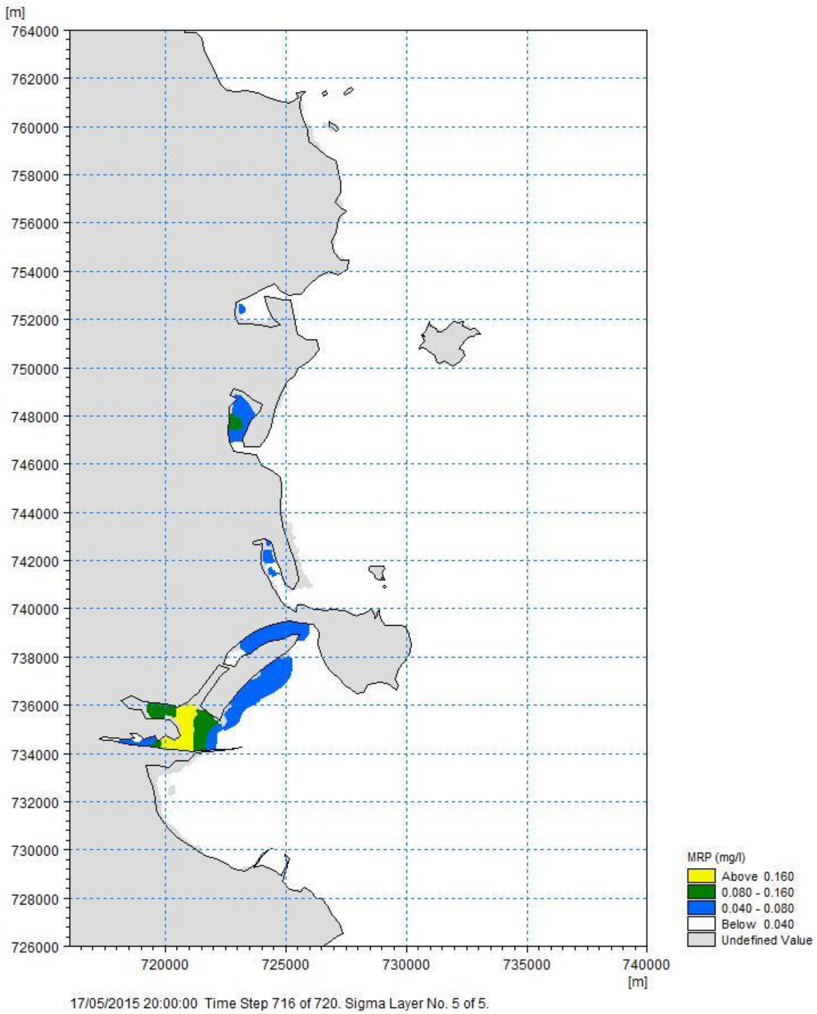

Diagram 8.32: MRP Concentration at Mid Flood on Spring Tide

8.4.2.3 Biochemical Oxygen Demand (BOD)

The Surface Water Amendment Regulations set a 95th percentile concentration limit for BOD at ≤4.0mg/l O_2 in coastal waters to achieve good status.

In Diagram 8.33 to Diagram 8.48 below, all coloured areas correspond to where the BOD concentrations in the water were predicted to exceed the good status limit of ≤4.0mg/l O_2.

8.4.2.3.1 Average Daily Flow

The tidal plots showing the maximum extent of the predicted BOD plume from the proposed outfall pipeline route (marine section) discharge point at high water, mid ebb, low water and mid flood on neap tides are presented in Diagram 8.33 to Diagram 8.36 and on spring tides in Diagram 8.37 to Diagram 8.40.

None of the diagrams show the BOD plume from the proposed outfall pipeline route (marine section) discharge point exceeding the 4.0mg/l O_2 limit required to achieve good status.

Elevated BOD levels in the transitional waters displayed in the diagrams result from other WwTPs or rivers directly discharging to the affected waters.

The diagrams show that there is predicted to be no impact on the receiving waters from the proposed operation of the proposed outfall pipeline route (marine section) discharge point, in line with the outcome of the previous modelling scenario undertaken for the 2018 planning application .

8.4.2.3.2 Flow to Full Treatment

The tidal plots showing the maximum extent of the predicted BOD plume from the proposed outfall pipeline route (marine section) discharge point at high water, mid ebb, low water and mid flood on neap tides are presented in Diagram 8.41 to Diagram 8.44 and on spring tides in Diagram 8.45 to Diagram 8.48.

None of the diagrams show the BOD plume from the proposed outfall pipeline route (marine section) discharge point exceeding the 4.0mg/l O_2 limit required to achieve good status.

Elevated BOD levels in the transitional waters displayed in the diagrams result from other WwTPs or rivers directly discharging to the affected waters.

The diagrams show that there is predicted to be no impact on the receiving waters from the proposed operation of the proposed outfall pipeline route (marine section) discharge point, in line with the outcome of the previous modelling scenario undertaken for the 2018 planning application .

8.4.2.3.3 Process Failure

No changes have been made to the proposed pumping failure scenario since the submission of the 2018 planning application and this is still considered a robust scenario. Therefore, there are no changes to this component of the EIAR in the 2018 planning application.

None of the updated scenarios predicted the likelihood of any significant impact on the receiving waters from the proposed operation of the proposed outfall pipeline route (marine section) discharge point.

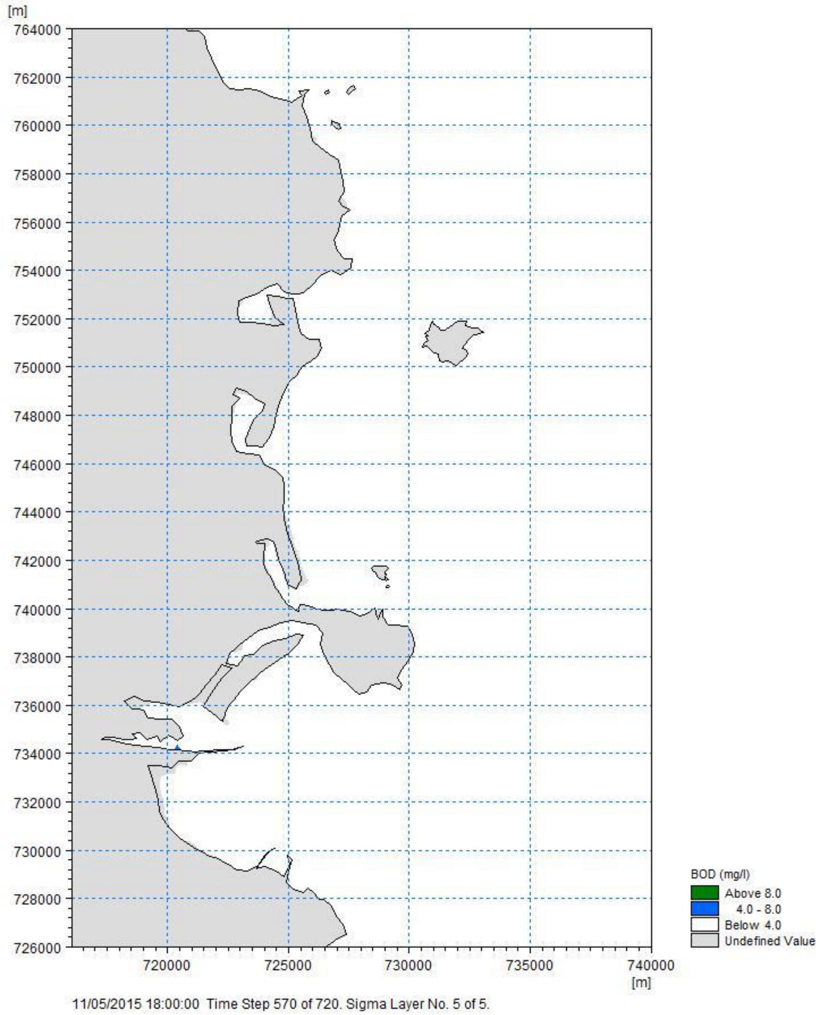

Diagram 8.33: BOD Concentration at High Water on Neap Tide

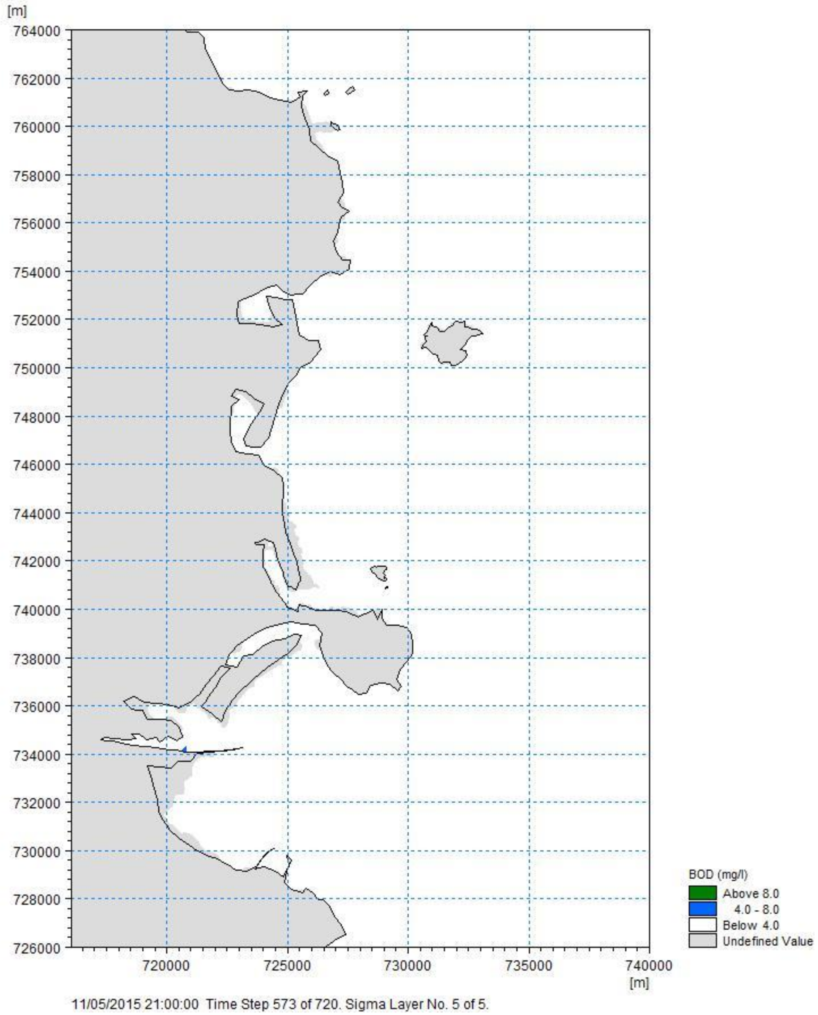

Diagram 8.34: BOD Concentration at Mid Ebb on Neap Tide

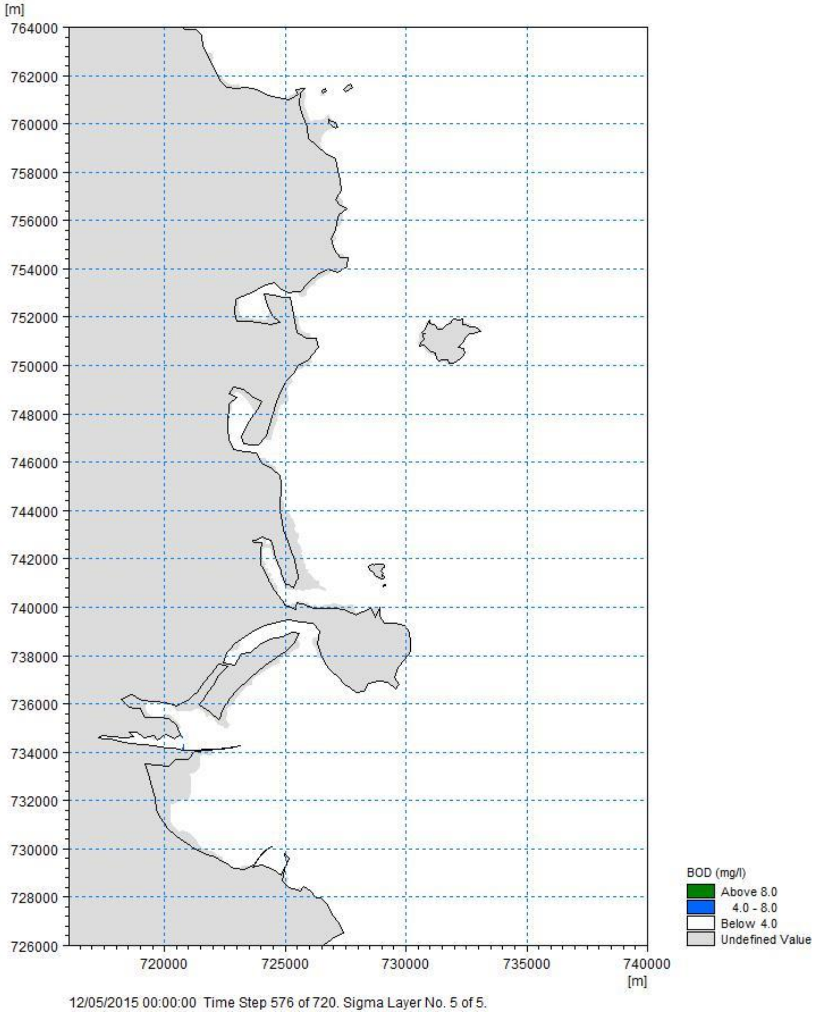

Diagram 8.35: BOD Concentration at Low Water on Neap Tide

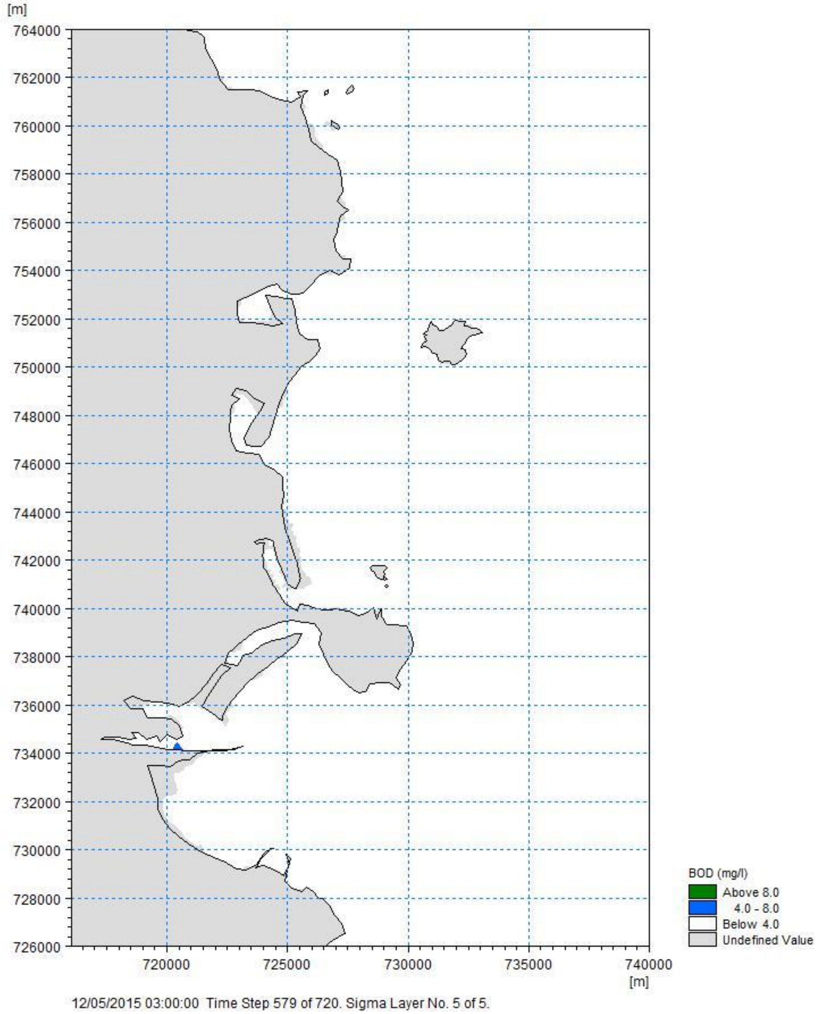

Diagram 8.36: BOD Concentration at Mid Flood on Neap Tide

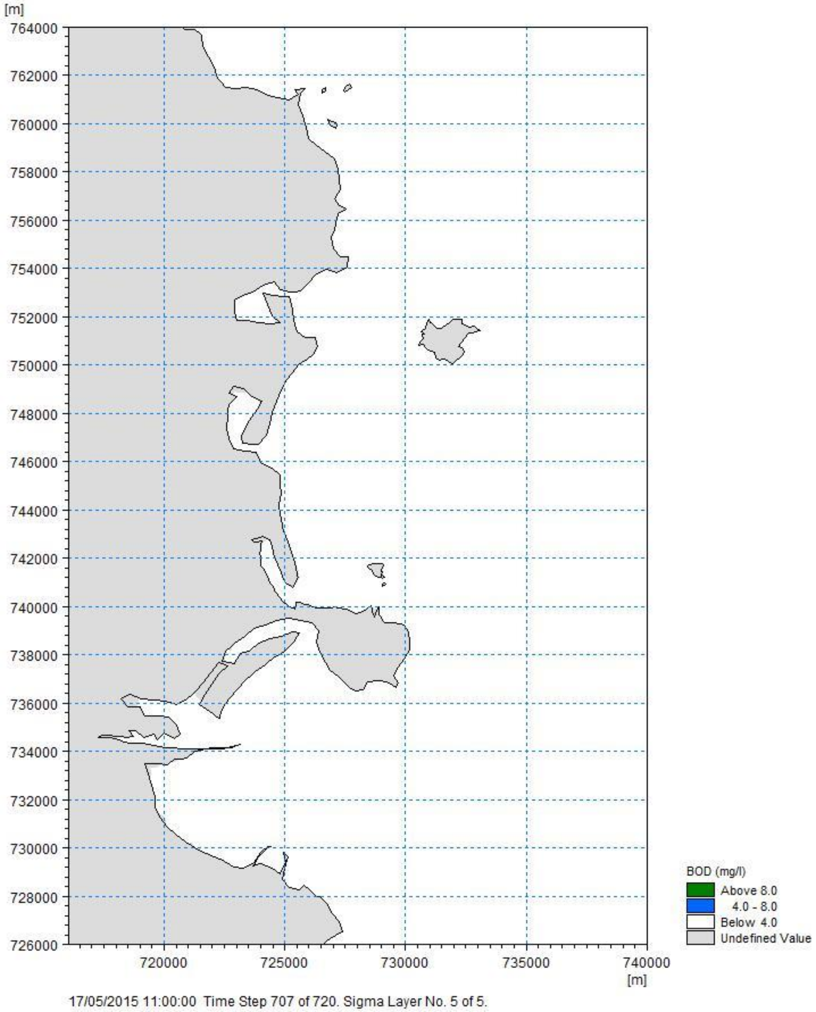

Diagram 8.37: BOD Concentration at High Water on Spring Tide

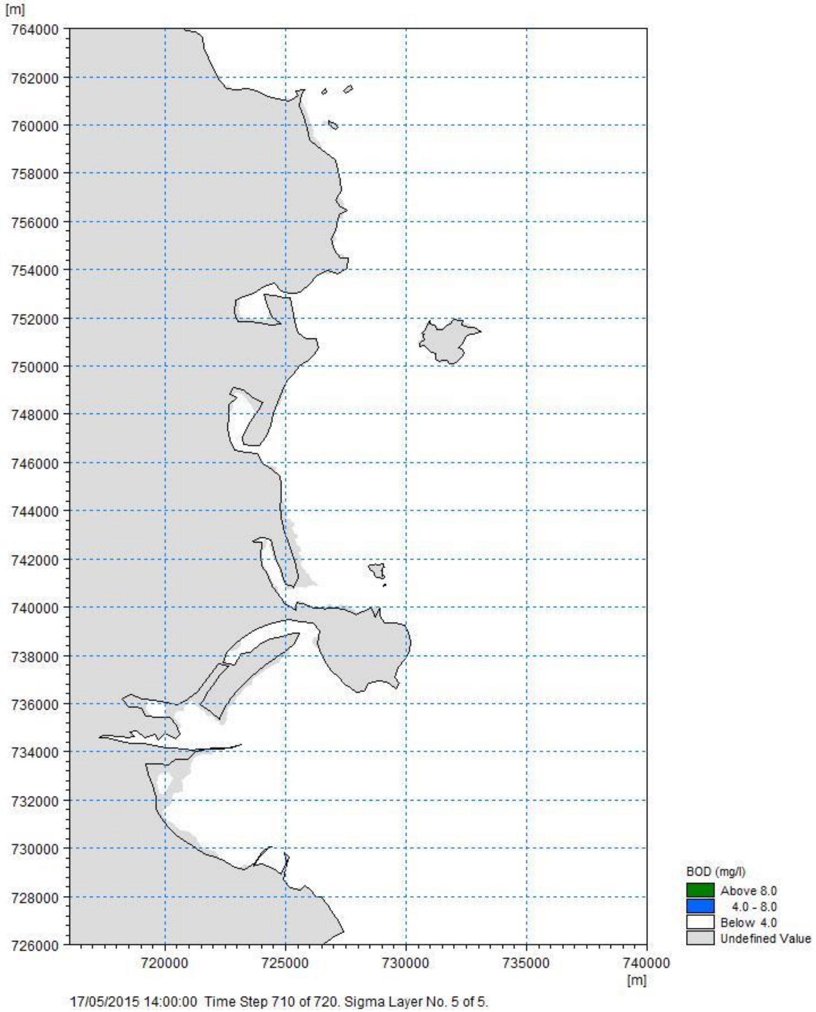

Diagram 8.38: BOD Concentration at Mid Ebb on Spring Tide

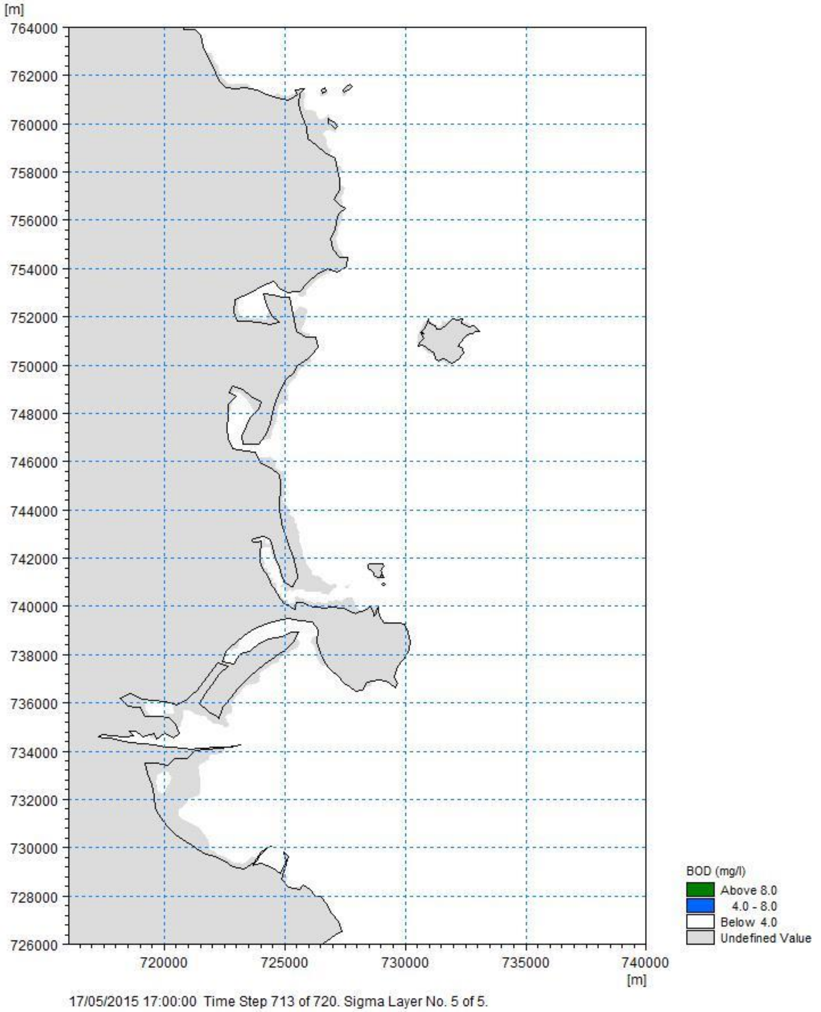

Diagram 8.39: BOD Concentration at Low Water on Spring Tide

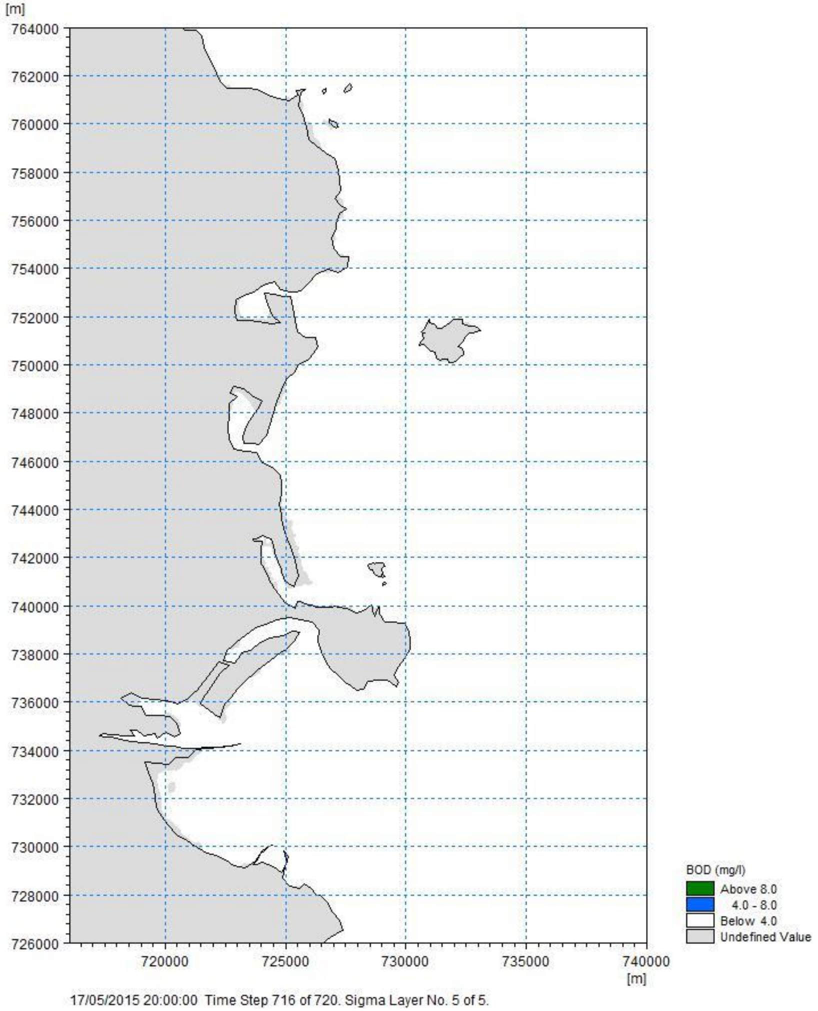

Diagram 8.40: BOD Concentration at Mid Flood on Spring Tide

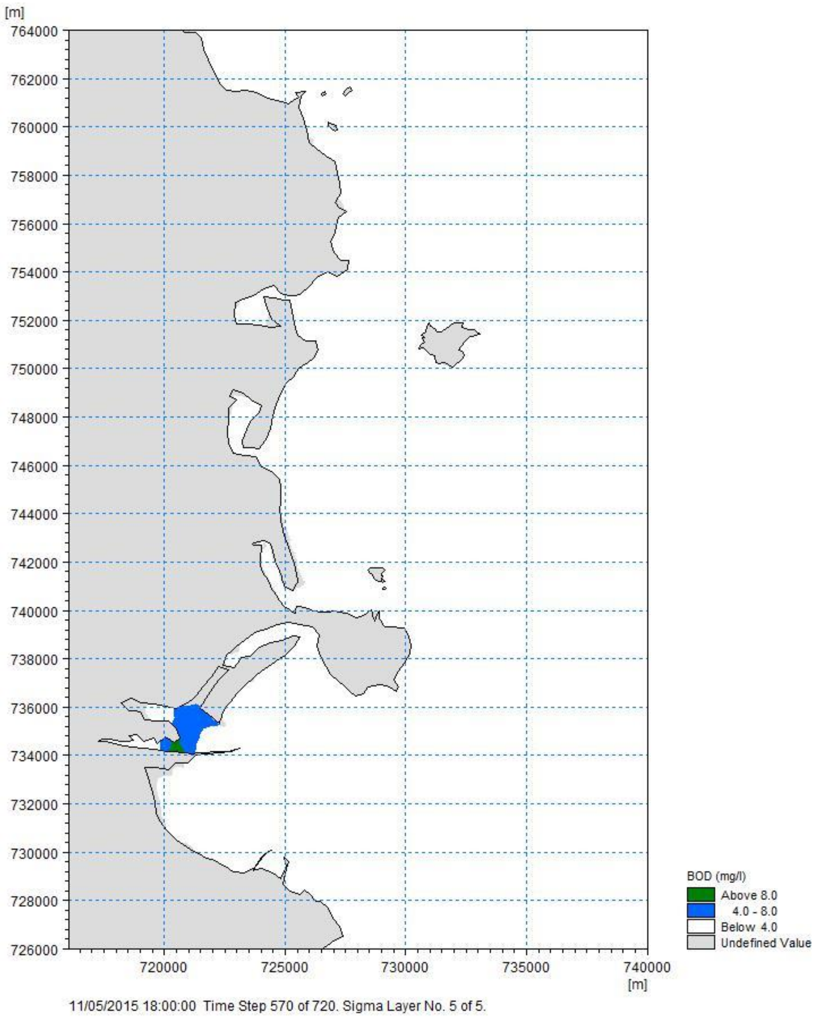

Diagram 8.41: BOD Concentration at High Water on Neap Tide

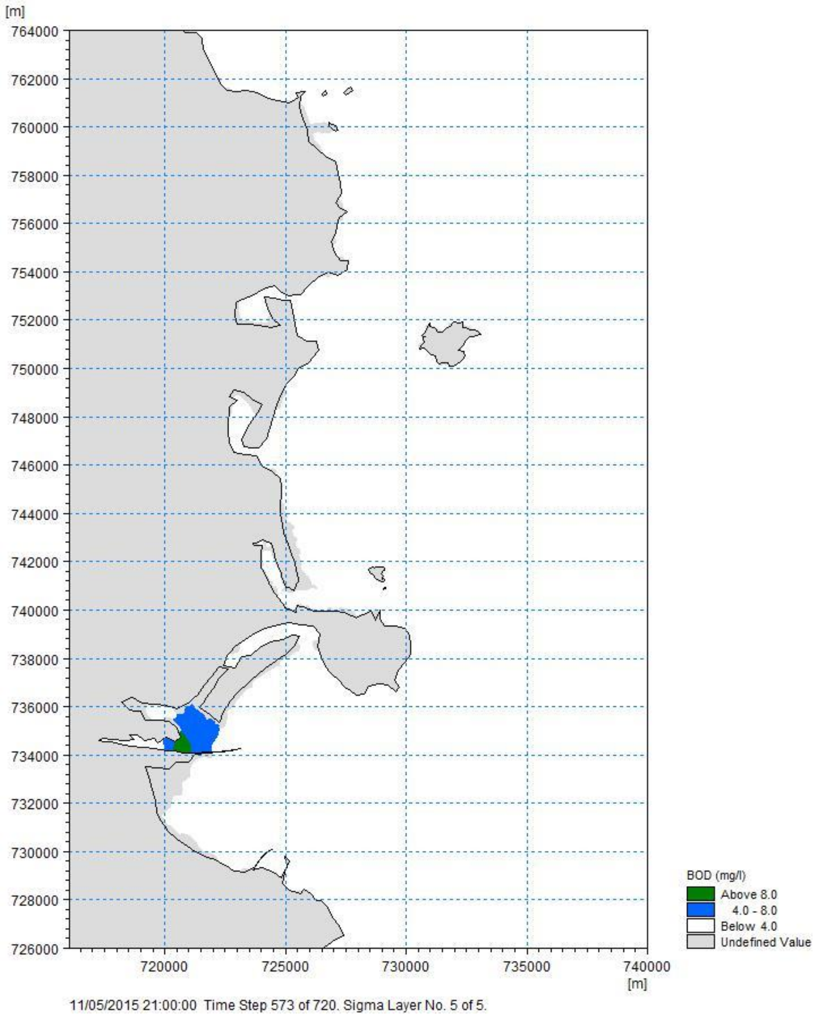

Diagram 8.42: BOD Concentration at Mid Ebb on Neap Tide

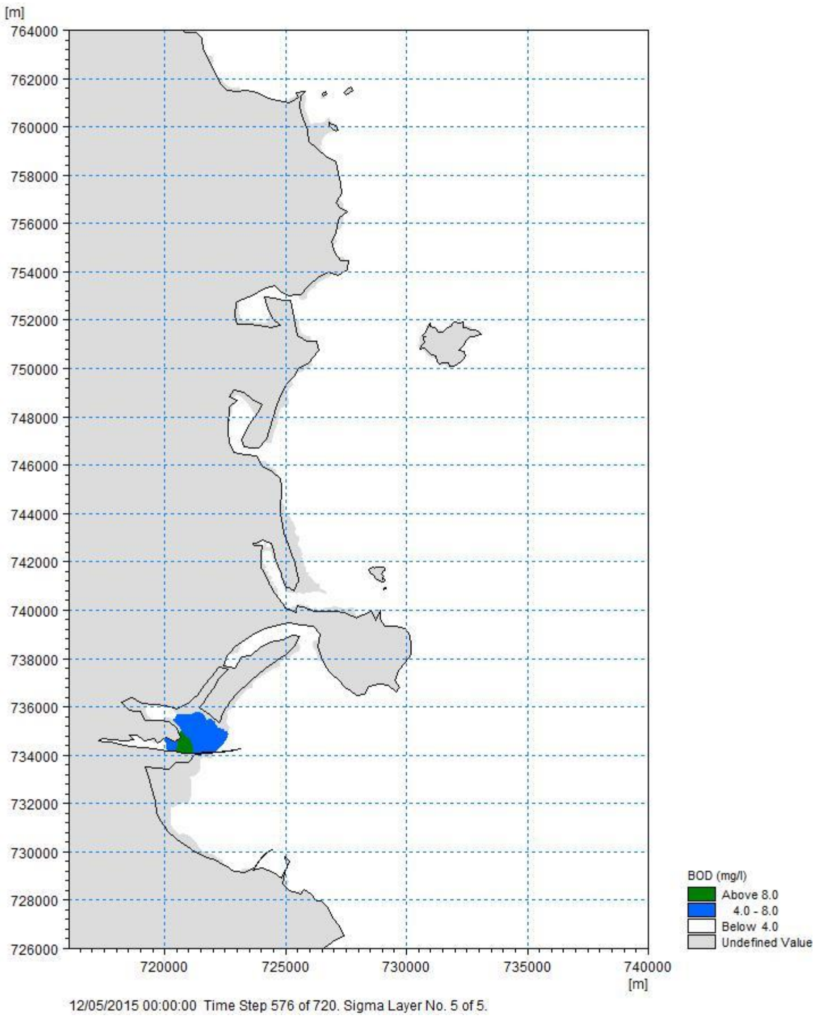

Diagram 8.43: BOD Concentration at Low Water on Neap Tide

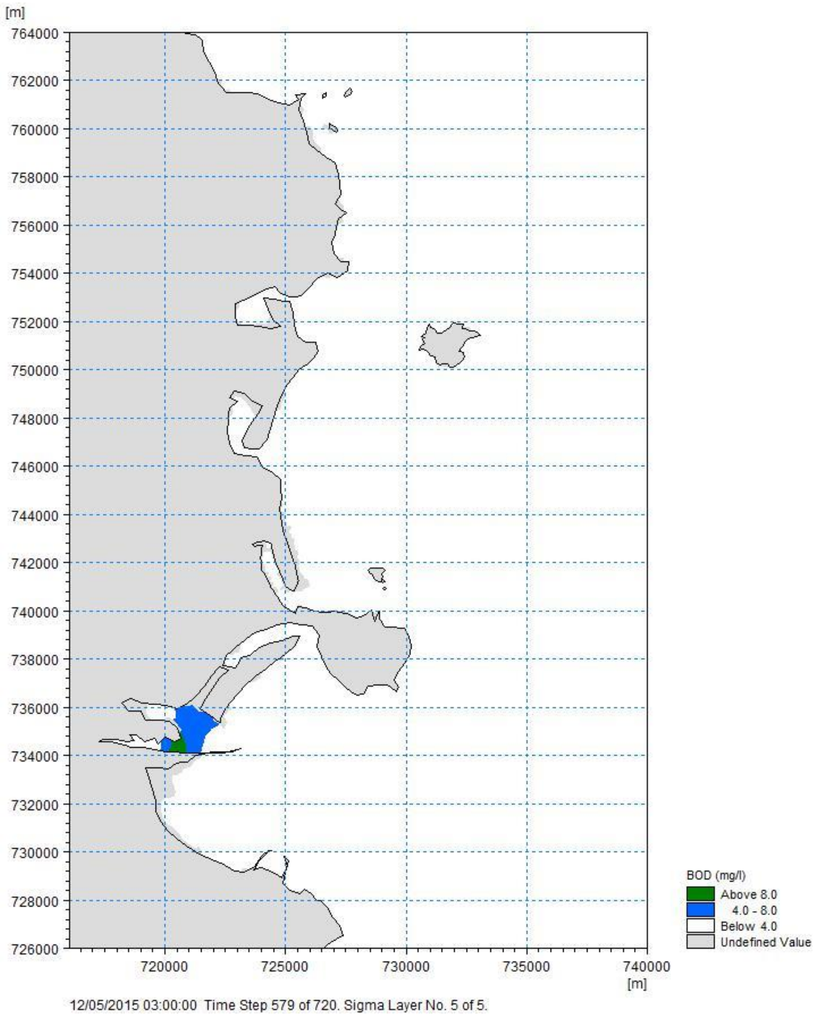

Diagram 8.44: BOD Concentration at Mid Flood on Neap Tide

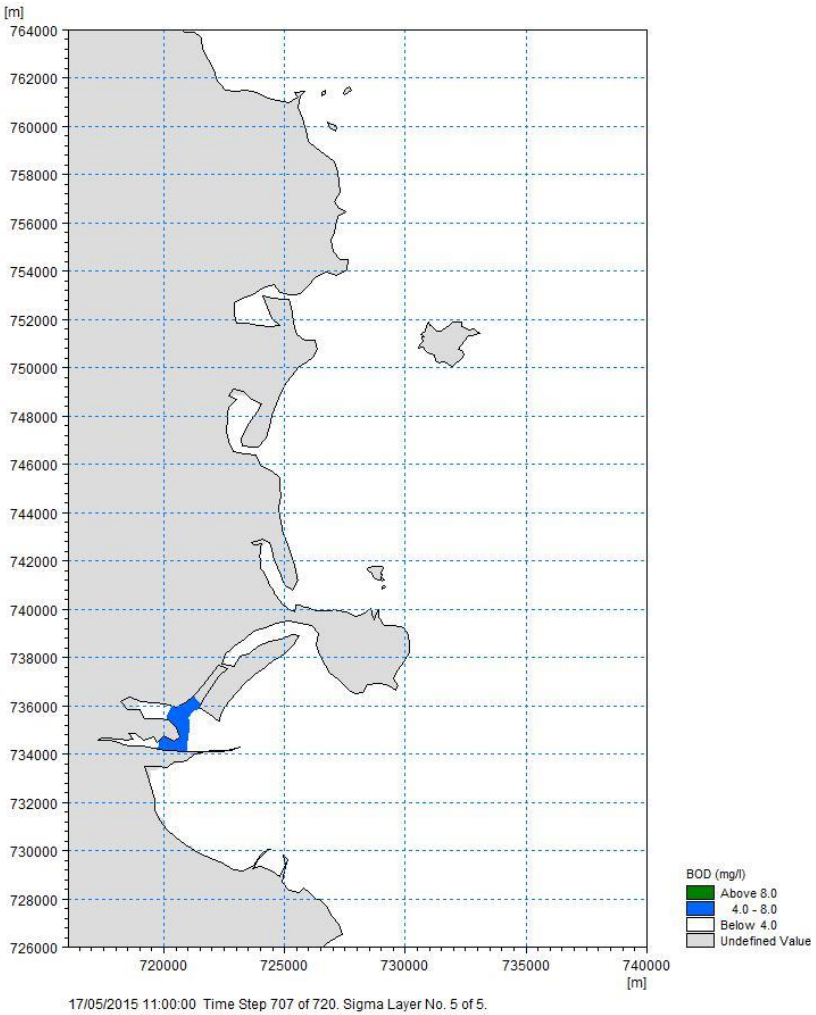

Diagram 8.45: BOD Concentration at High Water on Spring Tide

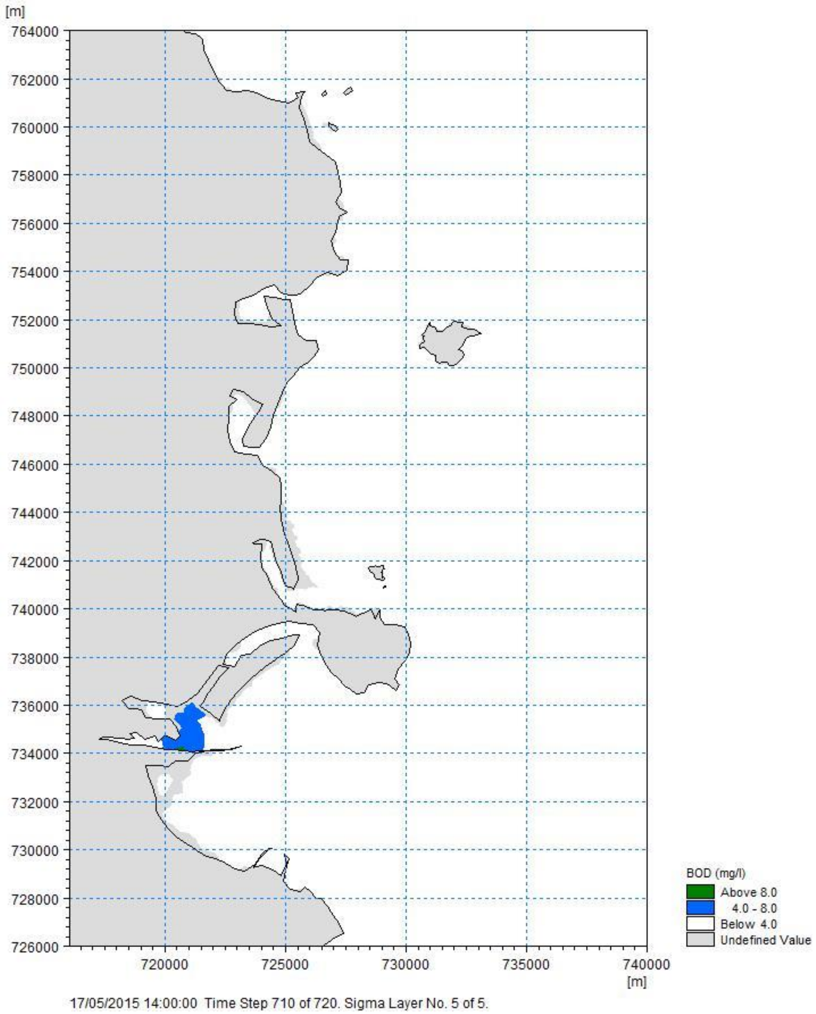

Diagram 8.46: BOD Concentration at Mid Ebb on Spring Tide

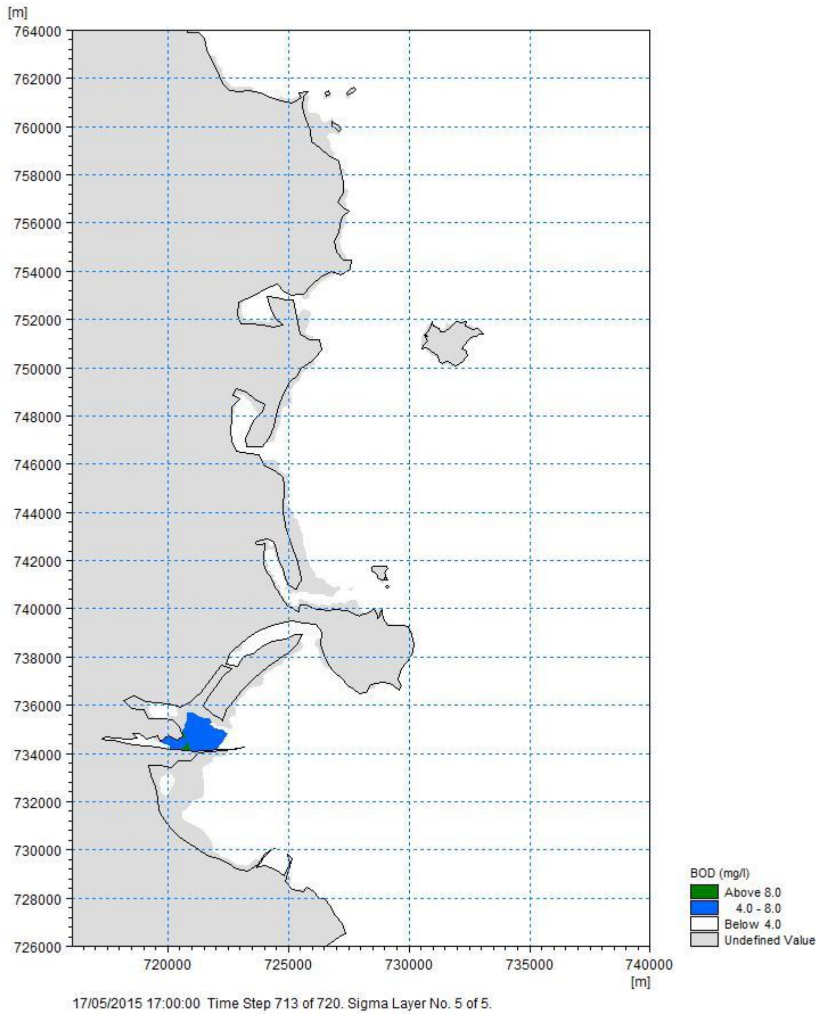

Diagram 8.47: BOD Concentration at Low Water on Spring Tide

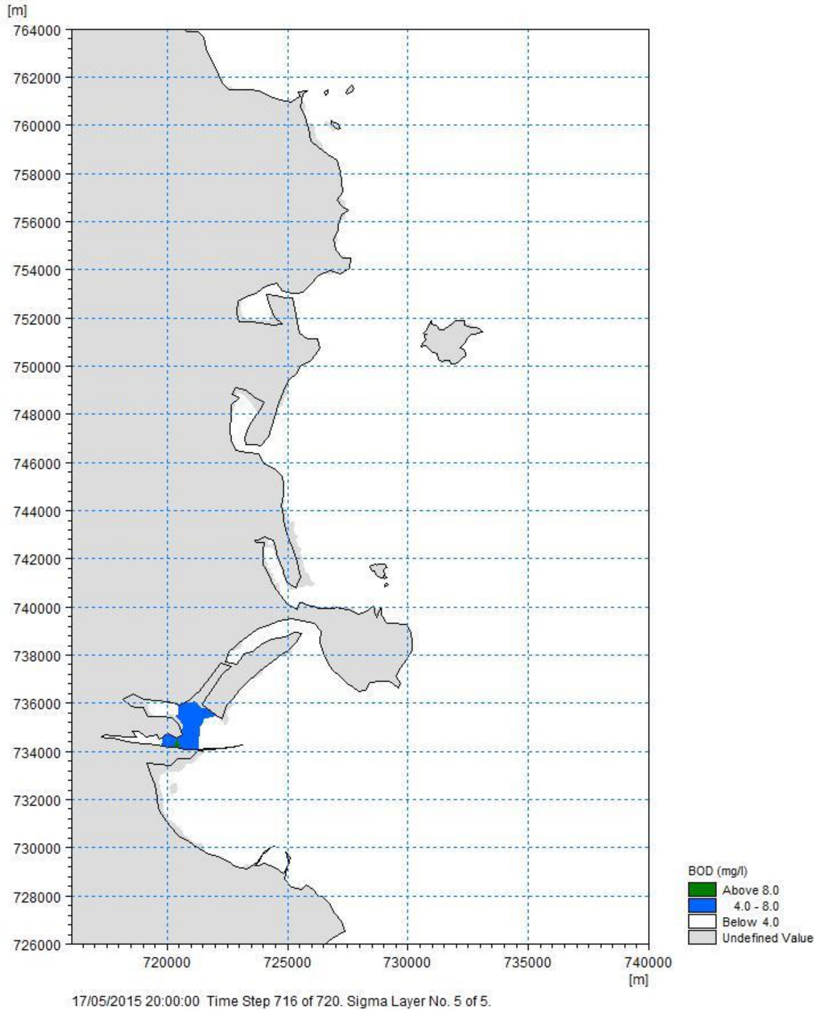

Diagram 8.48: BOD Concentration at Mid Flood on Spring Tide

8.4.2.4 Escherichia Coliform (COLI)

There have been no changes to S.I. No. 79/2008 - Bathing Water Quality Regulations 2008 (hereafter referred to as the Bathing Water Quality Regulations) since the submission of the 2018 planning application, and therefore, the requirement remains that the maximum values of COLI should not exceed the mandatory value of 500 cfu/100ml in 95% or more of the samples taken in the season to ensure a 'good' classification of bathing water beaches, or should not exceed the mandatory value of 250 cfu/100ml in 95% or more of the samples taken in the season to ensure an 'excellent' classification of bathing water beaches.

8.4.2.4.1 Average Daily Flow

The tidal plots showing the maximum extent of the predicted COLI plume from the proposed outfall pipeline route (marine section) discharge point at high water, mid ebb, low water and mid flood on neap tides are presented in Diagram 8.49 to Diagram 8.52 and on spring tides in Diagram 8.53 to Diagram 8.56.

None of the diagrams show the COLI plume from the proposed outfall pipeline route (marine section) discharge point exceeding the 250 cfu/100ml limit required to achieve 'excellent' status.

Elevated COLI levels in the transitional waters displayed in the diagrams result from other WwTPs or rivers directly discharging to the affected waters.

The diagrams show that there is predicted to be no impact on the receiving waters from the proposed operation of the proposed outfall pipeline route (marine section) discharge point, in line with the outcome of the previous modelling scenario undertaken for the 2018 planning application.

8.4.2.4.2 Flow to Full Treatment

The tidal plots showing the maximum extent of the predicted COLI plume from the proposed outfall pipeline route (marine section) discharge point at high water, mid ebb, low water and mid flood on neap tides are presented in Diagram 8.57 to Diagram 8.60 and on spring tides in Diagram 8.61 to Diagram 8.64.

None of the diagrams show the COLI plume from the proposed outfall pipeline route (marine section) discharge point exceeding the 250 cfu/100ml limit required to achieve 'excellent' status.

Elevated COLI levels in the transitional waters displayed in the diagrams result from other WwTPs or rivers directly discharging to the affected waters.

The diagrams show that there is now predicted to be no impact on the receiving waters from the proposed operation of the proposed outfall pipeline route (marine section) discharge point. The outcome from the previous modelling scenario undertaken for the 2018 planning application predicted an Imperceptible effect.

The effect of the proposed discharge on the bathing water beaches of Claremont Beach, Sutton Beach and Velvet Strand nearest to the proposed outfall location, and on the designated shellfish waters of Malahide, was examined. Diagram 8.65 presents the locations at which the evolution of the predicted COLI concentrations over time was recorded. The locations indicated in Diagram 8.65 correspond to:

- T1: Proposed Outfall Location;
- T2: Malahide Designated Shellfish Waters sampling location;
- T3: Velvet Strand, Portmarnock bathing waters sampling location;
- T4: Sutton Beach bathing waters sampling location;
- T5: Claremont Beach bathing waters sampling location;
- T6: Southern boundary of Malahide Designated Shellfish Waters;
- T7: Southern boundary of Malahide Designated Shellfish Waters;
- T8: Southern boundary of Malahide Designated Shellfish Waters;
- T9: Southern boundary of Malahide Designated Shellfish Waters; and

- T10: Southern boundary of Malahide Designated Shellfish Waters.

The evolution of the predicted COLI concentrations over time at each of the above locations are presented for the Baseline (i.e. no proposed outfall), Average Daily Flow, and FFT scenarios from Diagram 8.66 to Diagram 8.75.

All diagrams show that there are no compliance failures predicted at any of the designated bathing water beaches, Blue Flag beaches, nor shellfish waters arising from the proposed discharge from the Proposed Project.

8.4.2.4.3 Process Failure

No changes have been made to the proposed pumping failure scenario since the submission of the 2018 planning application and this is still considered a robust scenario. Therefore, there are no changes to this component of the EIAR in the 2018 planning application.

None of the scenarios examined predicted the likelihood of any significant impact on the receiving waters from the proposed operation of the proposed outfall pipeline route (marine section) discharge point. None of the scenarios examined predicted the likelihood of any significant impact on the receiving waters from the proposed operation of the proposed outfall pipeline route (marine section) discharge point, in line with the outcome of the previous modelling scenario undertaken for the 2018 planning application .

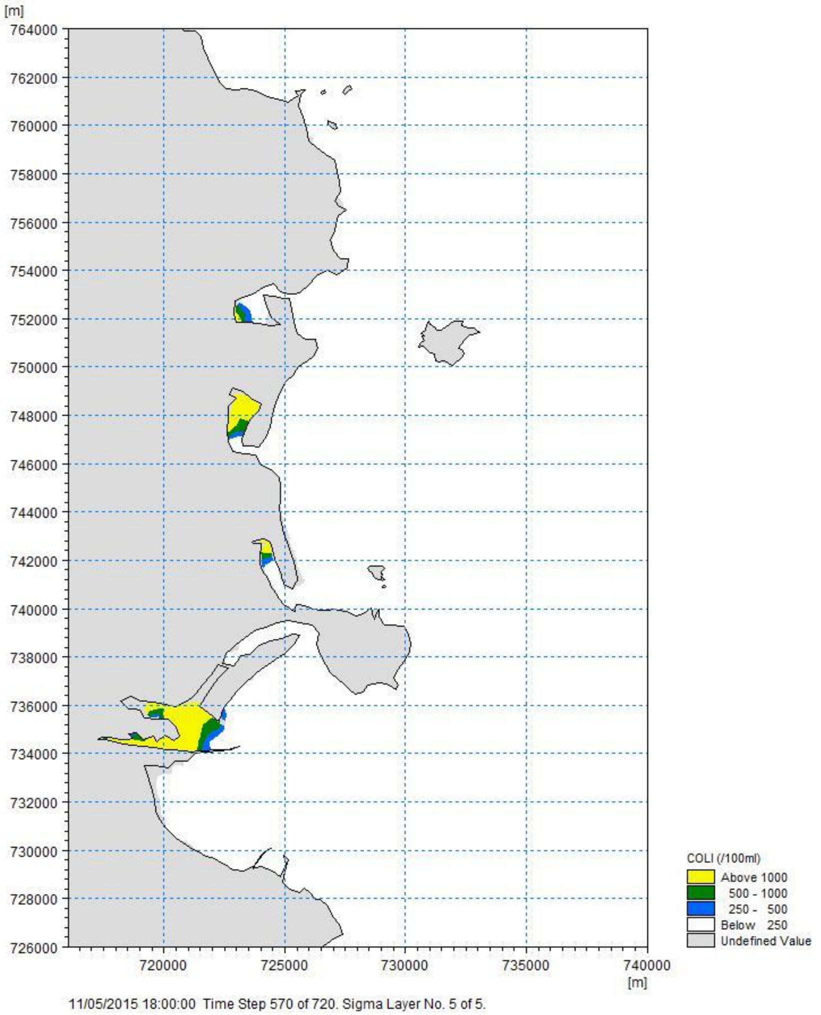

Diagram 8.49: COLI Concentration at High Water on Neap Tide

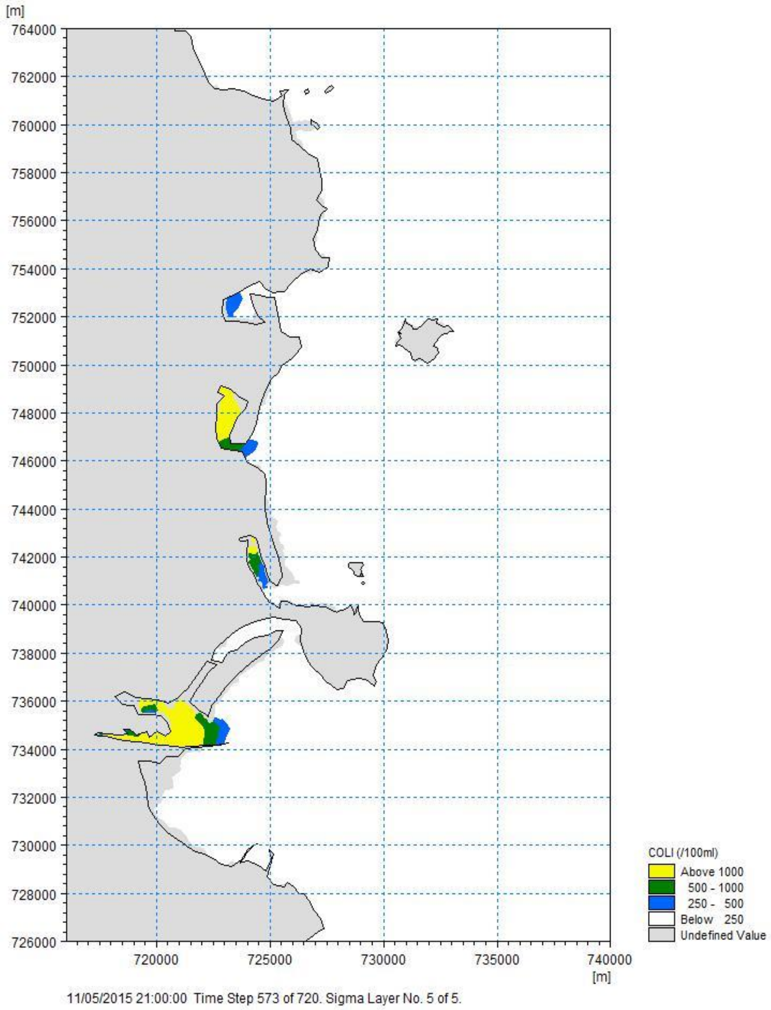

Diagram 8.50: COLI Concentration at Mid Ebb on Neap Tide

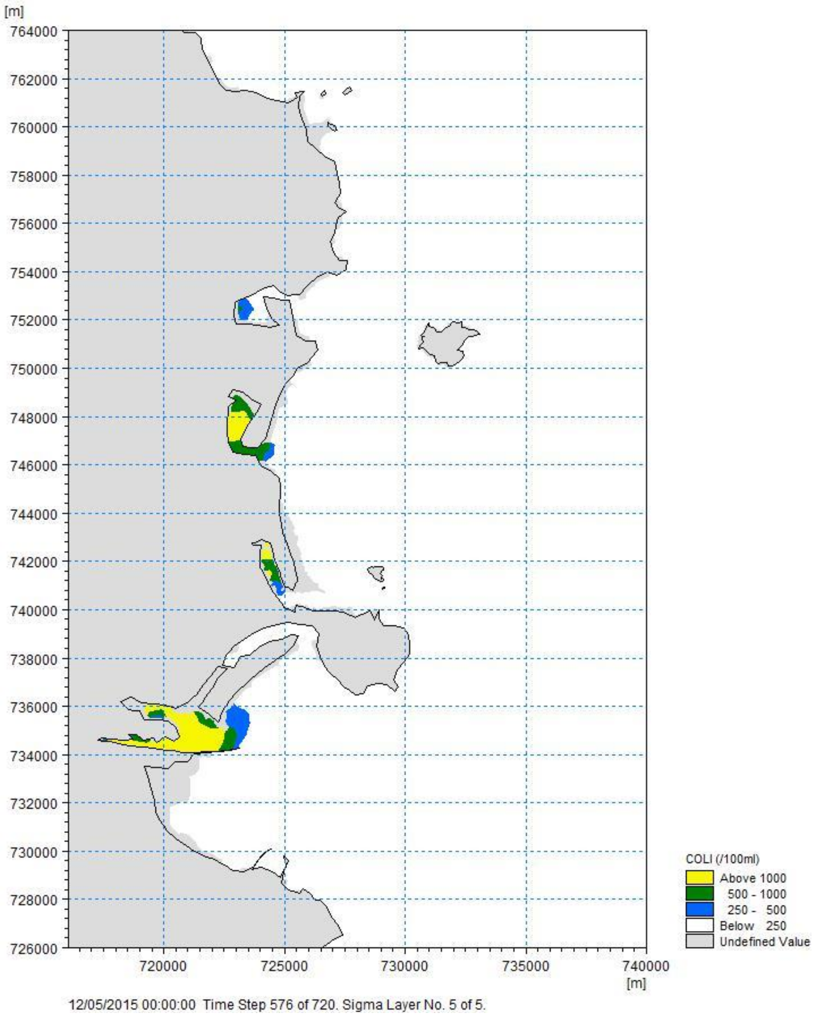

Diagram 8.51: COLI Concentration at Low Water on Neap Tide

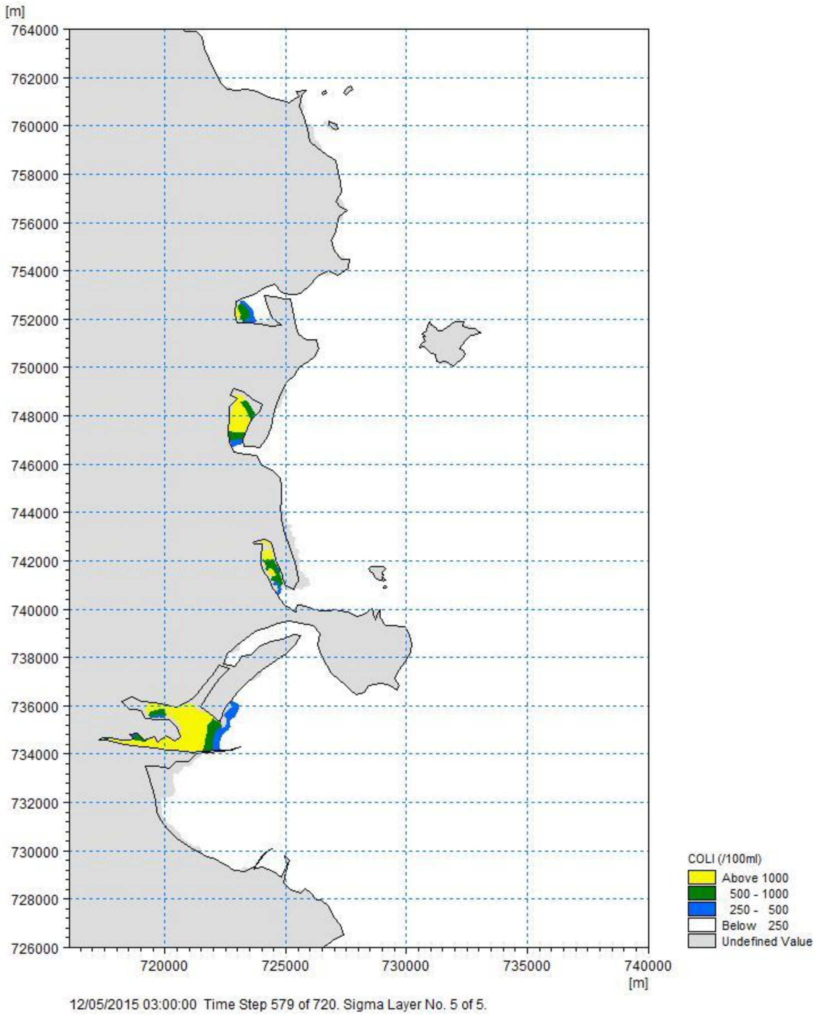

Diagram 8.52: COLI Concentration at Mid Flood on Neap Tide

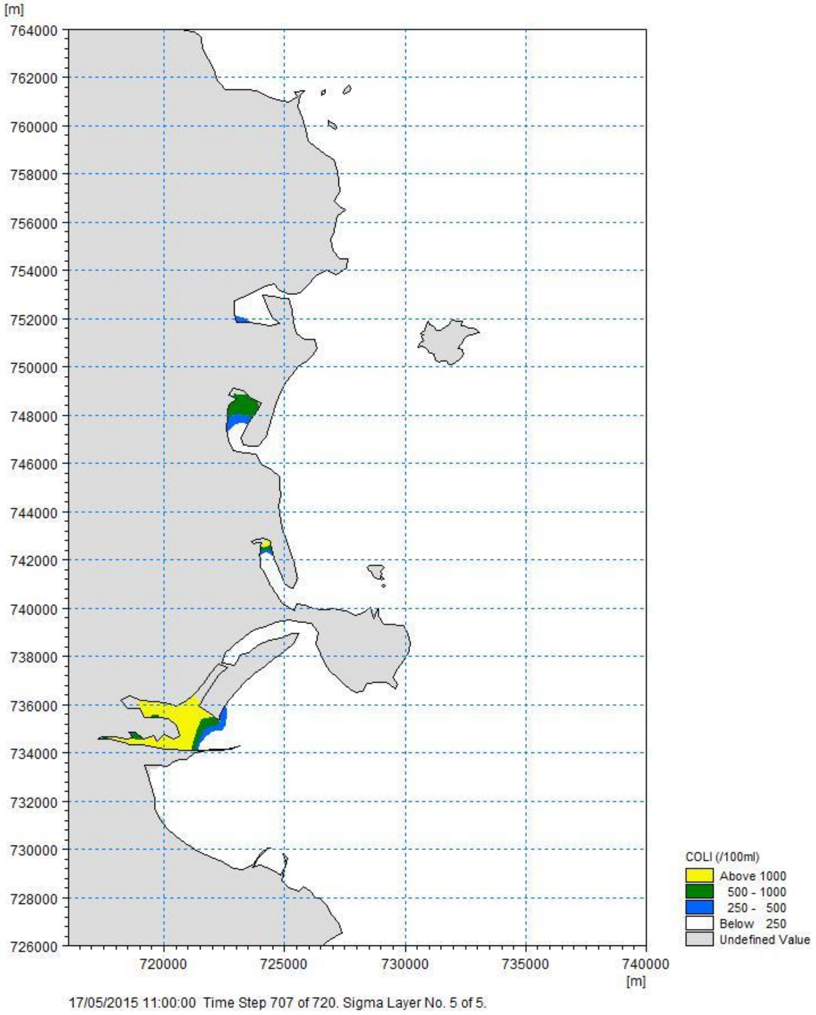

Diagram 8.53: COLI Concentration at High Water on Spring Tide

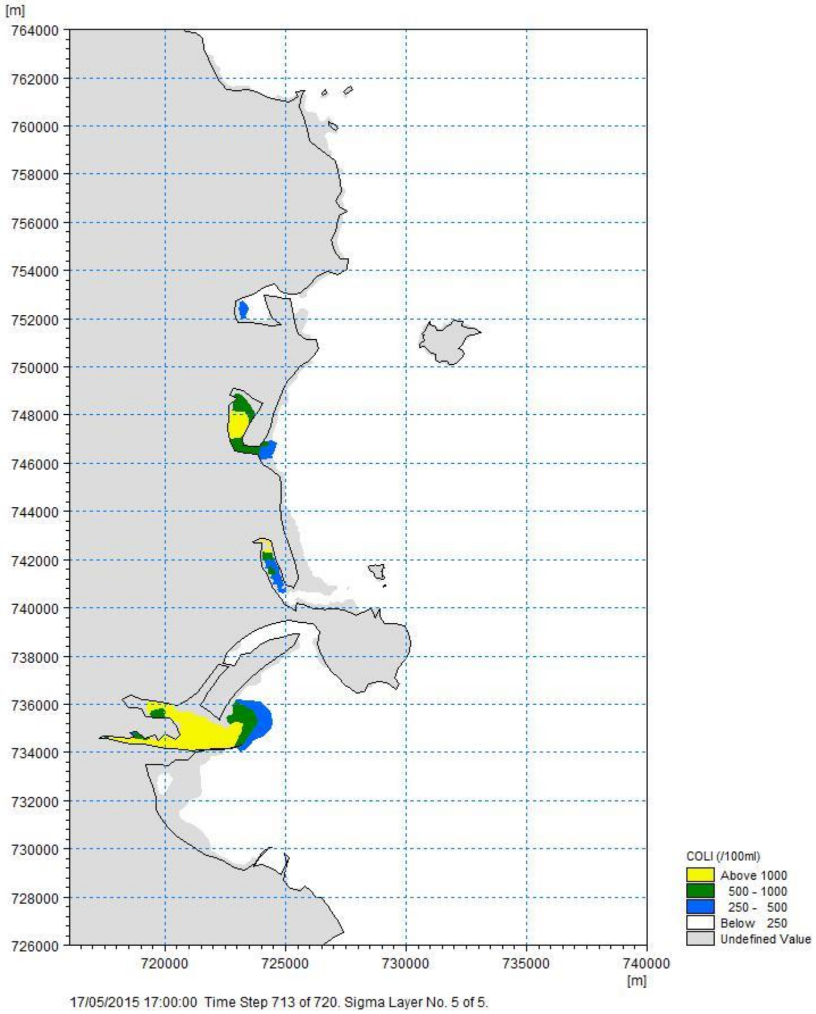

Diagram 8.54: COLI Concentration at Mid Ebb on Spring Tide

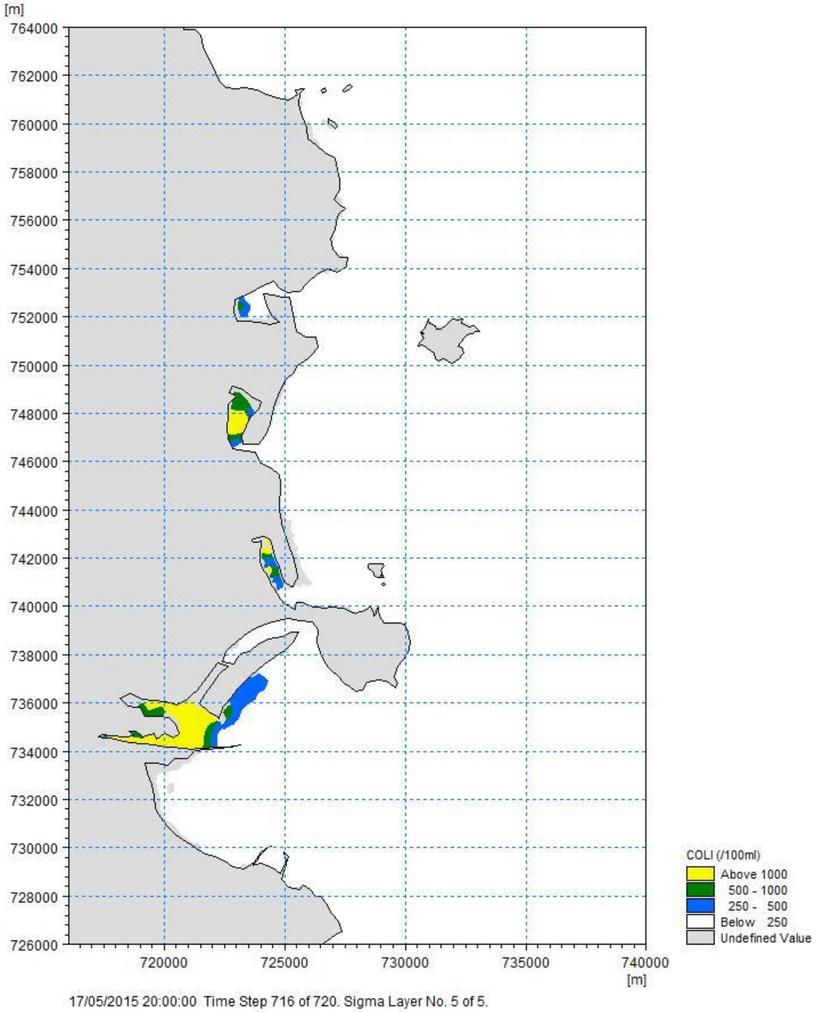

Diagram 8.55: COLI Concentration at Low Water on Spring Tide

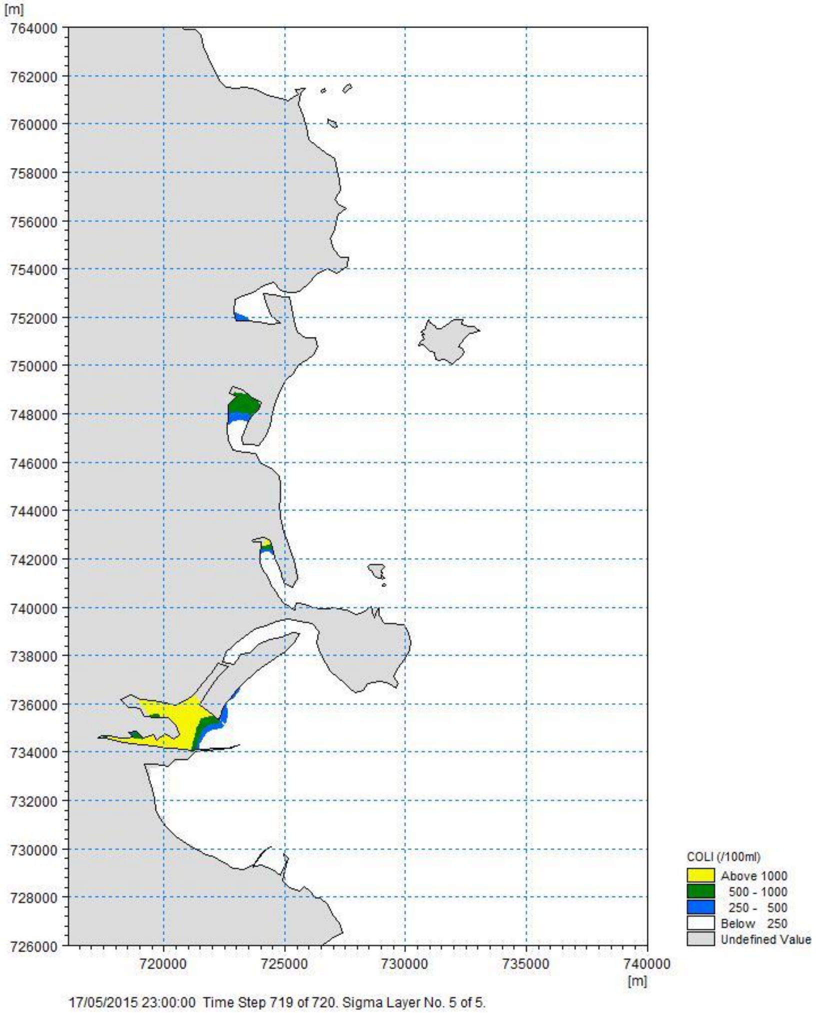

Diagram 8.56: COLI Concentration at Mid Flood on Spring Tide

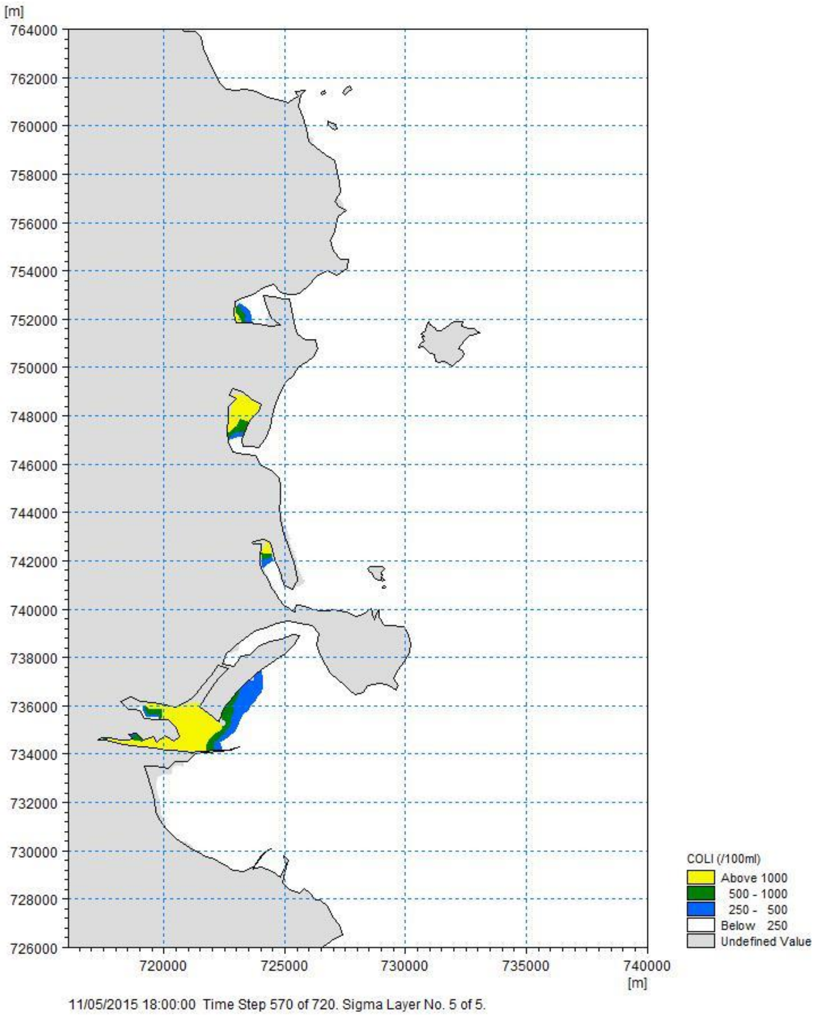

Diagram 8.57: COLI Concentration at High Water on Neap Tide

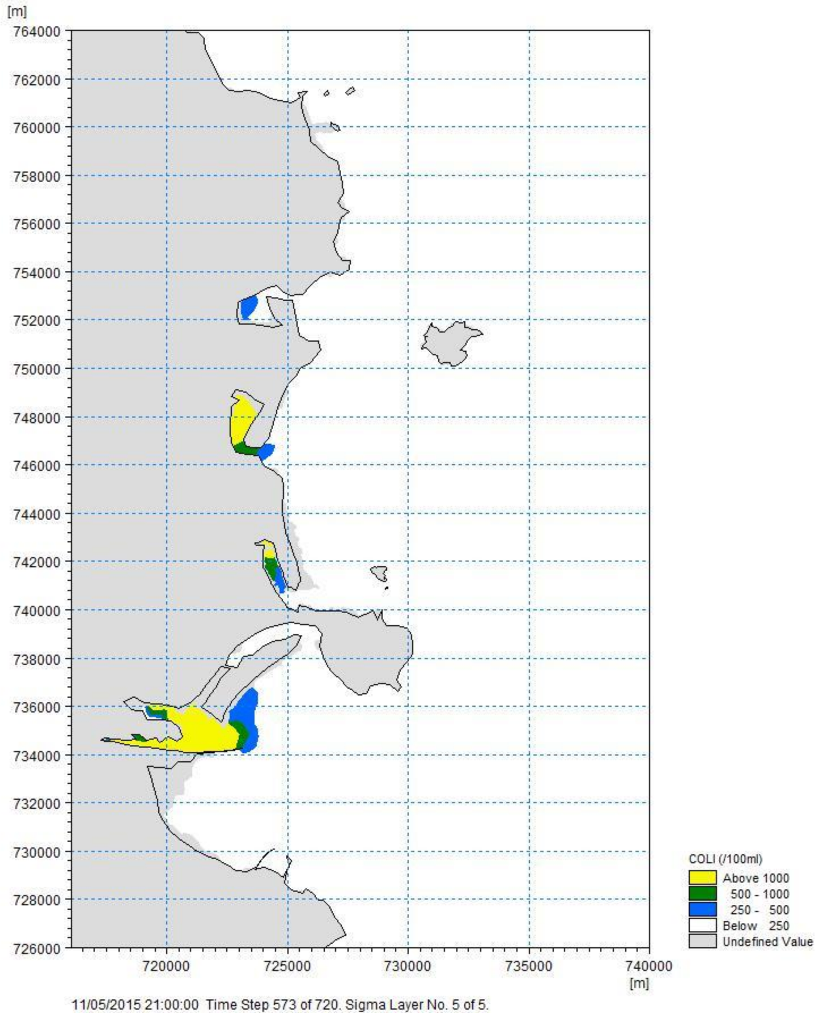

Diagram 8.58: COLI Concentration at Mid Ebb on Neap Tide

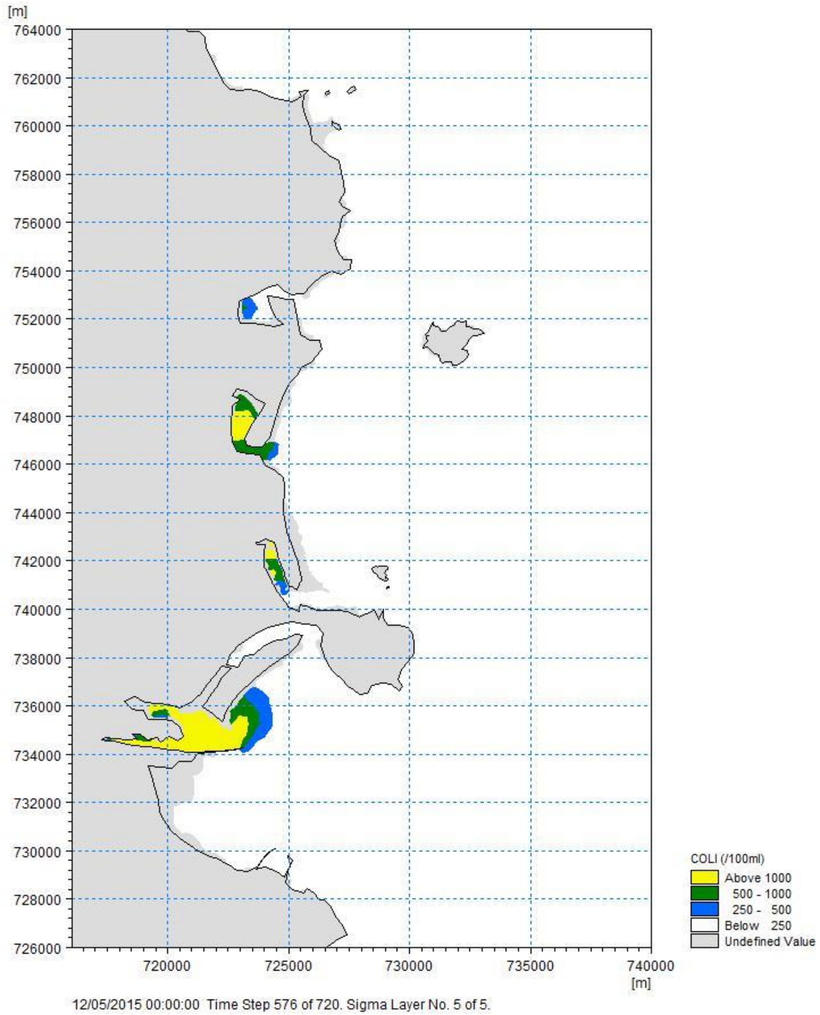

Diagram 8.59: COLI Concentration at Low Water on Neap Tide

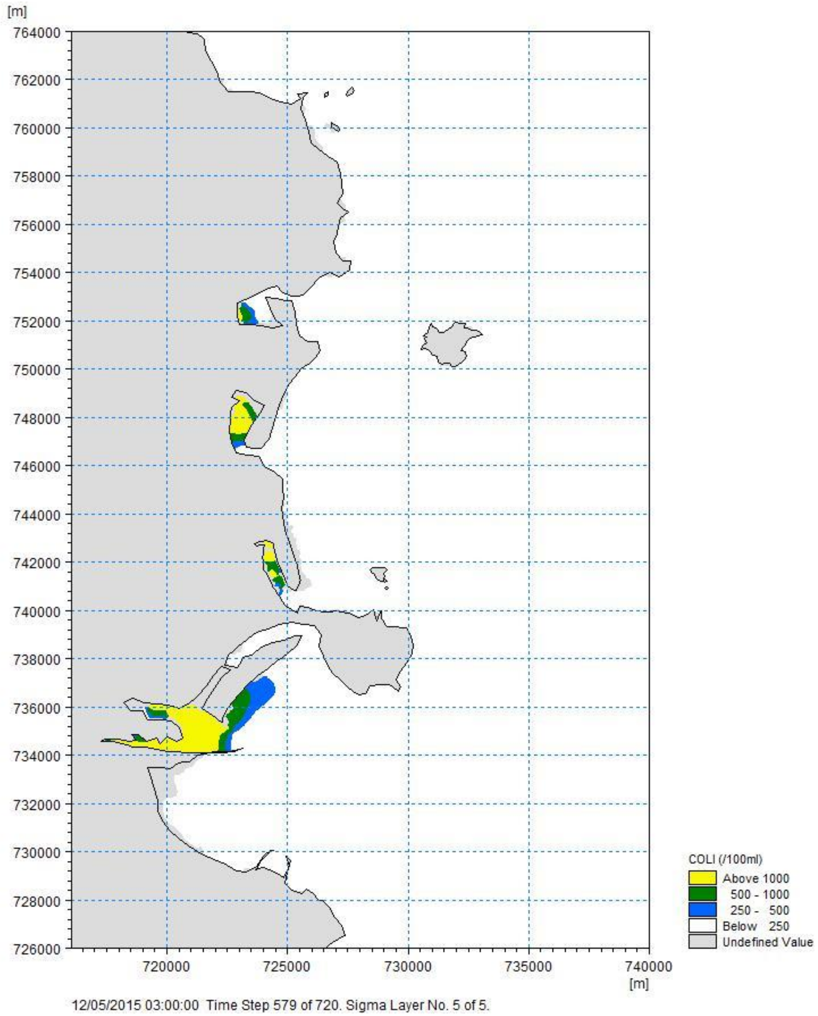

Diagram 8.60: COLI Concentration at Mid Flood on Neap Tide

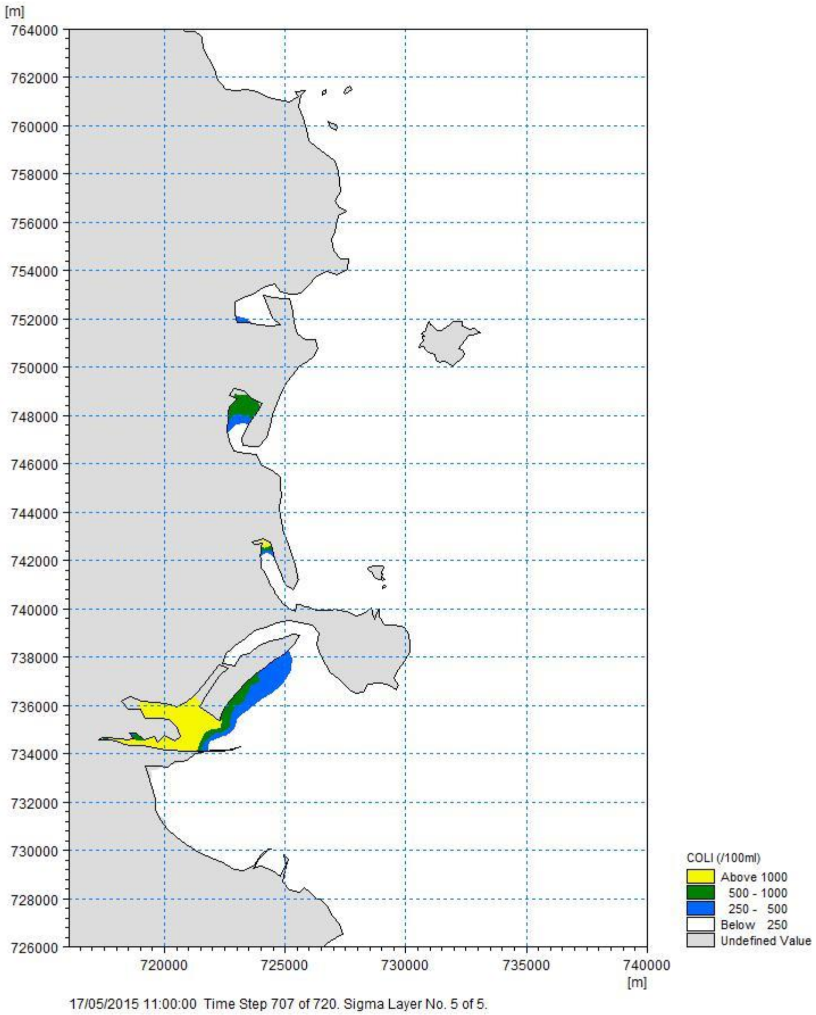

Diagram 8.61: COLI Concentration at High Water on Spring Tide

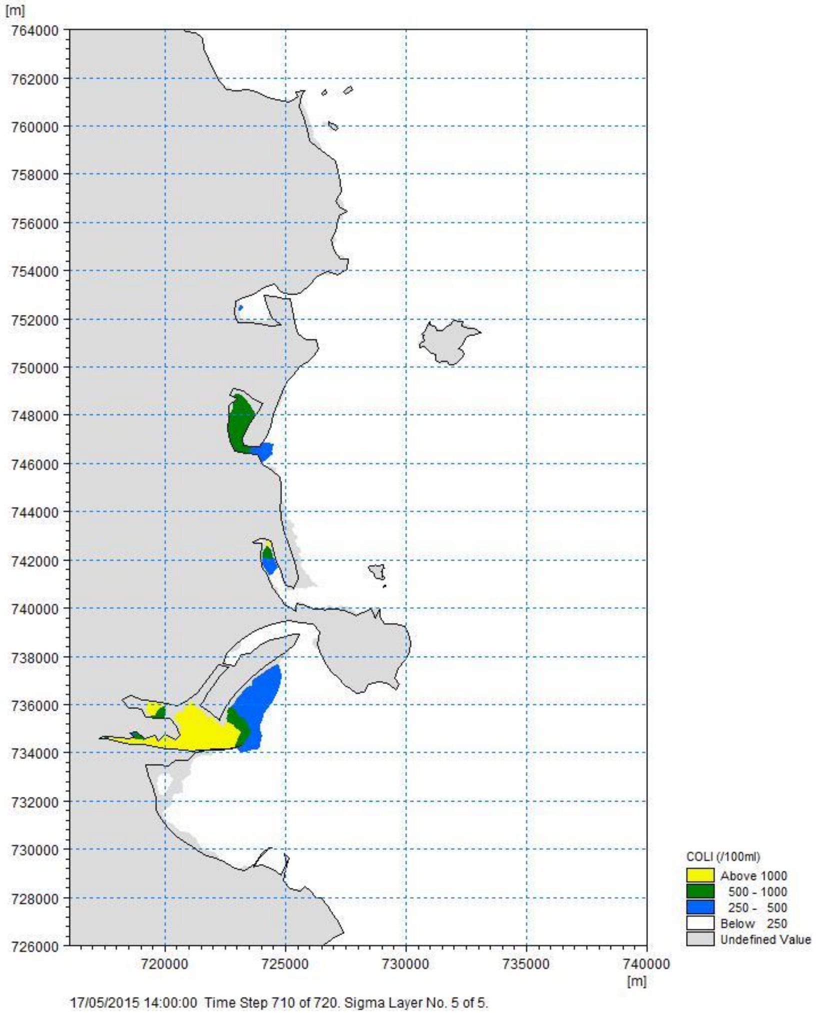

Diagram 8.62: COLI Concentration at Mid Ebb on Spring Tide

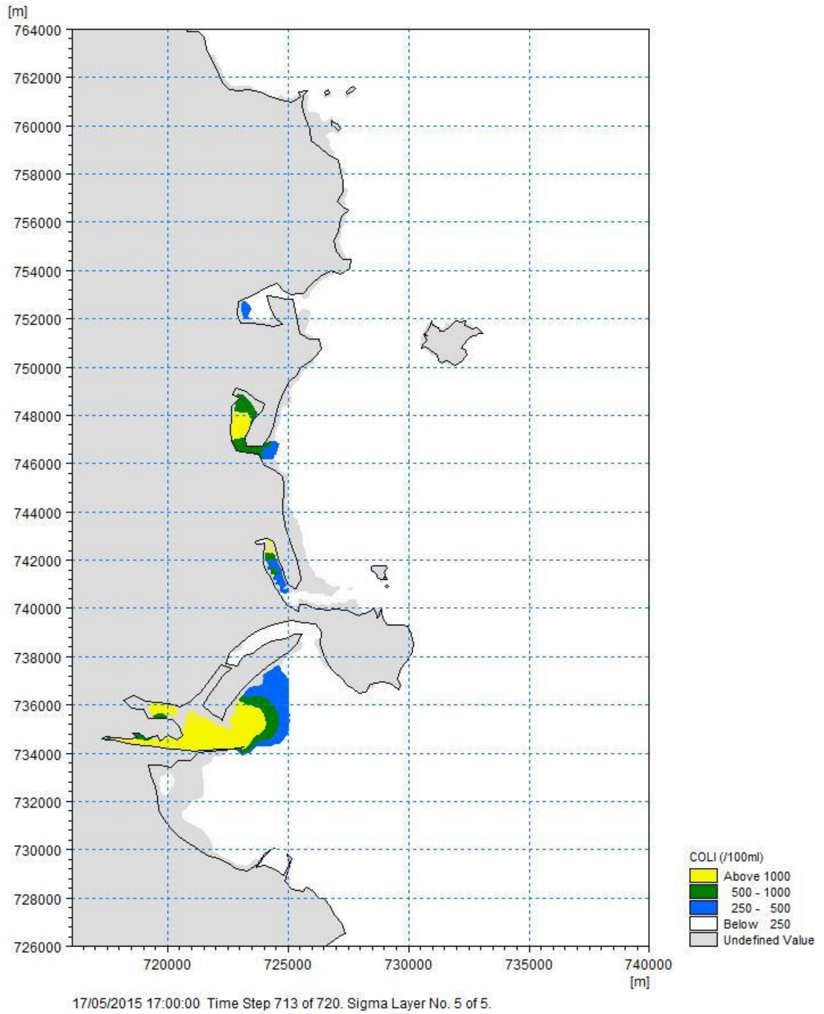

Diagram 8.63: COLI Concentration at Low Water on Spring Tide

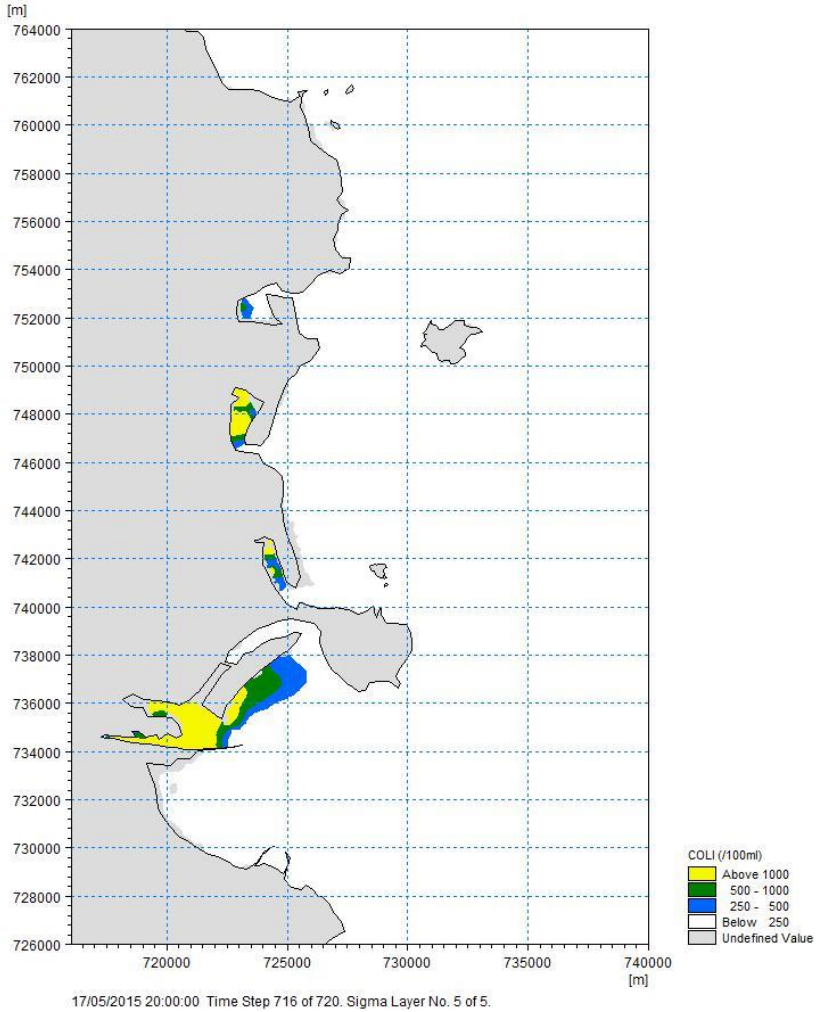

Diagram 8.64: COLI Concentration at Mid Flood on Spring Tide

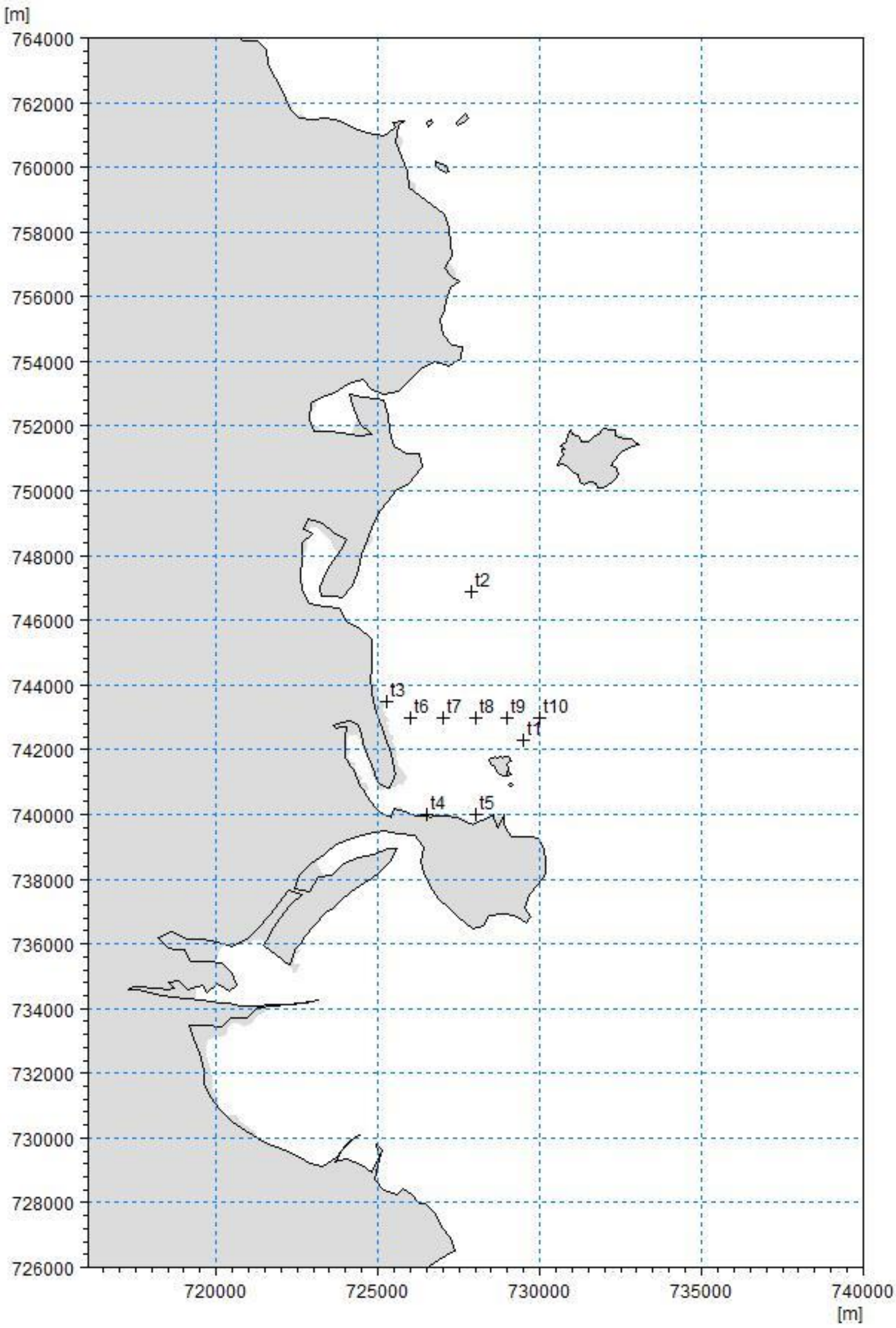

Diagram 8.65: Locations of Time-Series of Predicted COLI Concentrations

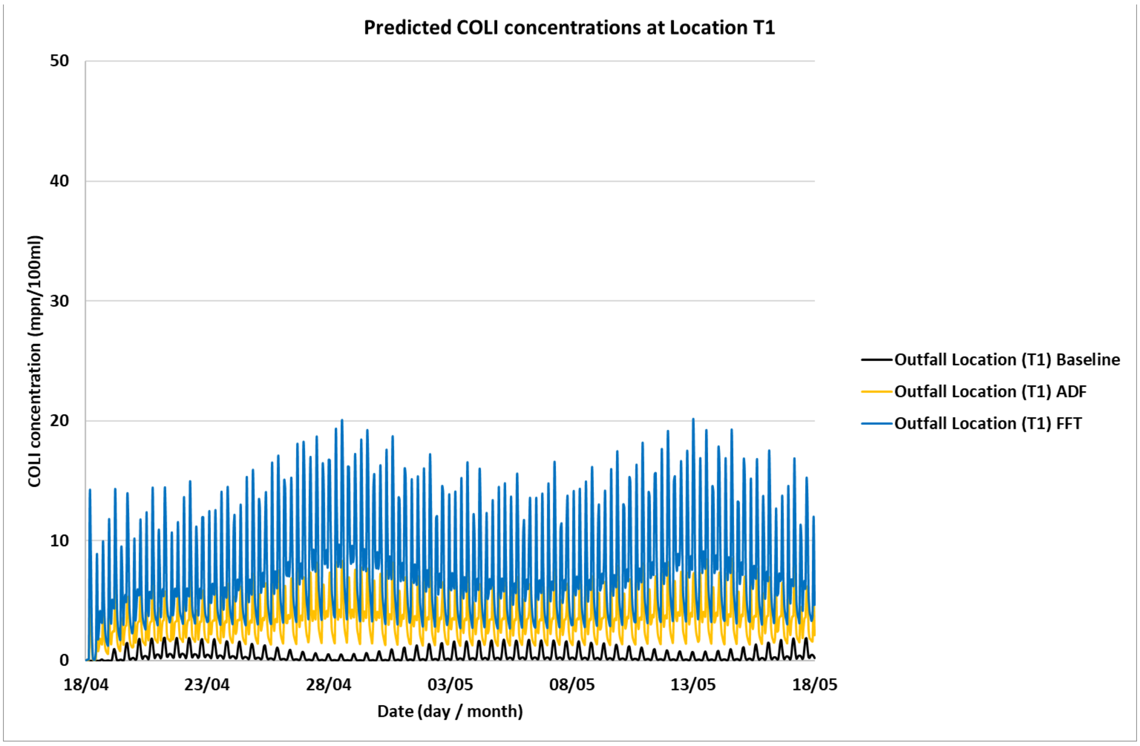

Diagram 8.66: Predicted COLI Concentrations at Proposed Outfall Location

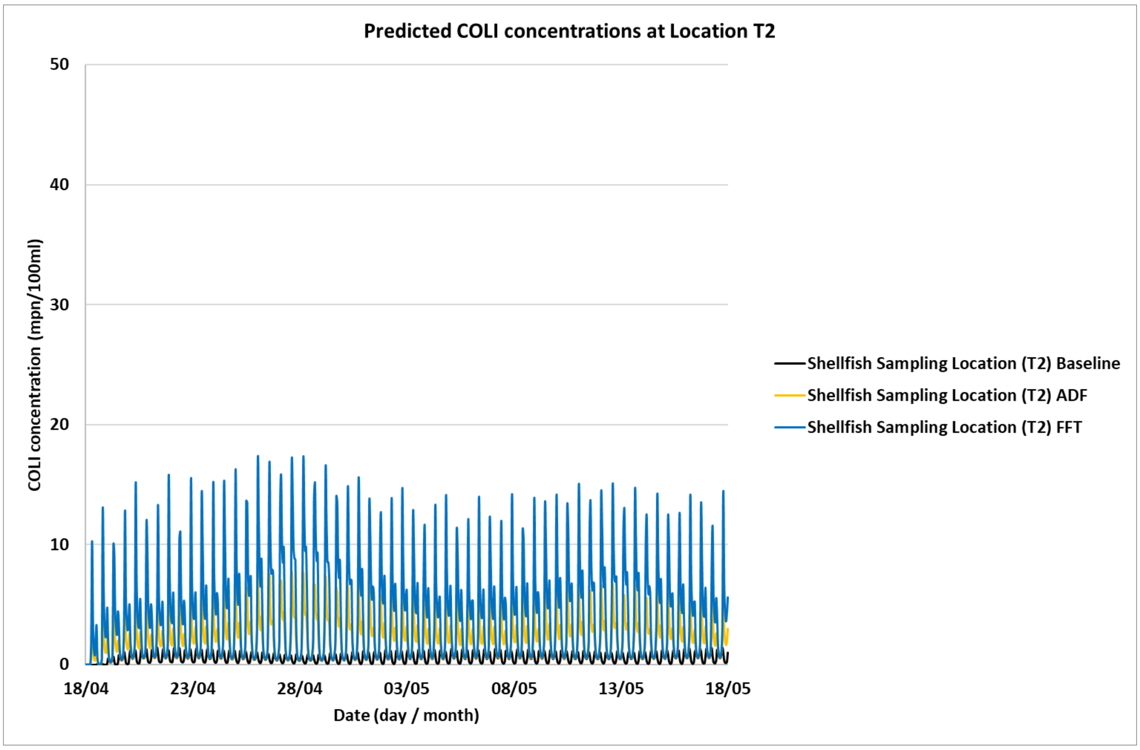

Diagram 8.67: Predicted COLI Concentrations at Malahide Designated Shellfish Waters Sampling Location

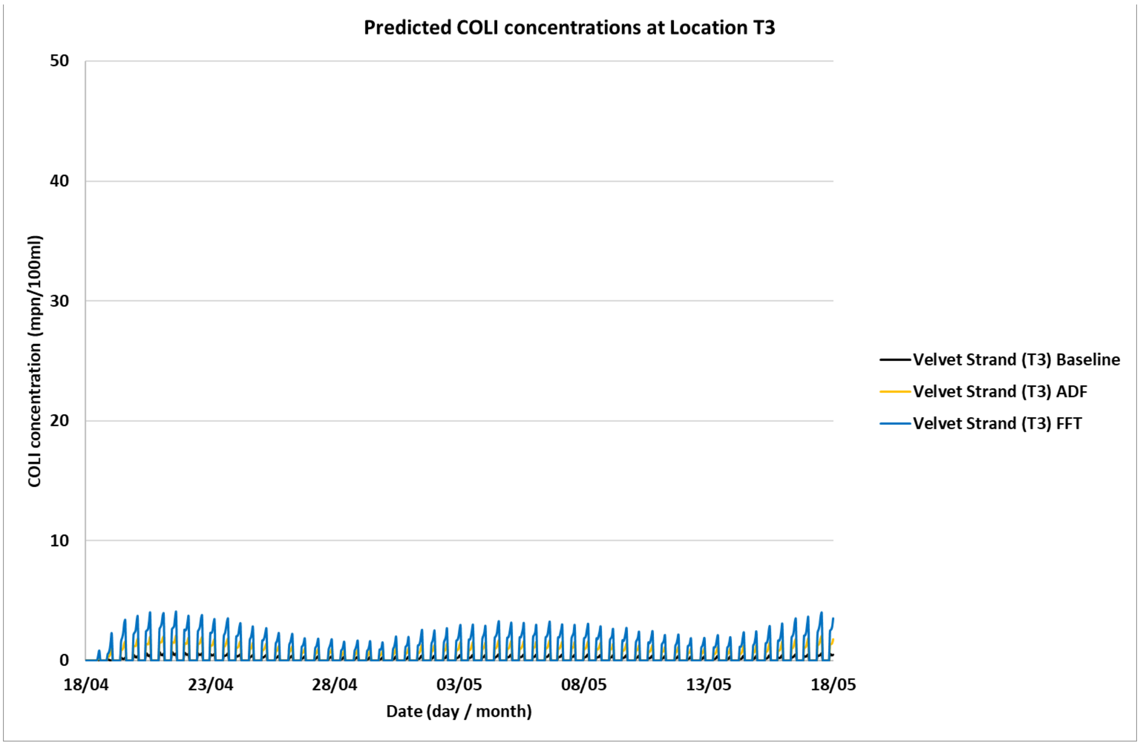

Diagram 8.68: Predicted COLI Concentrations at Velvet Strand, Portmarnock Bathing Waters Sampling Location

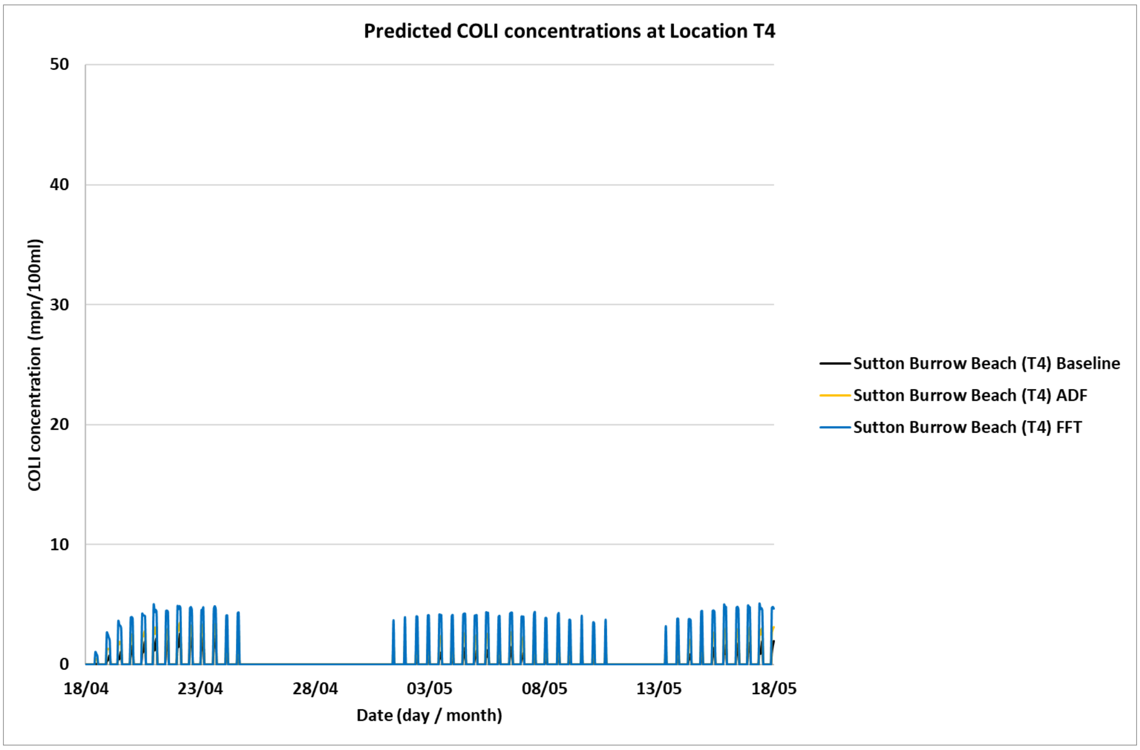

Diagram 8.69: Predicted COLI Concentrations at Sutton Beach Bathing Waters Sampling Location

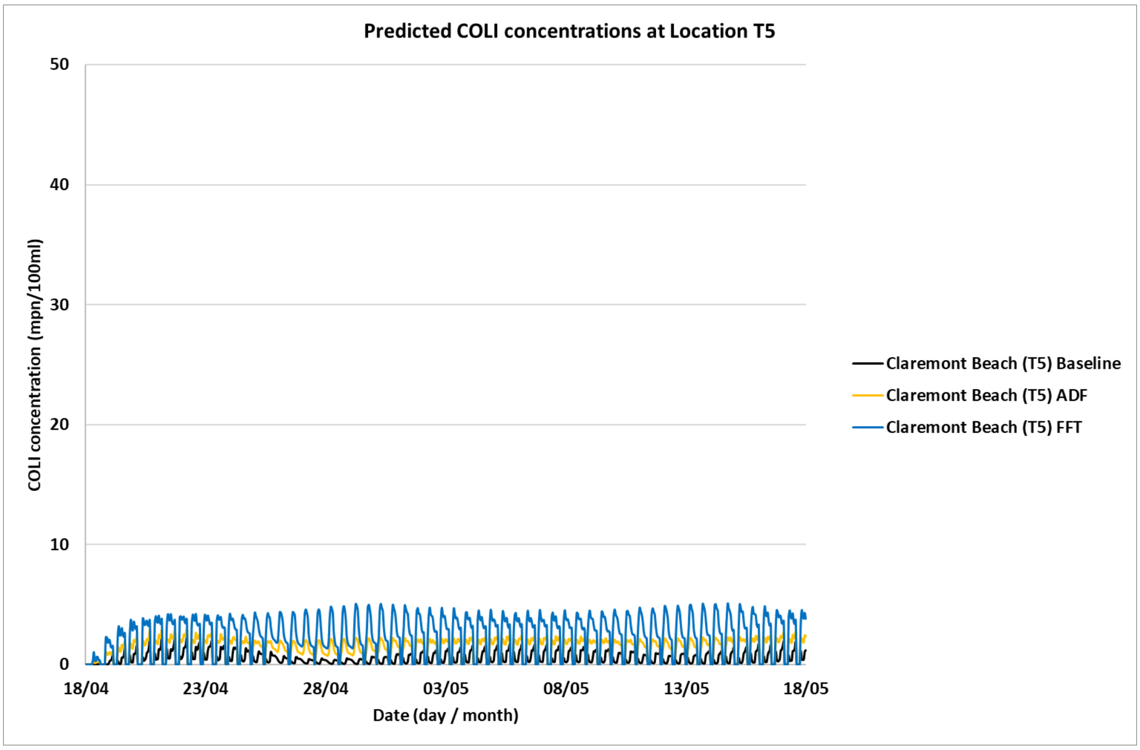

Diagram 8.70: Predicted COLI Concentrations at Claremont Beach Bathing Waters Sampling Location

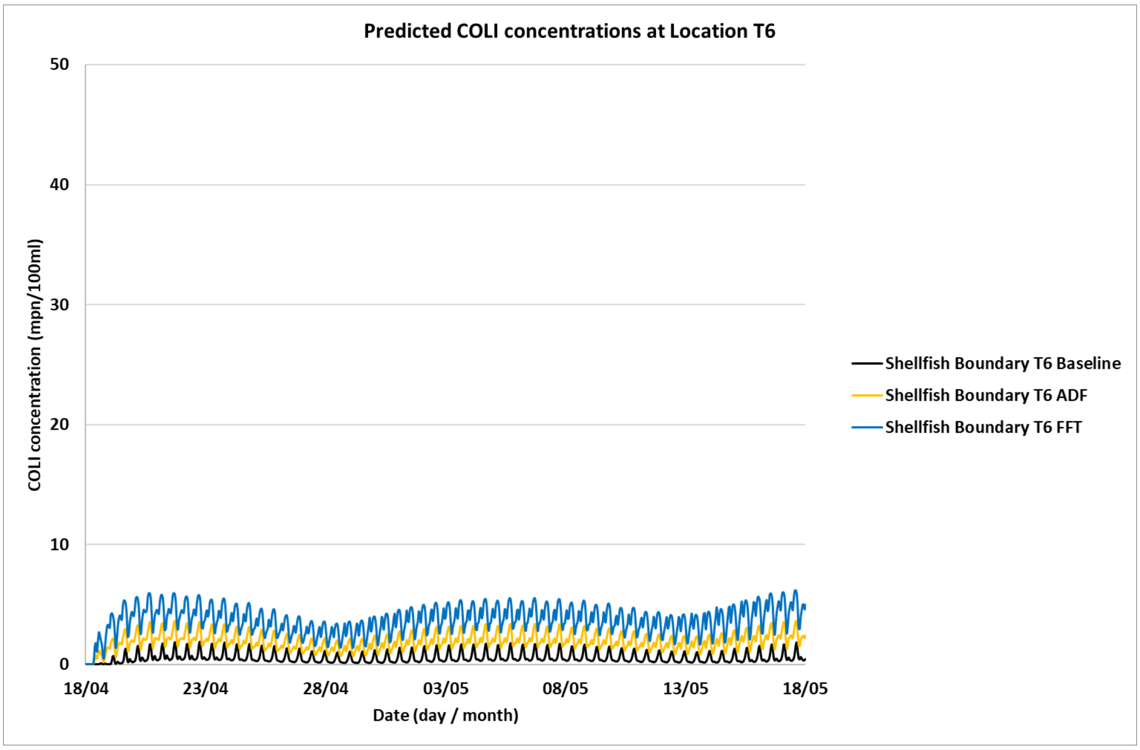

Diagram 8.71: Predicted COLI Concentrations at T6 Southern Boundary of Malahide Designated Shellfish Waters

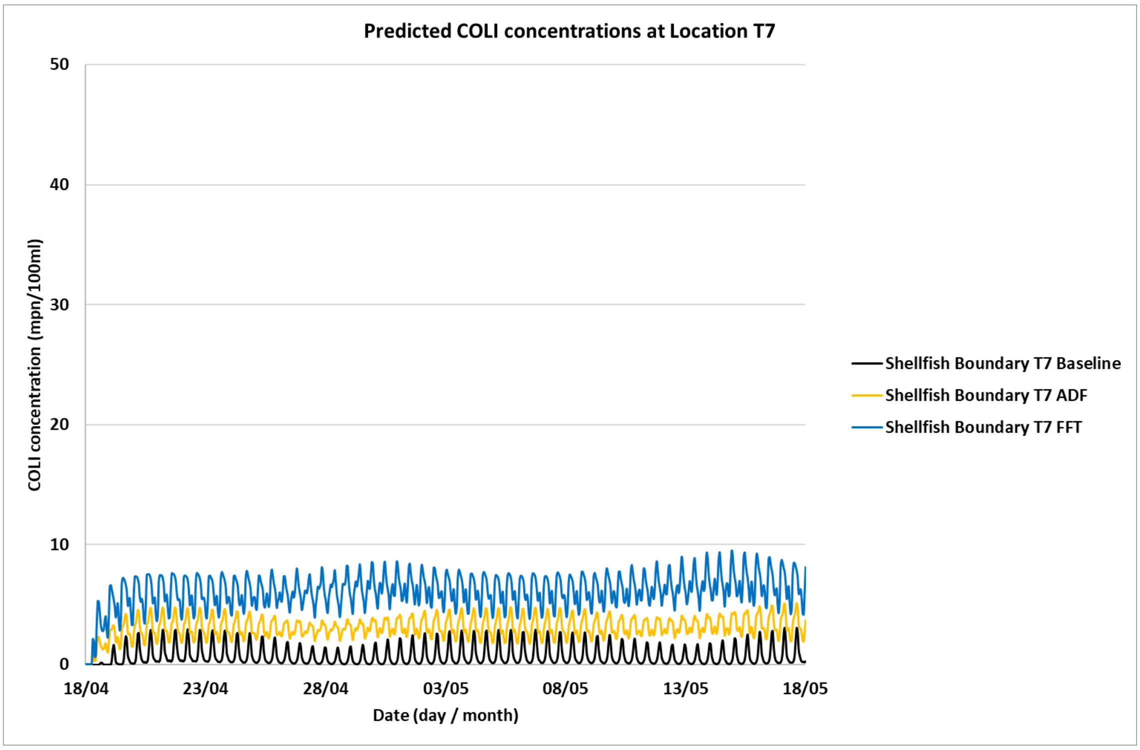

Diagram 8.72: Predicted COLI Concentrations at T7 Southern Boundary of Malahide Designated Shellfish Waters

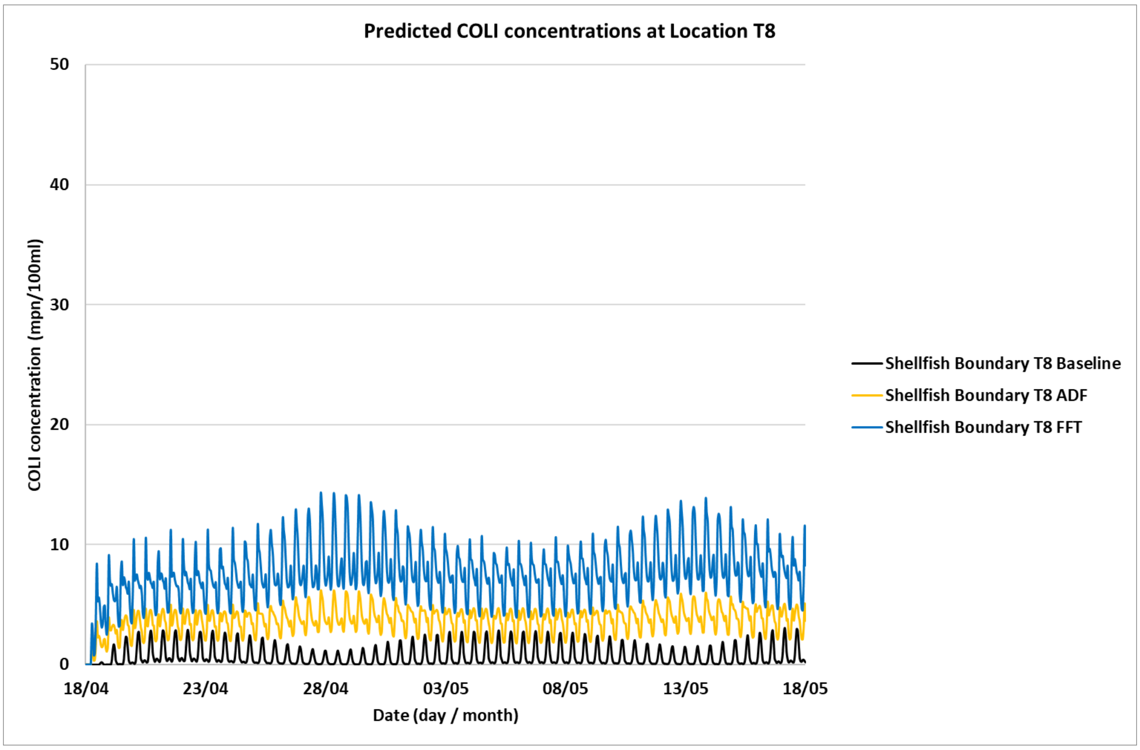

Diagram 8.73: Predicted COLI Concentrations at T8 Southern Boundary of Malahide Designated Shellfish Waters

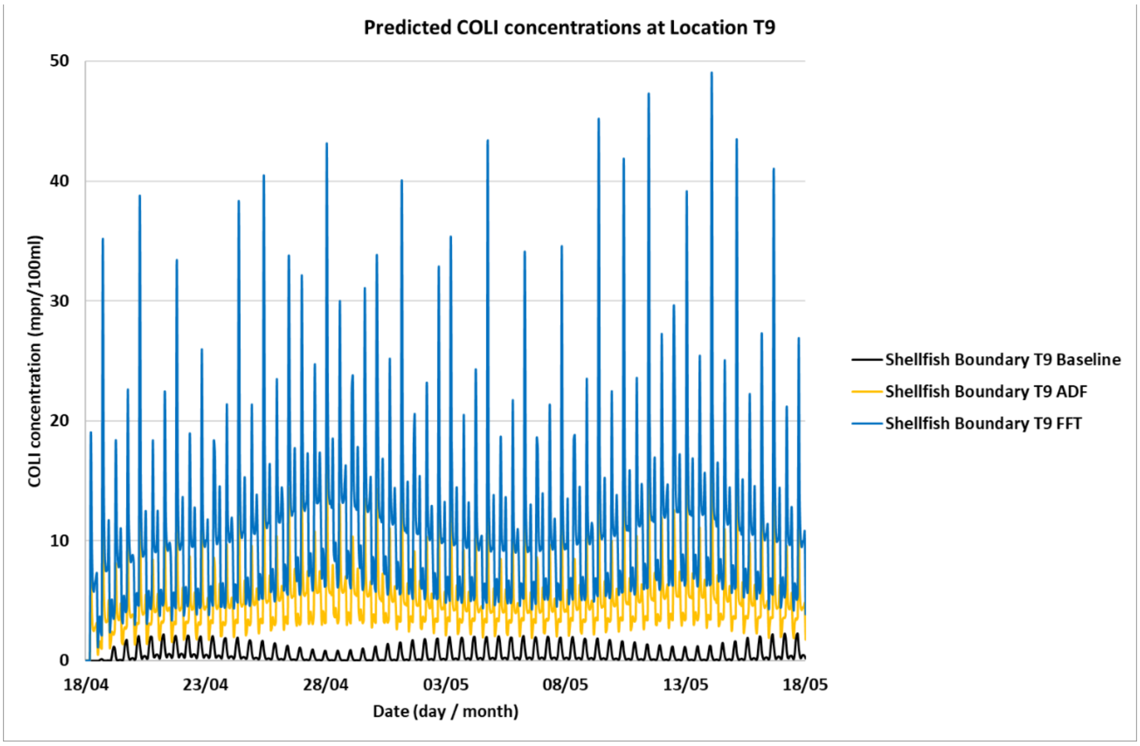

Diagram 8.74: Predicted COLI Concentrations at T9 Southern Boundary of Malahide Designated Shellfish Waters

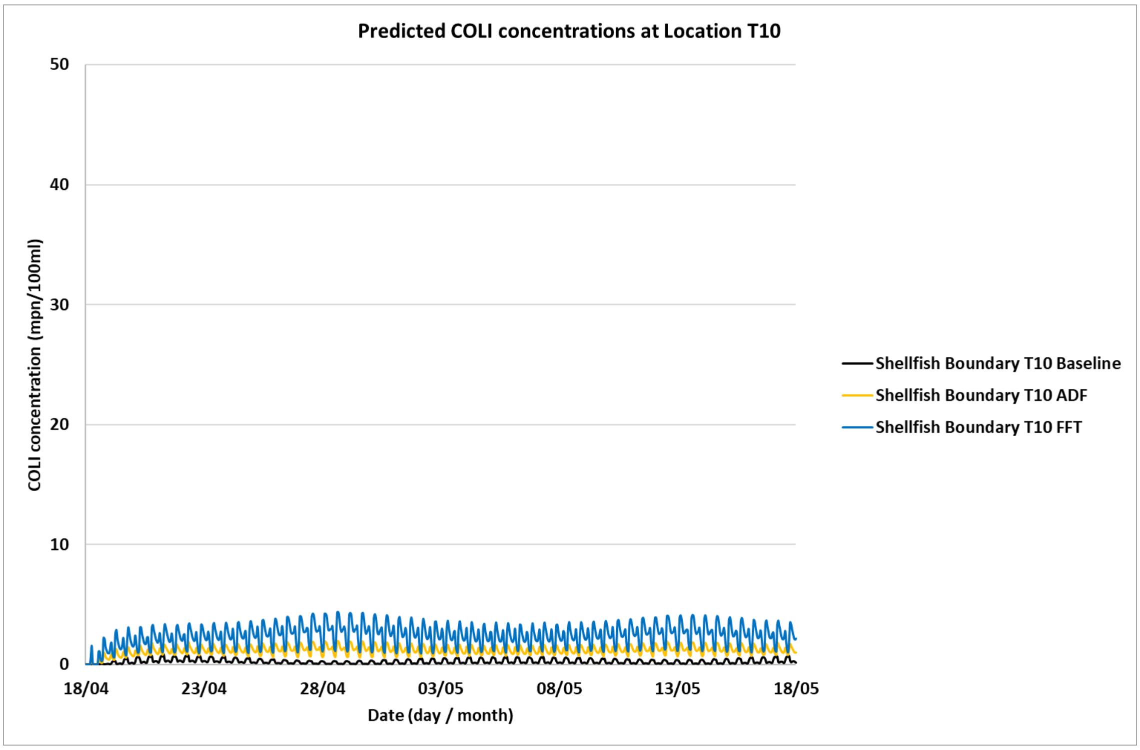

Diagram 8.75: Predicted COLI Concentrations at T10 Southern Boundary of Malahide Designated Shellfish Waters

8.4.2.5 Intestinal Enterococci (IE)

Intestinal Enterococci is included as a specific parameter for the modelling scenarios in this Addendum to align with assessments for the Bathing Water Quality Regulations. The approach adopted in the 2018 planning application was to infer Intestinal Enterococci concentrations from COLI modelling results, as both are bacterial indicator organisms.

There have been no changes to the Bathing Water Quality Regulations since the submission of the 2018 planning application, and therefore, the requirement remains that the maximum values of Intestinal Enterococci should not exceed the mandatory value of 200 cfu/100ml in 95% or more of the samples taken in the season to ensure a ‘Good’ classification of bathing water beaches, or should not exceed the mandatory value of 100 cfu/100ml in 95% or more of the samples taken in the season to ensure an ‘Excellent’ classification of bathing water beaches.

8.4.2.5.1 Average Daily Flow

The tidal plots showing the maximum extent of the predicted Intestinal Enterococci plume from the proposed outfall pipeline route (marine section) discharge point at high water, mid ebb, low water and mid flood on neap tides are presented in Diagram 8.76 to Diagram 8.79 and on spring tides in Diagram 8.80 to Diagram 8.83.

None of the diagrams show the Intestinal Enterococci plume from the proposed outfall pipeline route (marine section) discharge point exceeding the 100 cfu/100ml limit required to achieve ‘Excellent’ status.

Elevated Intestinal Enterococci levels in the transitional waters displayed in the diagrams result from other WwTPs or rivers directly discharging to the affected waters.

The diagrams show that there is predicted to be no impact on the receiving waters from the proposed operation of the proposed outfall pipeline route (marine section) discharge point.

8.4.2.5.2 Flow to Full Treatment

The tidal plots showing the maximum extent of the predicted Intestinal Enterococci plume from the proposed outfall pipeline route (marine section) discharge point at high water, mid ebb, low water and mid flood on neap tides are presented in Diagram 8.84 to Diagram 8.87 and on spring tides in Diagram 8.88 to Diagram 8.91.

None of the diagrams show the Intestinal Enterococci plume from the proposed outfall pipeline route (marine section) discharge point exceeding the 100 cfu/100ml limit required to achieve ‘excellent’ status.

Elevated Intestinal Enterococci levels in the transitional waters displayed in the diagrams result from other WwTPs or rivers directly discharging to the affected waters.

The diagrams show that there is predicted to be no impact on the receiving waters from the proposed operation of the proposed outfall pipeline route (marine section) discharge point.

The effect of the proposed discharge of Intestinal Enterococci on the bathing water beaches of Claremont Beach, Sutton Beach and Velvet Strand, and on the designated shellfish waters of Malahide over time was examined.

The evolution of the predicted Intestinal Enterococci concentrations over time at each of the above locations are presented for the Baseline (i.e. no proposed outfall), Average Daily Flow, and FFT scenarios from Diagram 8.92 to Diagram 8.101.

All diagrams show that there are no compliance failures predicted at any of the designated bathing water beaches, Blue Flag beaches, nor shellfish waters arising from the proposed discharge.

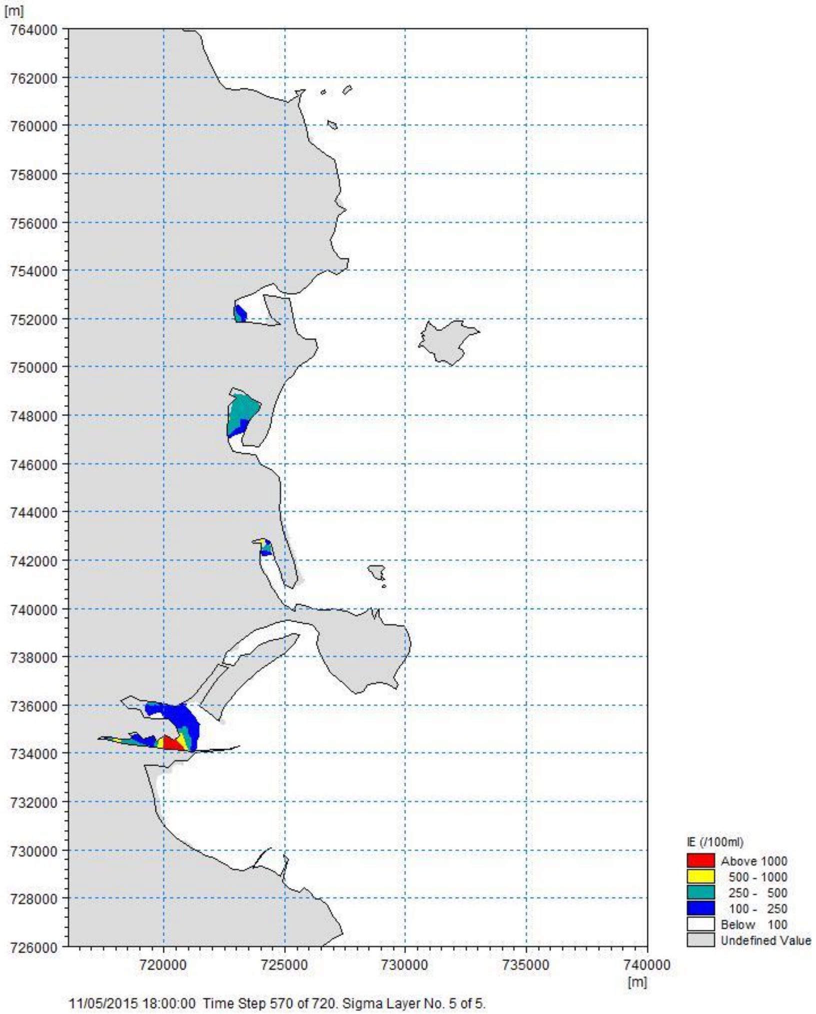

Diagram 8.76: IE Concentration at High Water on Neap Tide

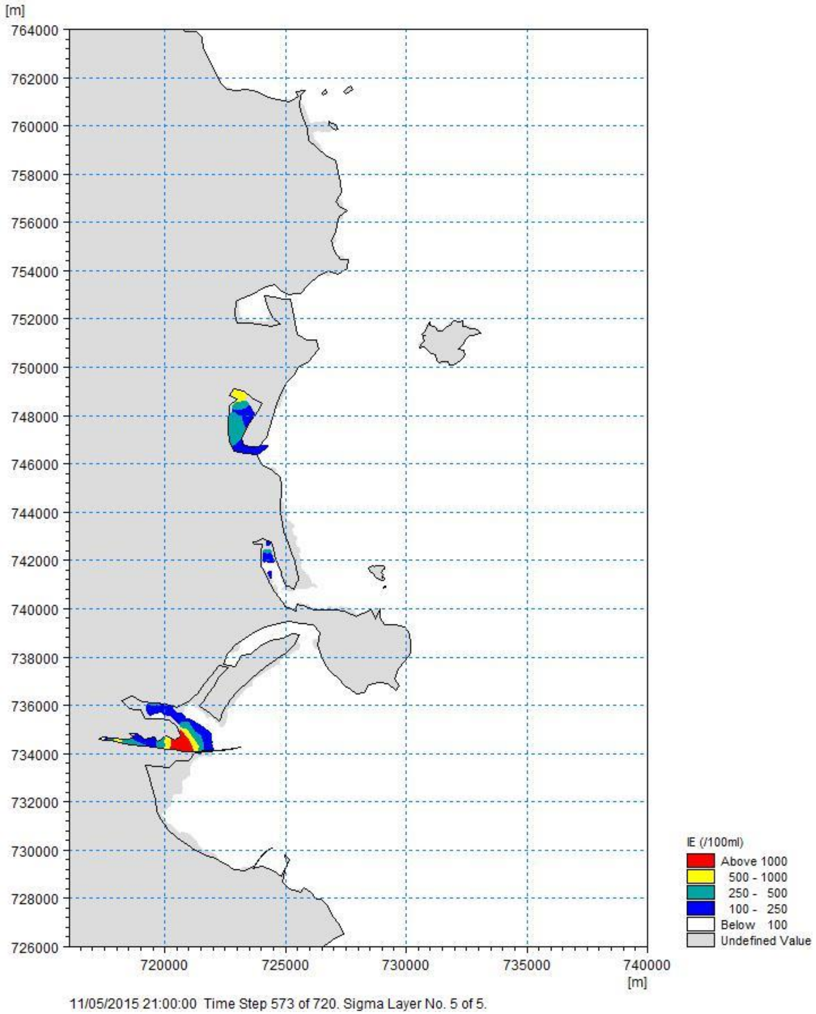

Diagram 8.77: IE Concentration at Mid Ebb on Neap Tide

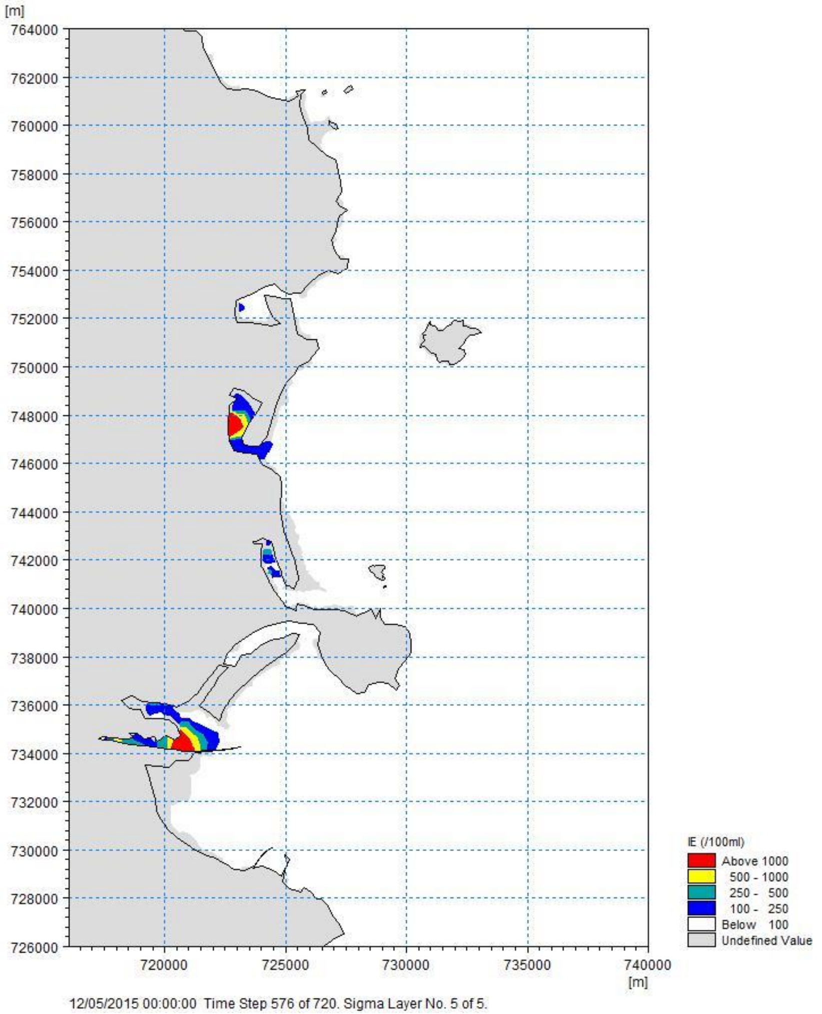

Diagram 8.78: IE Concentration at Low Water on Neap Tide

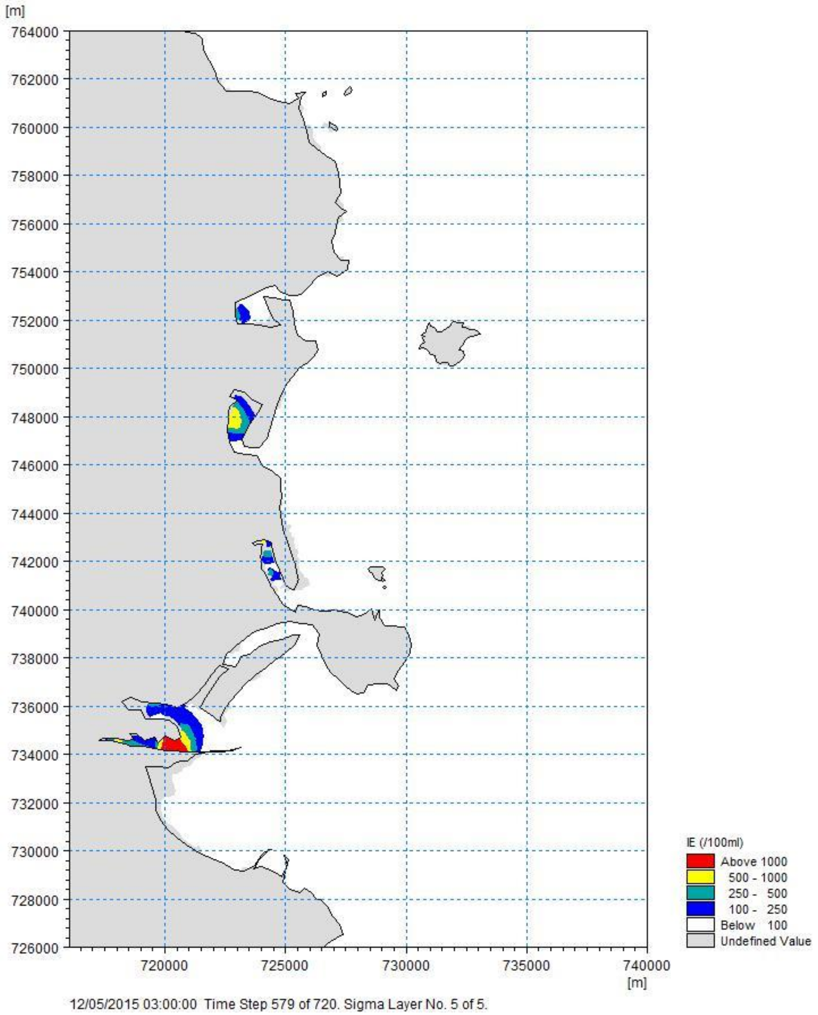

Diagram 8.79: IE Concentration at Mid Flood on Neap Tide

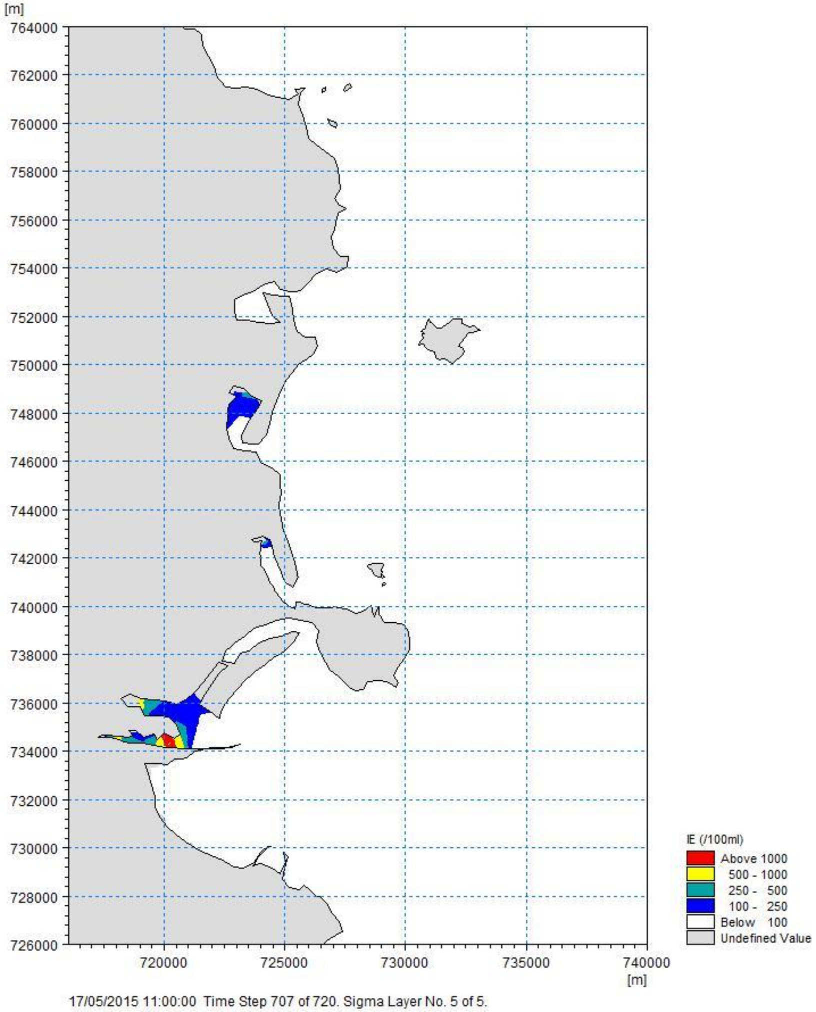

Diagram 8.80: IE Concentration at High Water on Spring Tide

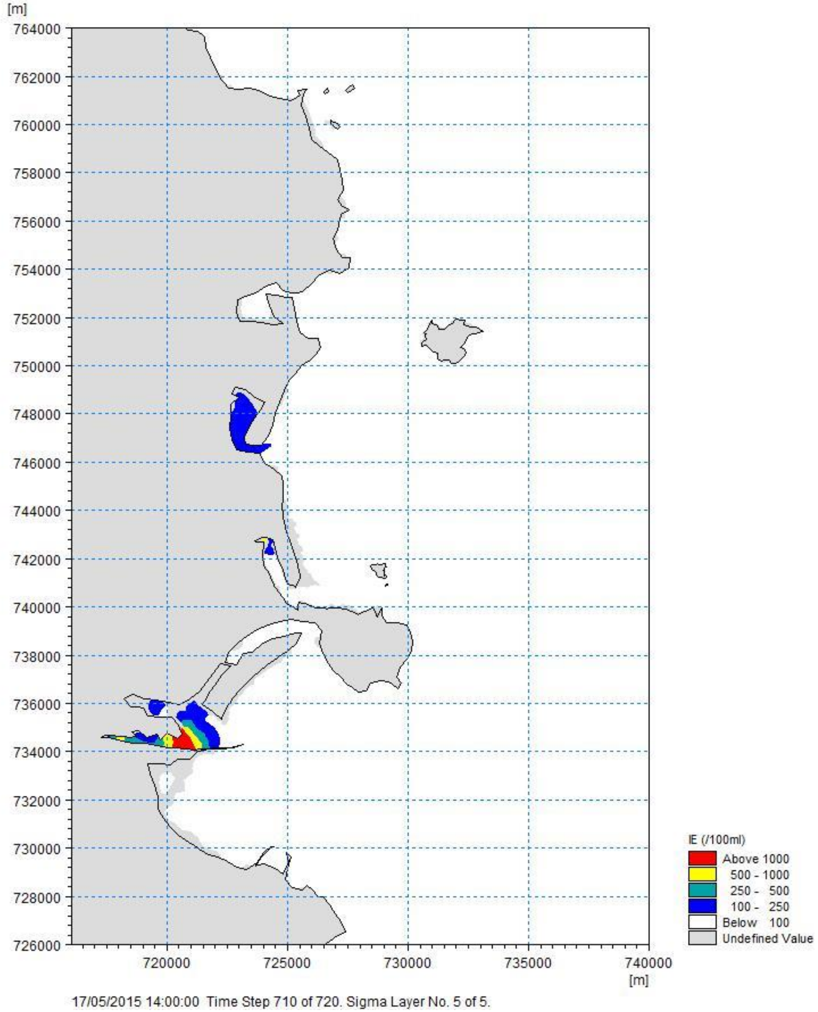

Diagram 8.81: IE Concentration at Mid Ebb on Spring Tide

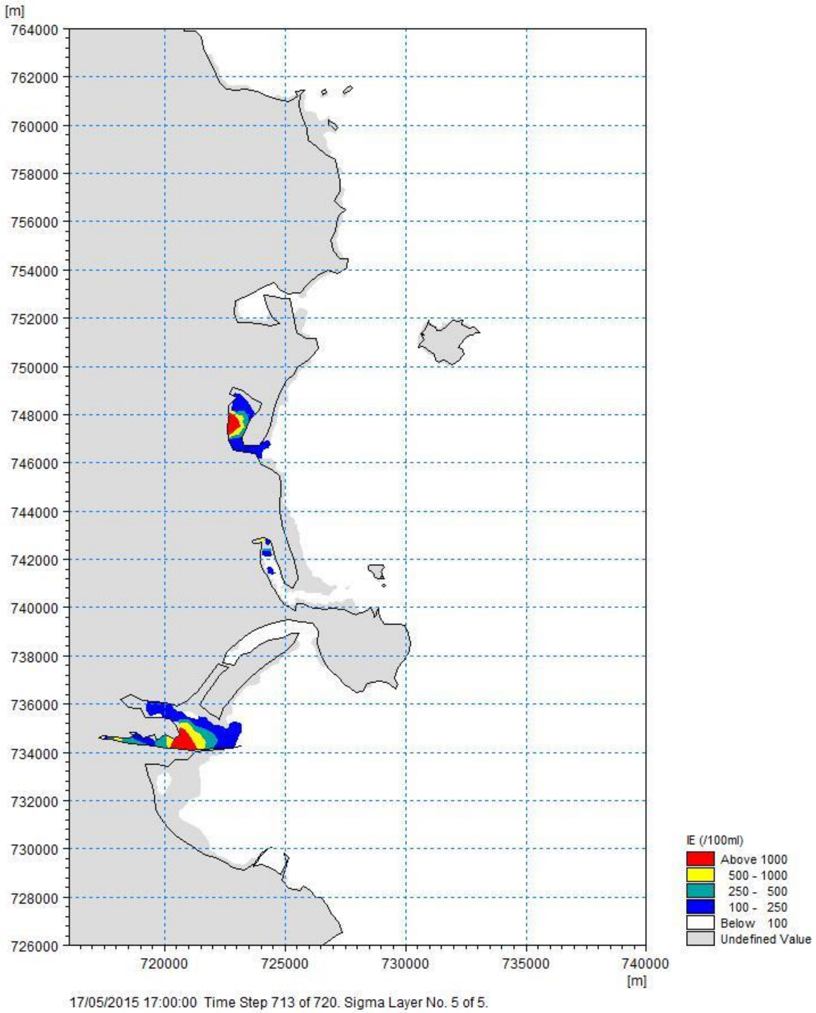

Diagram 8.82: IE Concentration at Low Water on Spring Tide

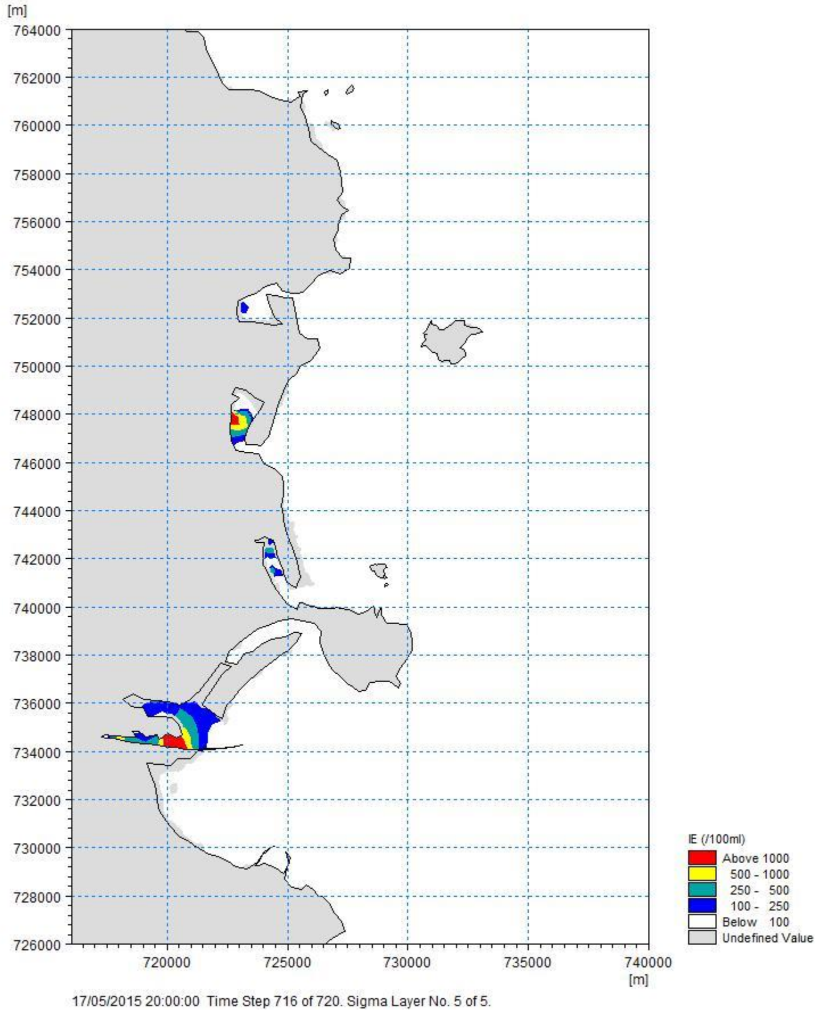

Diagram 8.83: IE Concentration at Mid Flood on Spring Tide

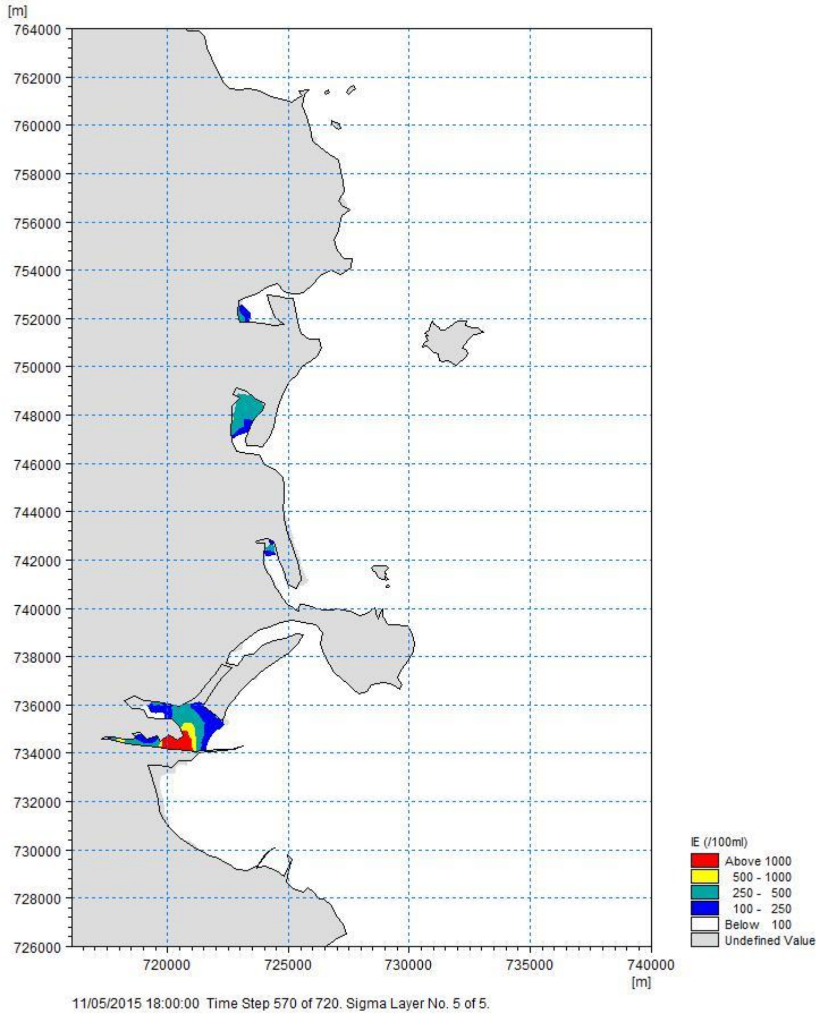

Diagram 8.84: IE Concentration at High Water on Neap Tide

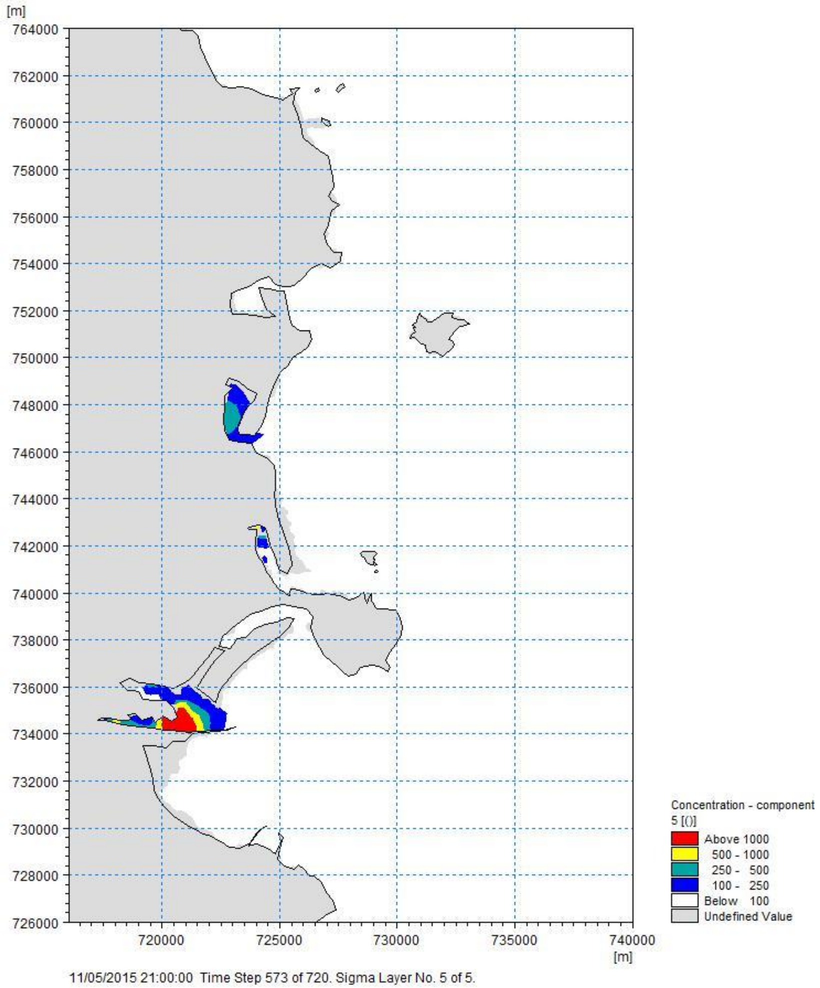

Diagram 8.85: IE Concentration at Mid Ebb on Neap Tide

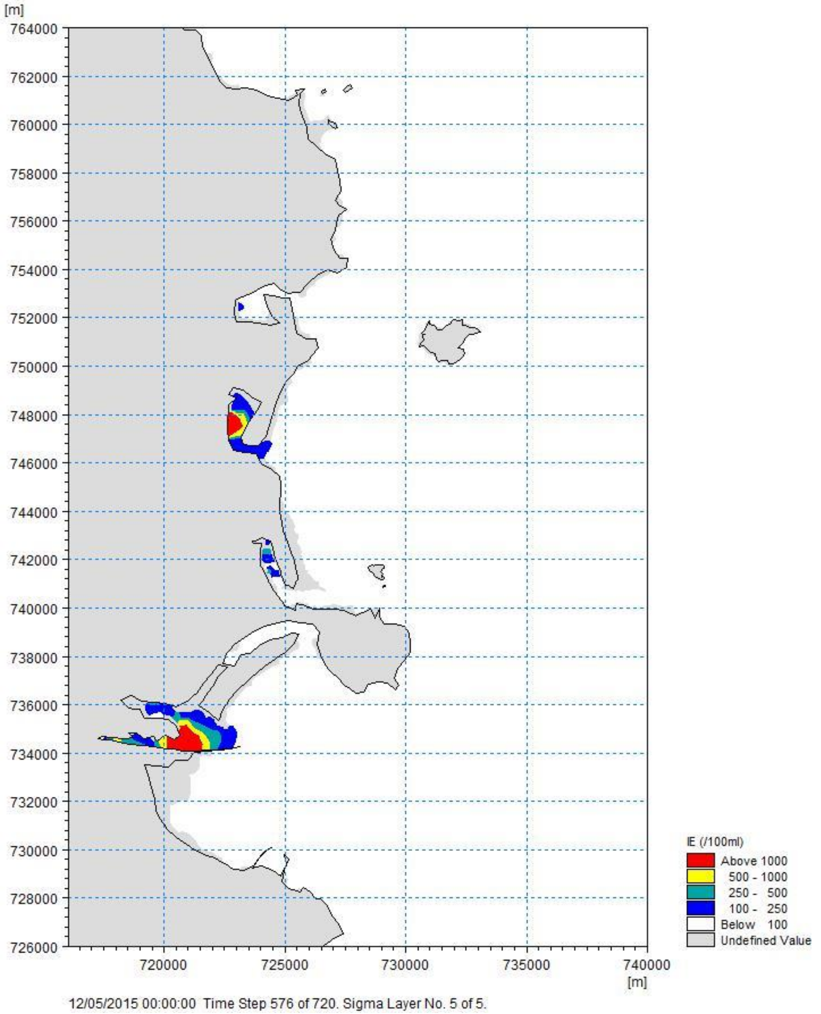

Diagram 8.86: IE Concentration at Low Water on Neap Tide

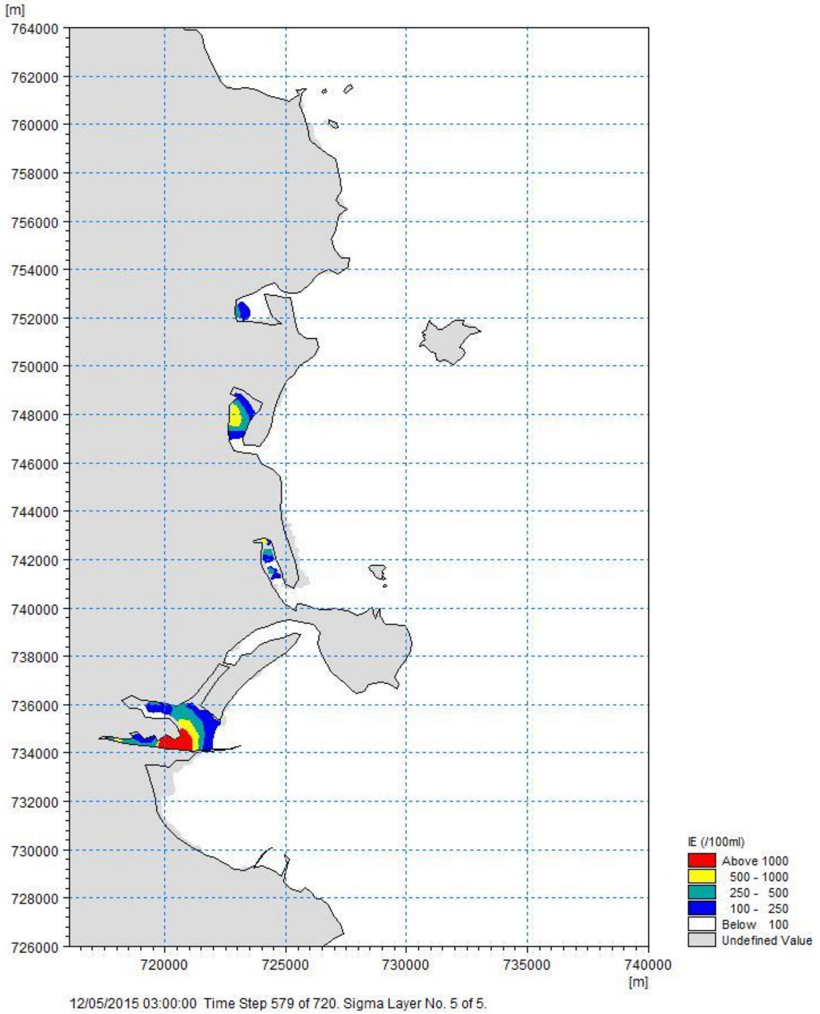

Diagram 8.87: IE Concentration at Mid Flood on Neap Tide

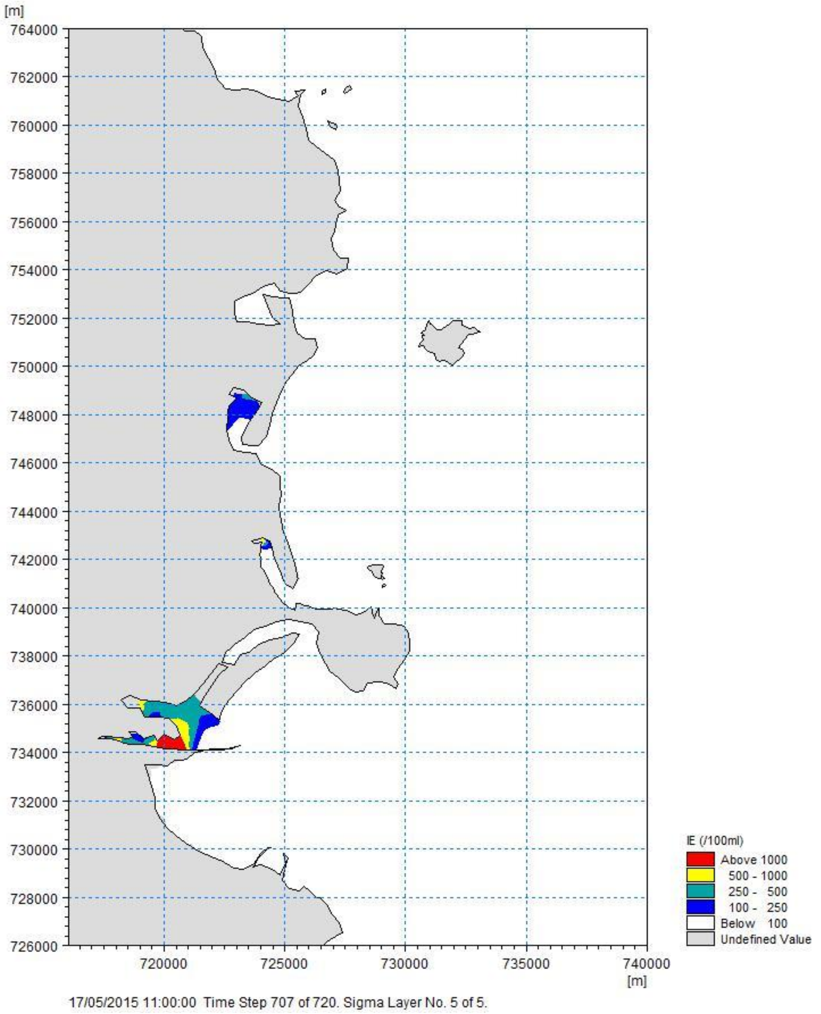

Diagram 8.88: IE Concentration at High Water on Spring Tide

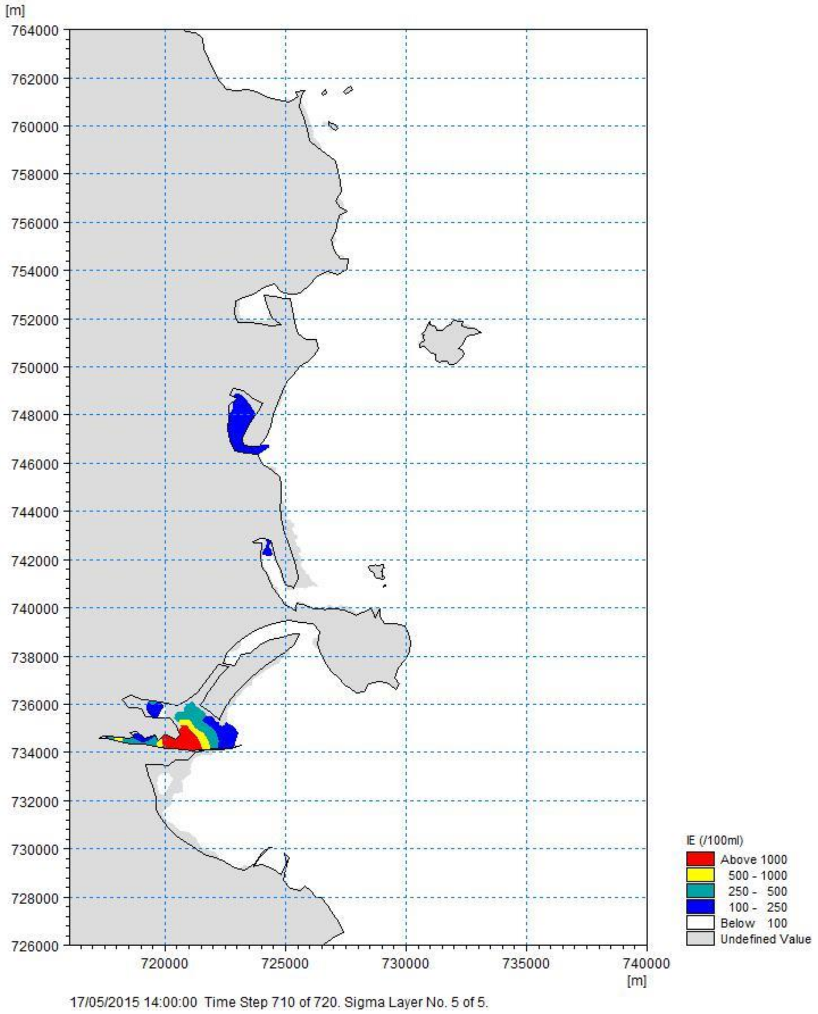

Diagram 8.89: IE Concentration at Mid Ebb on Spring Tide

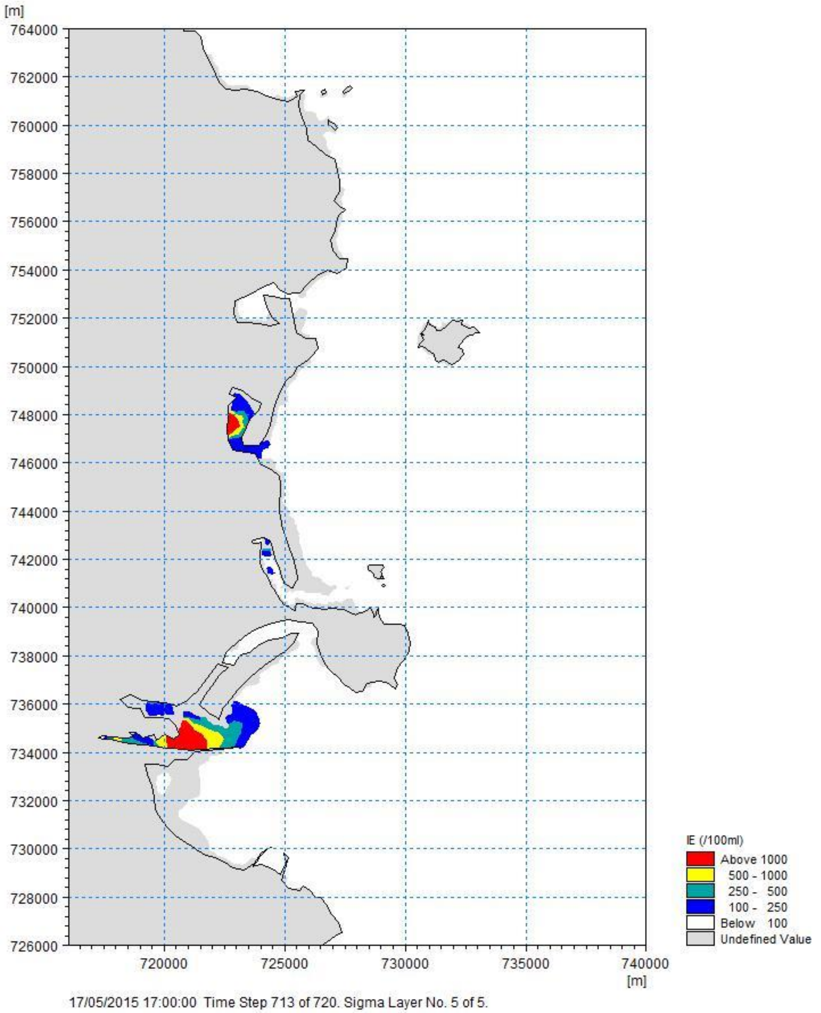

Diagram 8.90: IE Concentration at Low Water on Spring Tide

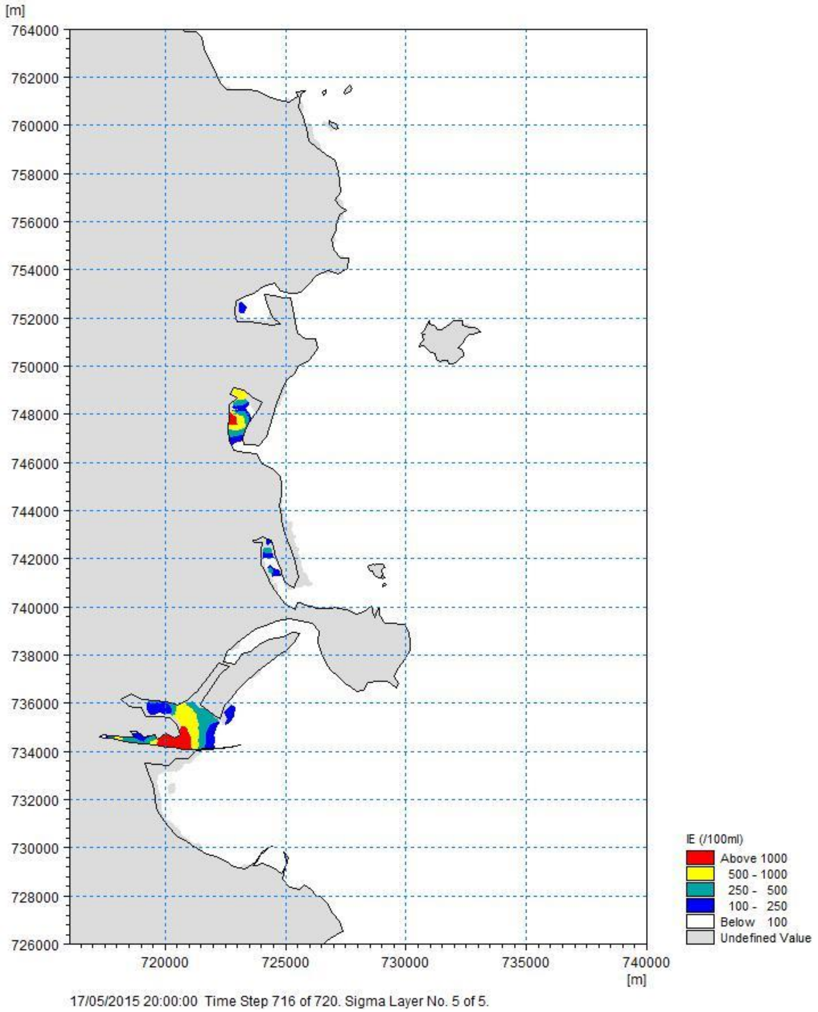

Diagram 8.91: IE Concentration at Mid Flood on Spring Tide

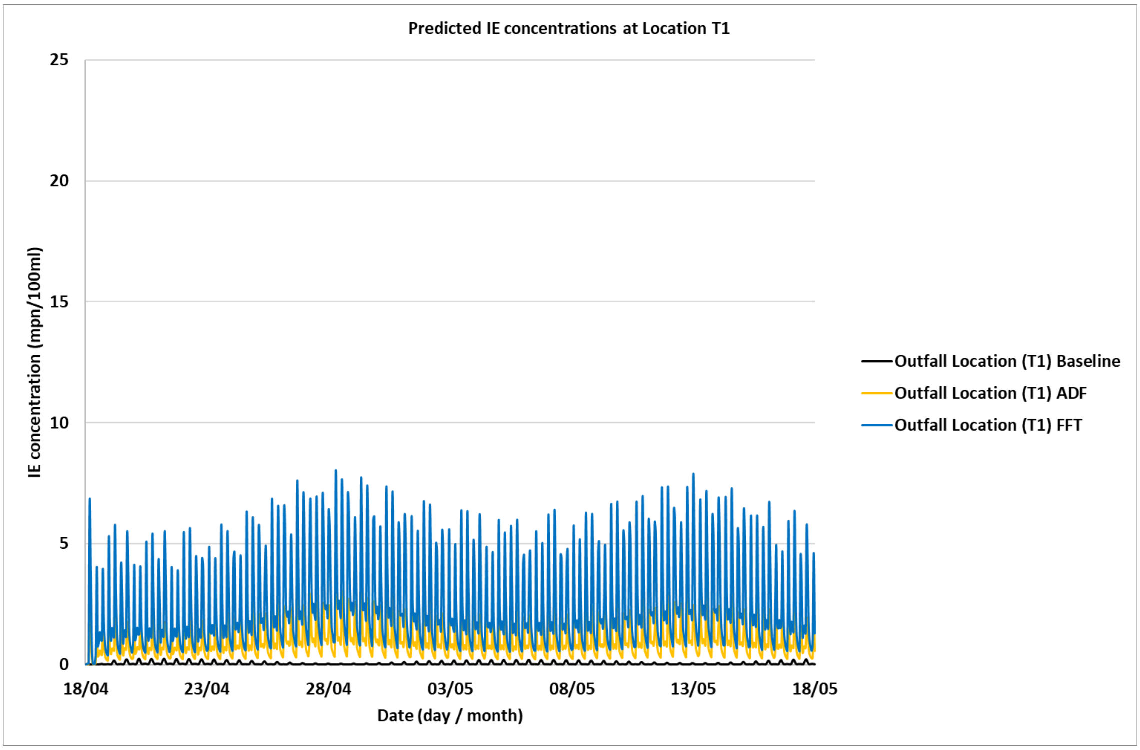

Diagram 8.92: Predicted IE Concentrations at Proposed Outfall Location

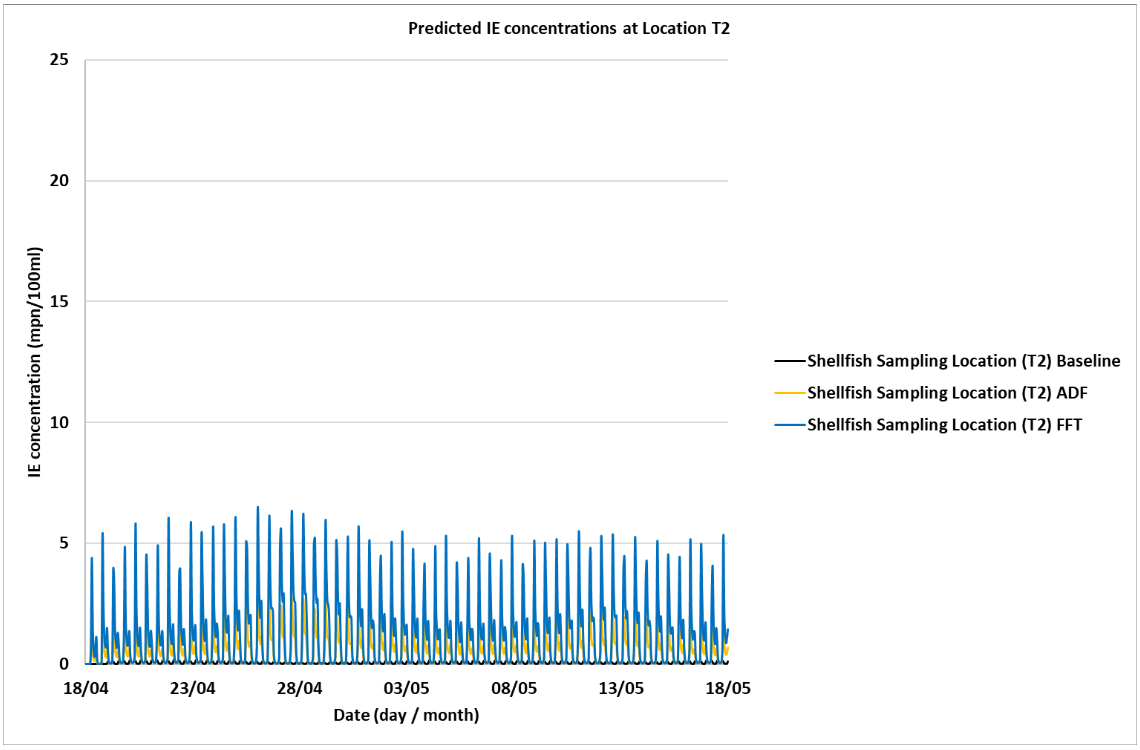

Diagram 8.93: Predicted IE Concentrations at Malahide Designated Shellfish Waters Sampling Location

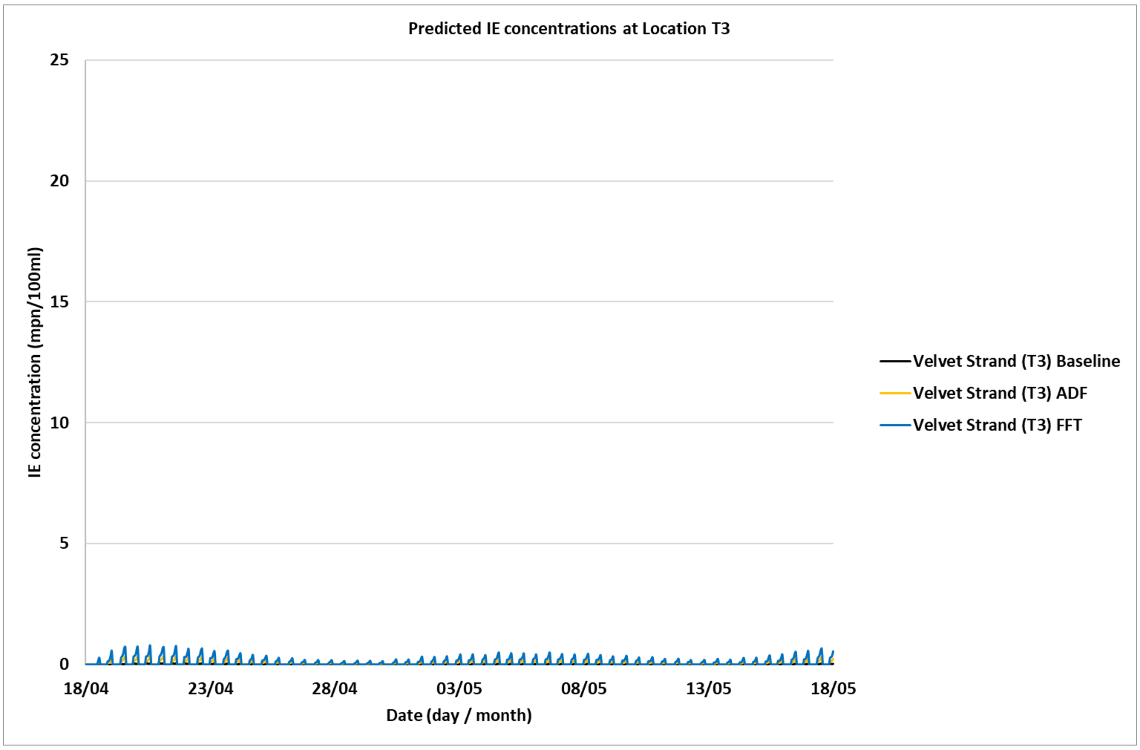

Diagram 8.94: Predicted IE Concentrations at Velvet Strand, Portmarnock Bathing Waters Sampling Location

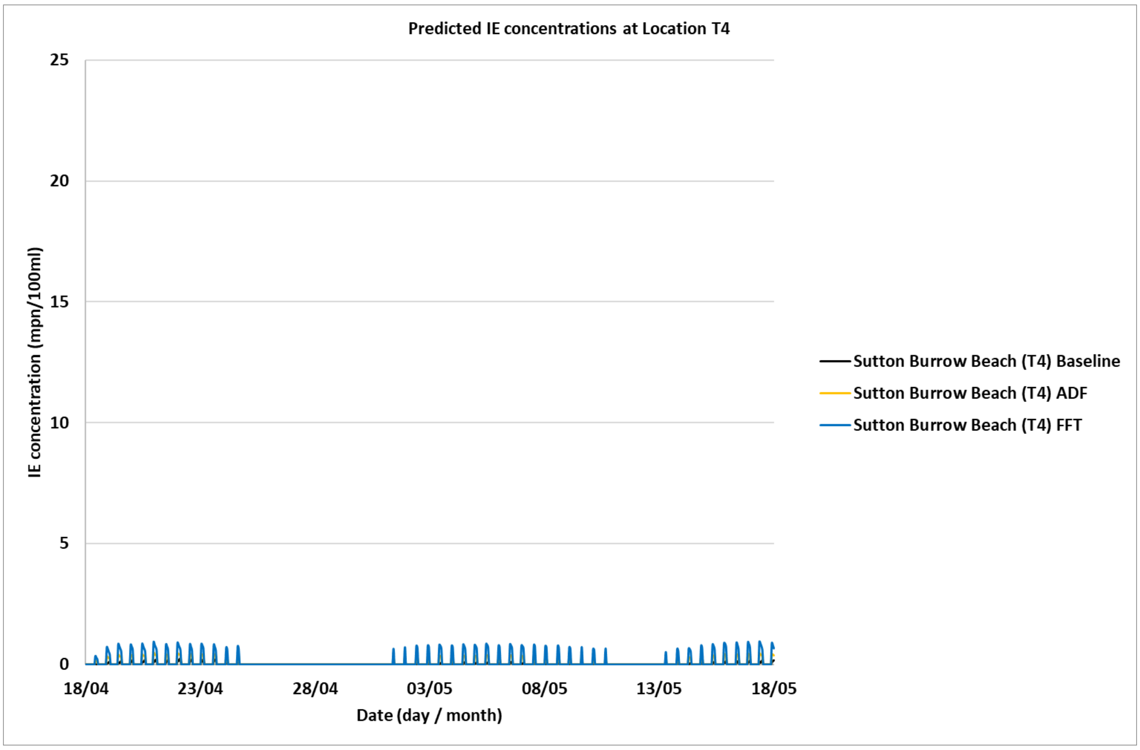

Diagram 8.95: Predicted IE Concentrations at Sutton Beach Bathing Waters Sampling Location

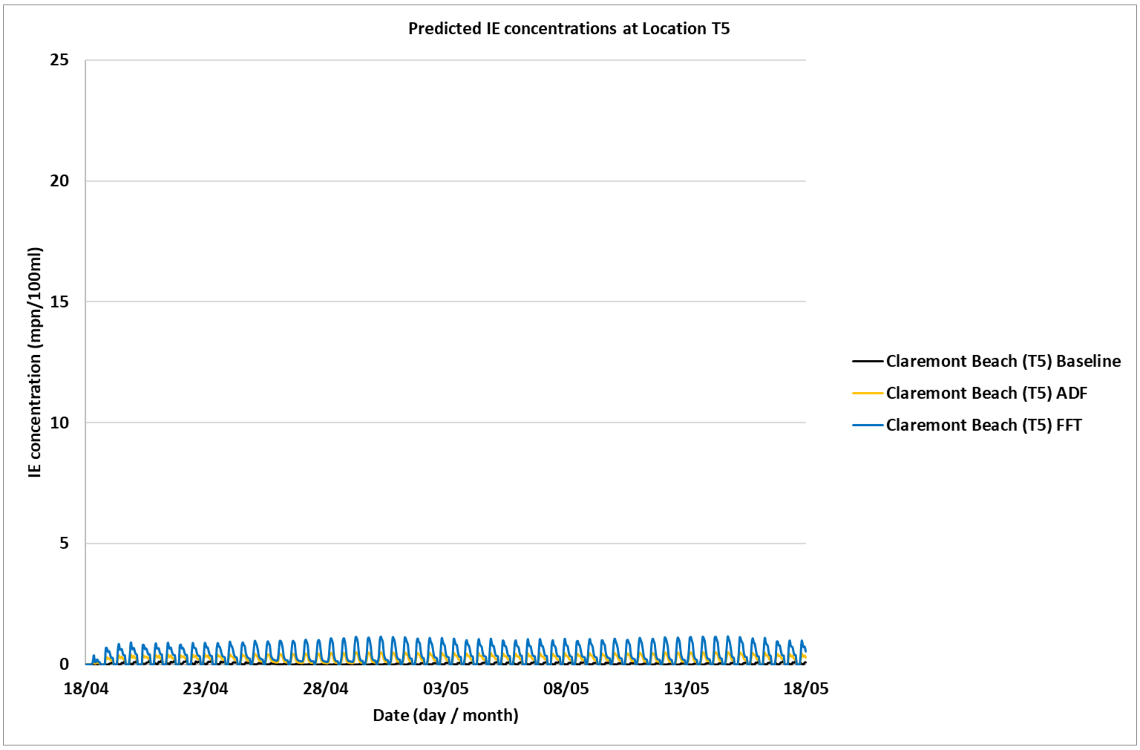

Diagram 8.96: Predicted IE Concentrations at Claremont Beach Bathing Waters Sampling Location

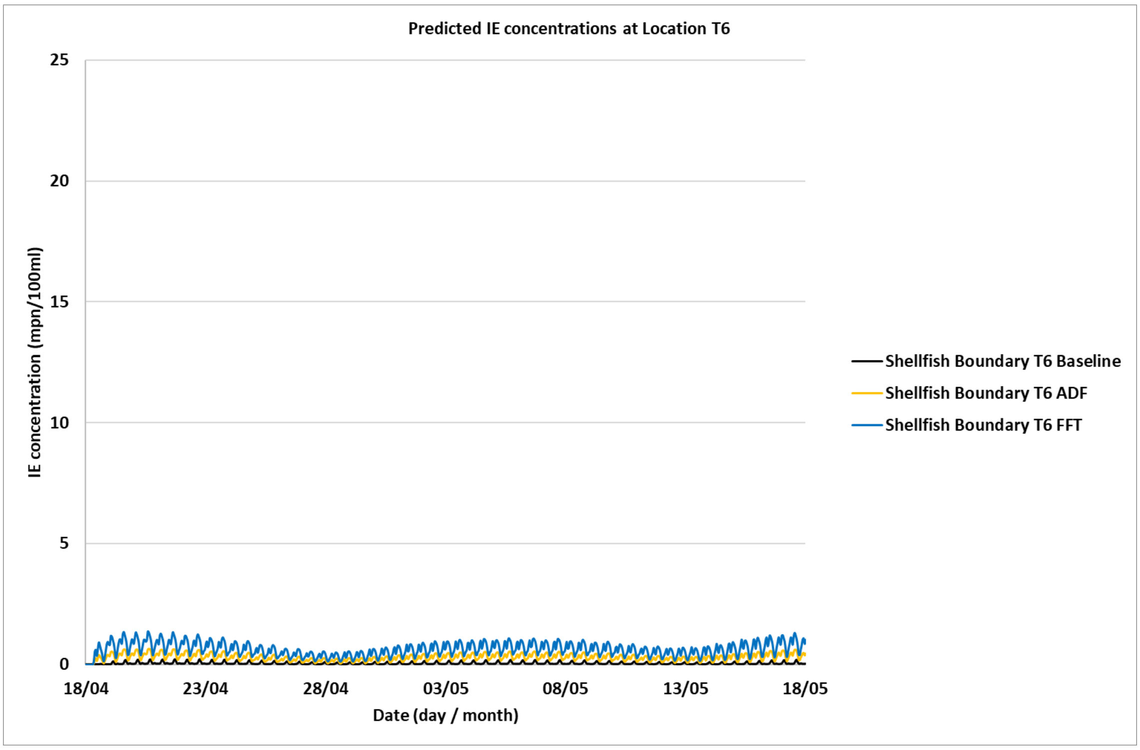

Diagram 8.97: Predicted IE Concentrations at T6 Southern Boundary of Malahide Designated Shellfish Waters

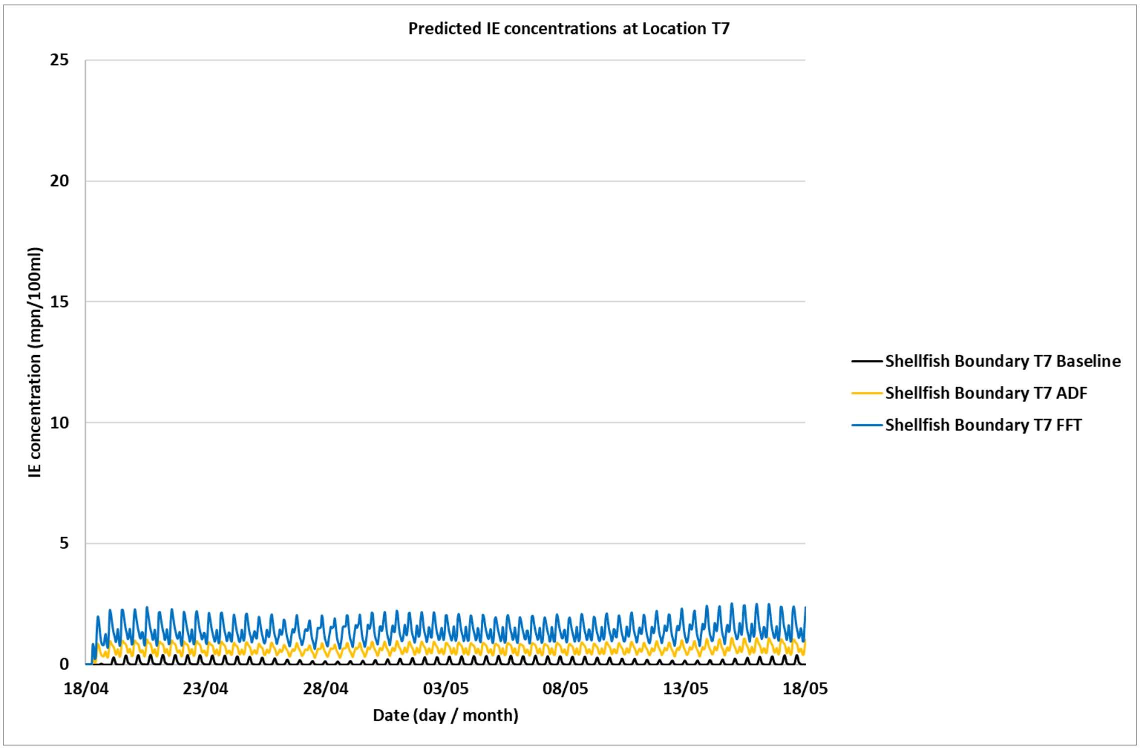

Diagram 8.98: Predicted IE Concentrations at T7 Southern Boundary of Malahide Designated Shellfish Waters

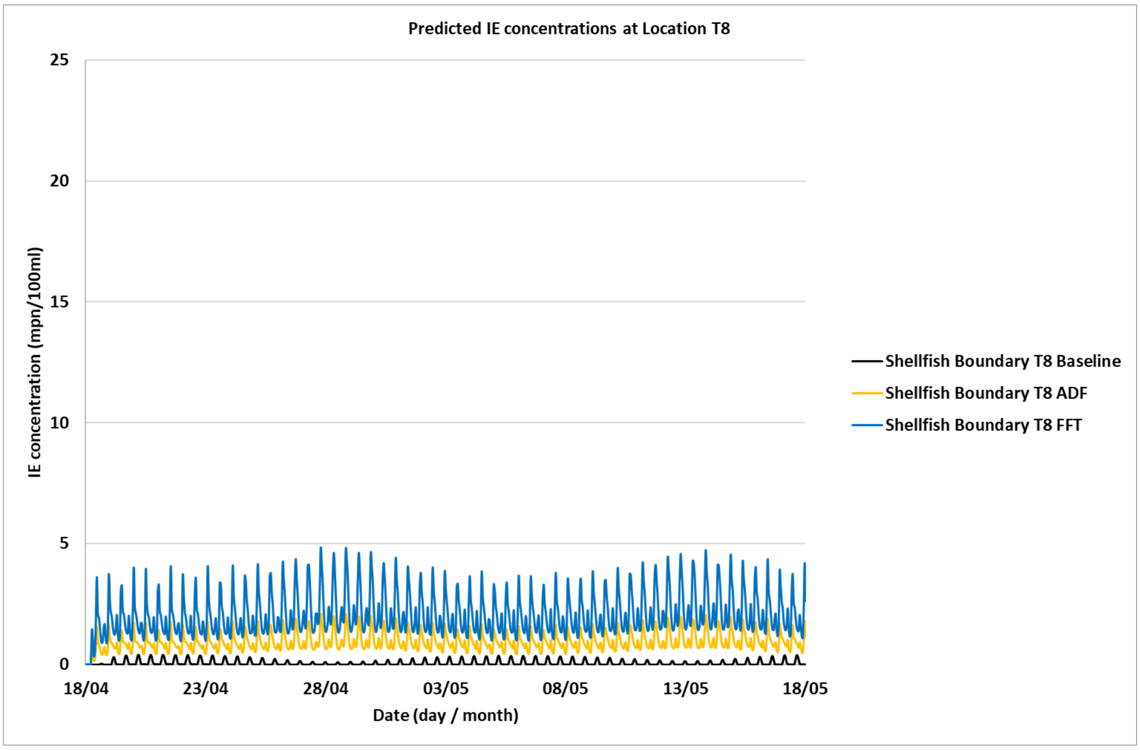

Diagram 8.99: Predicted IE Concentrations at T8 Southern Boundary of Malahide Designated Shellfish Waters

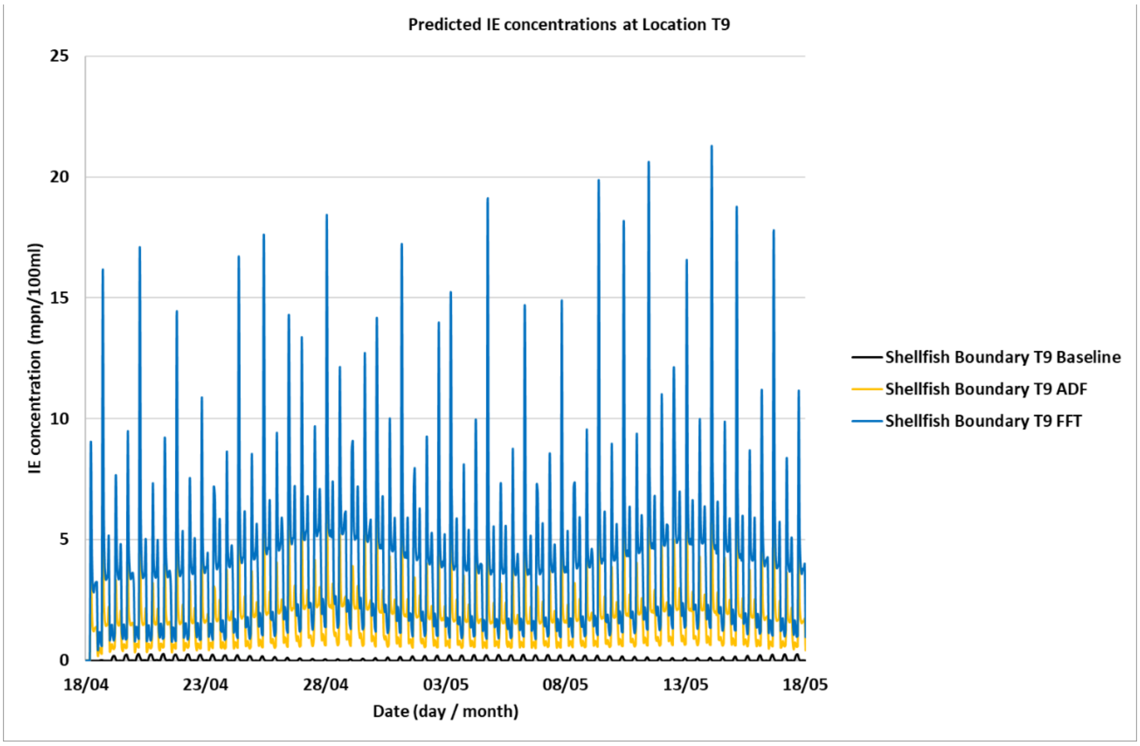

Diagram 8.100: Predicted IE Concentrations at T9 Southern Boundary of Malahide Designated Shellfish Waters

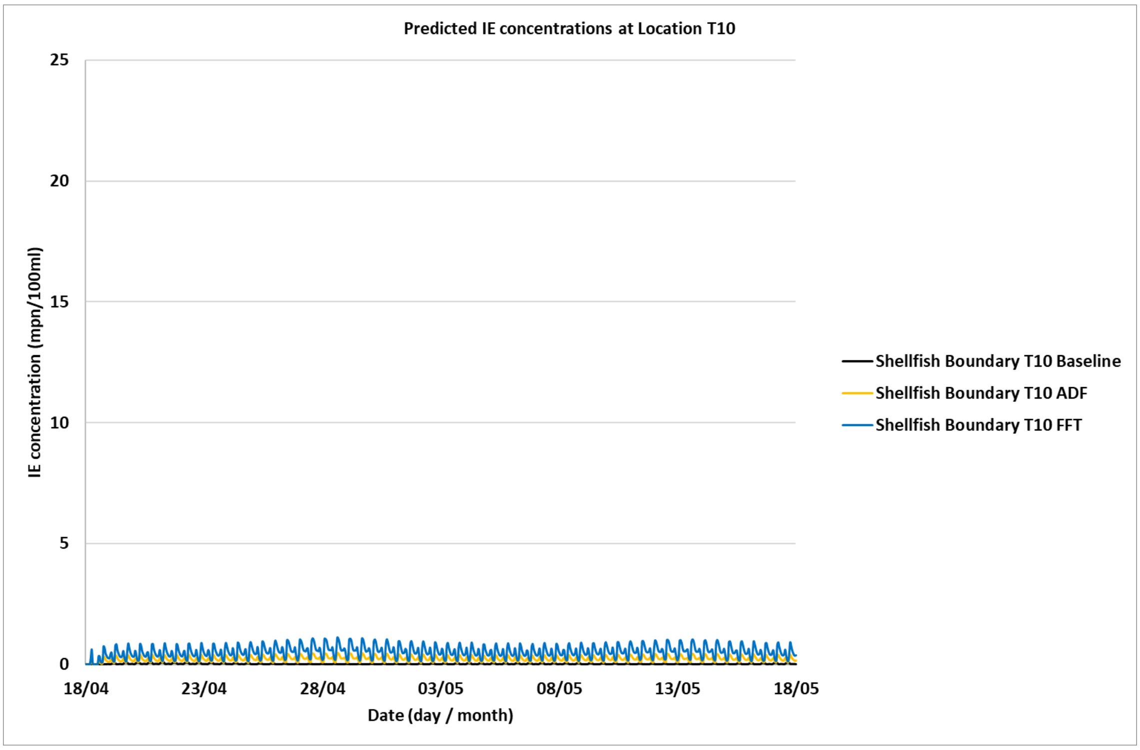

Diagram 8.101: Predicted IE Concentrations at T10 Southern Boundary of Malahide Designated Shellfish Waters

8.5 Mitigation Measures

8.5.1 Construction – Dredging of the Proposed Outfall Pipeline Route (Marine Section) Trench

No changes have been made to the proposed construction methodology for the dredging of the proposed outfall pipeline route (marine section) since the submission of the 2018 planning application, and therefore, there are no changes to this Section of the EIAR in the 2018 planning application.

8.5.2 Operational Phase

The extensive updated modelling undertaken as part of this EIAR Addendum demonstrates that there are no significant impacts predicted on marine water quality during the Operational Phase. As a result, no mitigation measures are proposed.

8.6 Residual Impacts

8.6.1 Surface Water Amendment Regulations 2019

The extensive updated modelling undertaken as part of this EIAR Addendum demonstrates that the receiving water will meet good status criteria and will meet the environmental quality objectives for transitional and coastal water nutrients levels, as applicable. The Proposed Project will have an Imperceptible residual impact on the water quality of the coastal waters off Dublin.

8.6.2 Water Framework Directive

The extensive updated modelling undertaken as part of this EIAR Addendum demonstrates that the Proposed Project will have an Imperceptible residual impact on the water quality of the coastal waters off Dublin and will not impact on achieving the goals of the WFD of reaching good status in all water bodies.

8.6.3 Bathing Waters Regulations

The extensive updated modelling undertaken as part of this EIAR Addendum demonstrates that the Proposed Project will have an Imperceptible residual impact on the water quality of the coastal waters off Dublin and will not influence any designated bathing water beaches nor Blue Flag beaches.

8.6.4 Shellfish Waters Regulations

The extensive updated modelling undertaken as part of this EIAR Addendum demonstrates that the Proposed Project will have an Imperceptible residual impact on the water quality of the coastal waters off Dublin and will not influence any designated shellfish waters.

8.7 Conclusion

The extensive updated modelling undertaken as part of this EIAR Addendum has predicted that the Proposed Project will have an Imperceptible to Slight impact on the water quality off the coastal waters off Dublin.

8.8 Difficulties Encountered in Compiling Required Information

No significant difficulties were encountered in compiling the required information for this Addendum Chapter.

8.9 Oral Hearing

During the 2019 Oral Hearing, the Inspector and Fingal County Council requested further information and / or clarity on a number of issues relating to marine water quality modelling. Further clarification was provided in the 'Response to Inspector's Questions (Marine Water Quality) – Alan Berry' and the 'General Response to Water Quality Model (Marine Water Quality) – Alan Berry'. These two responses are provided in Appendix A8.1 in Volume 3A Part B of this EIAR Addendum. The issues are summarised as follows:

- The significance of modelling a single port diffuser;
- Errors in modelling;
- The water quality modelling being 'only' a desk study; and
- Modelling results have been inadequately presented.

These additional statements provided the following clarification at the Oral Hearing, based on the above points:

- The diffuser modelling study was undertaken to determine the dilution and dispersion characteristics from two outfall locations, in order to progress detailed modelling work. There is no significance in only modelling a single port diffuser as the purpose of the near-field modelling study was to assess the relative merits (not the magnitude of impacts) of two marine outfall locations with respect to the mixing capacity of the receiving water body;
- The appropriateness of model predictions to field data can be assessed in the following ways: visual comparison of the model output against observed data, the shape, trend, range and limits of model output and observed data, and statistical comparison of the difference between observation and the model in order to determine the frequency with which the model fits observation within defined limits. In the (then) absence of a widely adopted industry standard for a definition on calibration requirements, the numerical model was considered against a set of performance metrics, defined in a Guidance Note developed by ABPmer (ABPmer 2013), based on a variety of statistical measures;
- In addition to the statistical analysis of the numerical model, a further assessment of the model performance throughout the calibration period was carried out. For this assessment, a further set of tolerances was applied to the results from the hydrodynamic model and an analysis of the frequency (throughout the calibration period) that the tolerances are met was undertaken. The tolerances applied to this stage of the calibration were taken from the Foundation for Water Research (Evans 1993) guidelines for coastal models;
- In general, the comparison of the modelled and measured datasets, both statistically and visually, demonstrated a robust calibration agreement. The summary of results demonstrated that the numerical model was successfully calibrated and validated against field measurements, to provide a sufficiently accurate representation of the hydrodynamics within the study region;
- The computer model is a dynamic model, calculating changes in water surface level, tidal currents, water quality concentrations on a second by second basis as the dynamics of the system change. The results from the calibrated and validated hydrodynamic computer model demonstrated a high level of agreement with the maps produced by Howth Yacht Club; and
- All of the information pertaining to the water quality modelling simulations, the accuracy of model predictions, the process to arrive at the most environmentally advantageous location for the Proposed Project's outfall, have been presented in the Proposed Project's Alternate Sites Assessment reports, the EIAR and associated appendices in the 2018 planning application, which were subject to various rounds of public consultation. The model as developed, calibrated and applied, represents the best available representation of the circulation patterns throughout the area of interest.

8.10 References

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<u>Directives and Legislation</u>

Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment (hereafter referred to as the Urban Waste Water Treatment Directive

Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy

Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC

Directive 2006/113/EC of the European Parliament and of the Council of 12 December 2006 on the quality required of shellfish waters

Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy

Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL concerning urban wastewater treatment (recast)

S.I. No. 684/2007 - Waste Water Discharge (Authorisation) Regulations 2007

S.I. No. 79/2008 - Bathing Water Quality Regulations 2008

S.I. No. 231/2010 - Waste Water Discharge (Authorisation) (Amendment) Regulations 2010

S.I. No. 652/2016 - Waste Water Discharge (Authorisation) (Environmental Impact Assessment) Regulations 2016.

S.I. No. 77/2019 - European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019

S.I. No. 214 of 2020 - European Union (Waste Water Discharge) Regulations 2020

S.I. No. 166/2022 - European Union (Water Policy) (Amendment) Regulations 2022.