

**An Bord Pleanála Oral Hearing**

**Irish Water**

**Greater Dublin Drainage**

**General Response to Water Quality Model**

**Marine Water Quality – Alan Berry**

**GDD Oral Hearing  
General Response in Relation to Water Quality Model**

1. Addressing issues of the water quality modelling as being 'only' a desk study I would like to make reference to two of MarCon's contextually significant previous water quality and shellfish assessment projects.
2. From 2005 to 2015 MarCon were engaged by the United Kingdom Environment Agency to develop and maintain a suite of water quality models for the Environment Agency for the purposes of meeting their obligations under the Habitats and Bathing Waters Directives. Our models were used by the Environment Agency to independently assess all applications for Waste Water and IPPC discharge licences in Morecambe Bay (significant commercial shellfisheries), Ribble Estuary (significant bathing waters including Blackpool and St. Annes beaches), Mersey Estuary, Severn Estuary and the Bristol Channel.
3. In addition, from 2007 to 2009, MarCon were commissioned by Bord Iascaigh Mhara to develop water quality and shellfish management models of mussel and oyster production areas in selected regions around the Irish coast. This modelling was published by the United Nations Food and Agriculture Organisation (UNFAO) as a case study highlighting best practice in shellfishery management practices.

Specific response to Cllr Healy and others on water quality model

4. Returning to the present Proposed Project, with respect to the circulation patterns around Ireland's Eye as predicted by the model. Shown in the following figures is the model's representation of the flood and ebb tides compared directly with the maps from Howth Yacht Club. This material has previously been presented in the Response to An Bord Pleanála of Jan 2019.
5. The results from the calibrated and validated hydrodynamic computer model shows a high level of agreement with the maps produced by Howth Yacht Club. 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. Although the maps from Howth Yacht Club indicate effluent will be washed ashore to Portmarnock and Baldoyle on flooding tides, the maps do not account for the dispersion or dilution of effluent, nor the ever changing direction and the strength of the tidal currents over the course of a tidal cycle.

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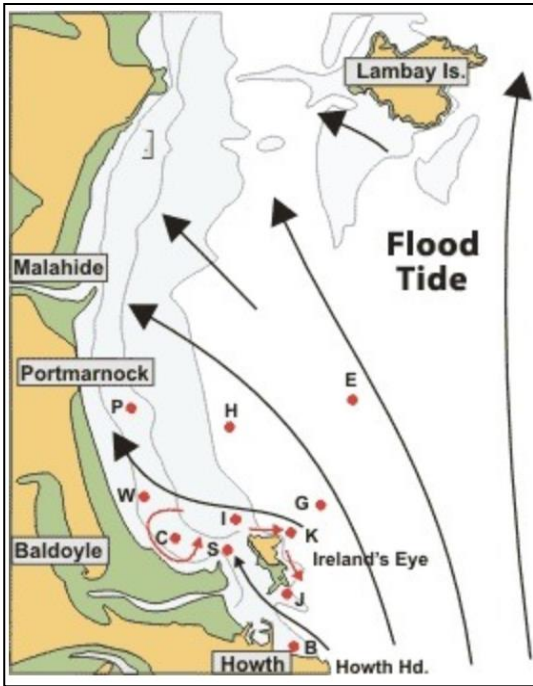


Fig 1(a): Howth Yacht Club: Flood Tide

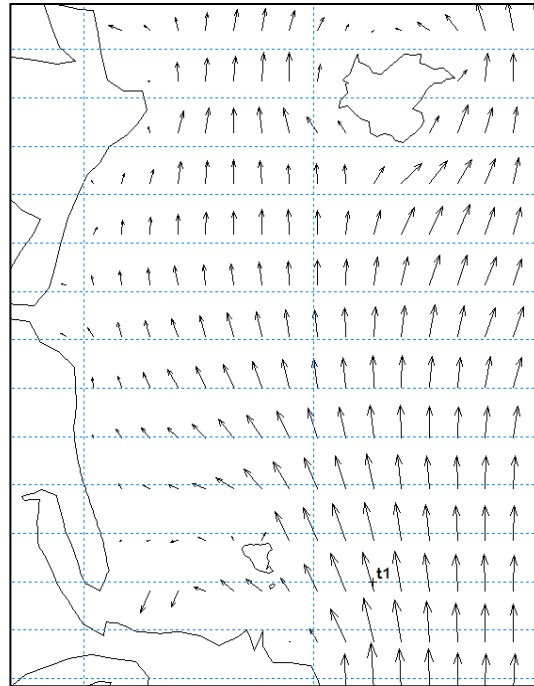
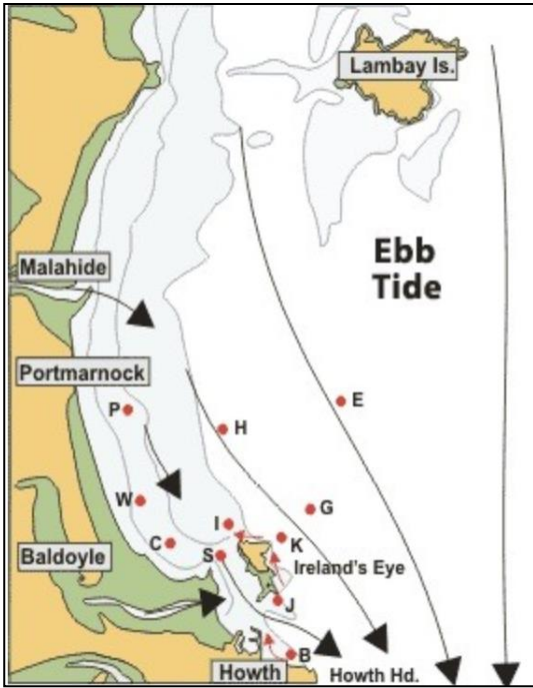


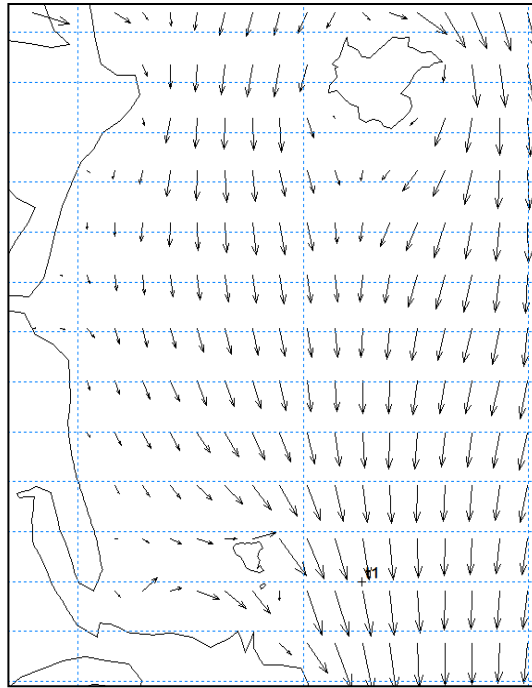
Fig 1(b): GDD model: Flood Tide

6. Comparing Fig 1(a) with Fig 1(b) (from the Response to An Bord Pleanála of Jan 2019) for flood tide circulation patterns between Howth and Lambay Island it can be seen that; (i) both maps show the flooding tide to the north and east of Ireland's Eye stronger than the flooding tide between Ireland's Eye and the Baldoye Estuary as well as showing the same direction for the tidal currents; (ii) to the north of Ireland's Eye both maps show the flooding tide on a northwesterly heading with a notable westerly component towards Portmarnock; (iii) both maps show the flooding tide diverging to the east and west around Lambay Island;
7. Comparing Fig 2(a) with Fig 2(b) for ebb tide circulation patterns between Howth and Lambay Island it can be seen that; (i) both maps show the ebbing tide between Ireland's Eye and Lambay Island on a south-southeasterly heading, with the 'offshore' ebbing tide to the east of Lambay Island on a southerly heading; (ii) both maps show the nearshore ebbing tide on a south-southeasterly heading meeting then turning due east off Baldoye Estuary.

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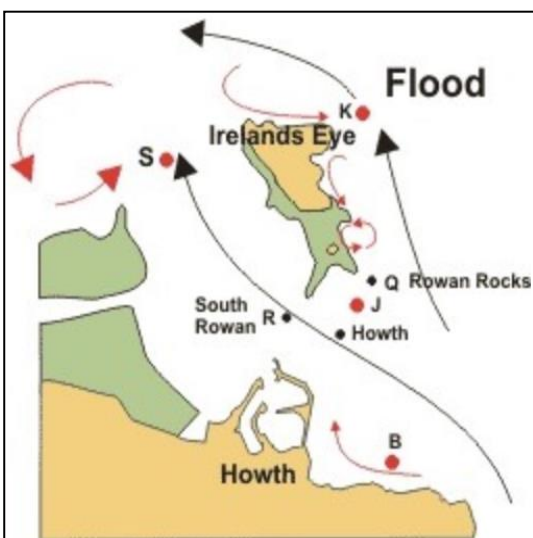


**Fig 2(a): Howth Yacht Club: Ebb Tide**

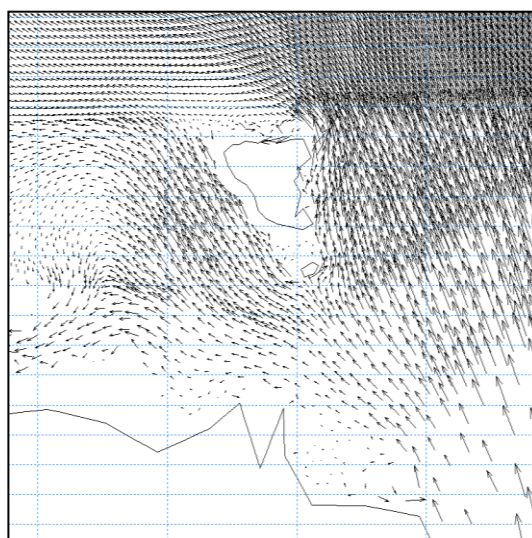


**Fig 2(b): GDD model: Ebb Tide**

8. At higher resolution, comparing Fig 3(a) with Fig 3(b) (from the Response to An Bord Pleanála of Jan 2019) for flood tide circulation patterns around Ireland's Eye it can be seen that; (i) both maps show the flooding tide between Ireland's Eye and Howth on a northwesterly heading, with a much weaker tidal current immediately to the east of Howth Harbour; (ii) both maps show the magnitude of the flooding current to the east and west of Ireland's Eye to be almost equal; (iii) both maps show an anti-clockwise re-circulation / gyre structure to the west of Ireland's Eye and to the north of Baldoye Estuary; (iv) both maps show an anti-clockwise re-circulation / gyre structure immediately north of Ireland's Eye at a much lesser magnitude than that of the predominant northwesterly flooding tide.



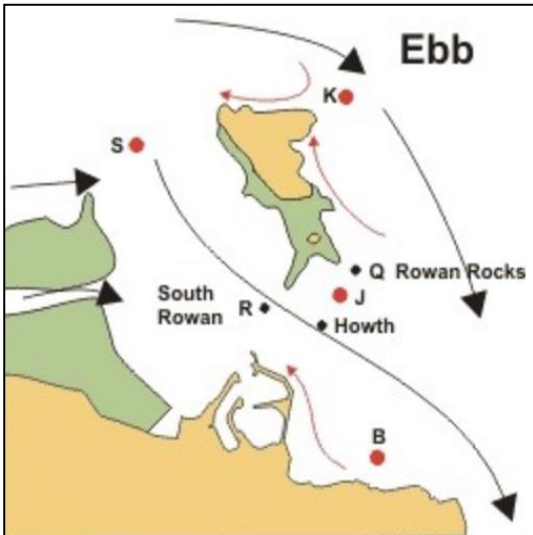
**Fig 3(a): Howth Yacht Club: Flood Tide**



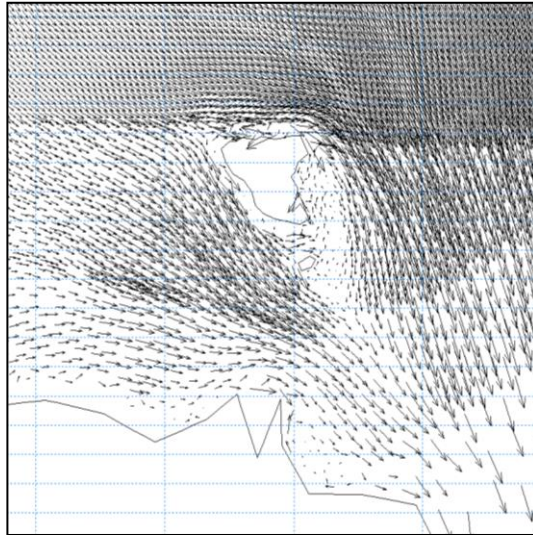
**Fig 3(b): GDD model: Flood Tide**

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9. Comparing Fig 4(a) with Fig 4(b) for ebb tide circulation patterns around Ireland's Eye it can be seen that; (i) both maps show the ebbing tide between Ireland's Eye and Howth on a southeasterly heading, with a counter current immediately to the east of Howth Harbour heading in a northerly direction; (ii) both maps show the magnitude of the ebbing current to the north, east and west of Ireland's Eye to be almost equal; (iii) both maps show a weak counter current immediately to the east of Ireland's Eye; (iv) both maps show a weak clockwise re-circulation / gyre structure immediately north of Ireland's Eye.



**Fig 4(a): Howth Yacht Club: Ebb Tide**



**Fig 4(b): GDD model: Ebb Tide**

10. Moving on to the accuracy of the model in representing observed dispersion patterns in the region around Ireland's Eye; the solute transport (advection) model was calibrated against 2015 dye release surveys from locations around the area of interest, with 4 releases taking place on a spring tide and again on a neap (20<sup>th</sup> April 2015 and 9<sup>th</sup> June 2015 respectively). I submit a number of diagrams as presented in Appendix 8.1 of the EIAR.

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Figure A1.15 – Dye Release, Spring 1

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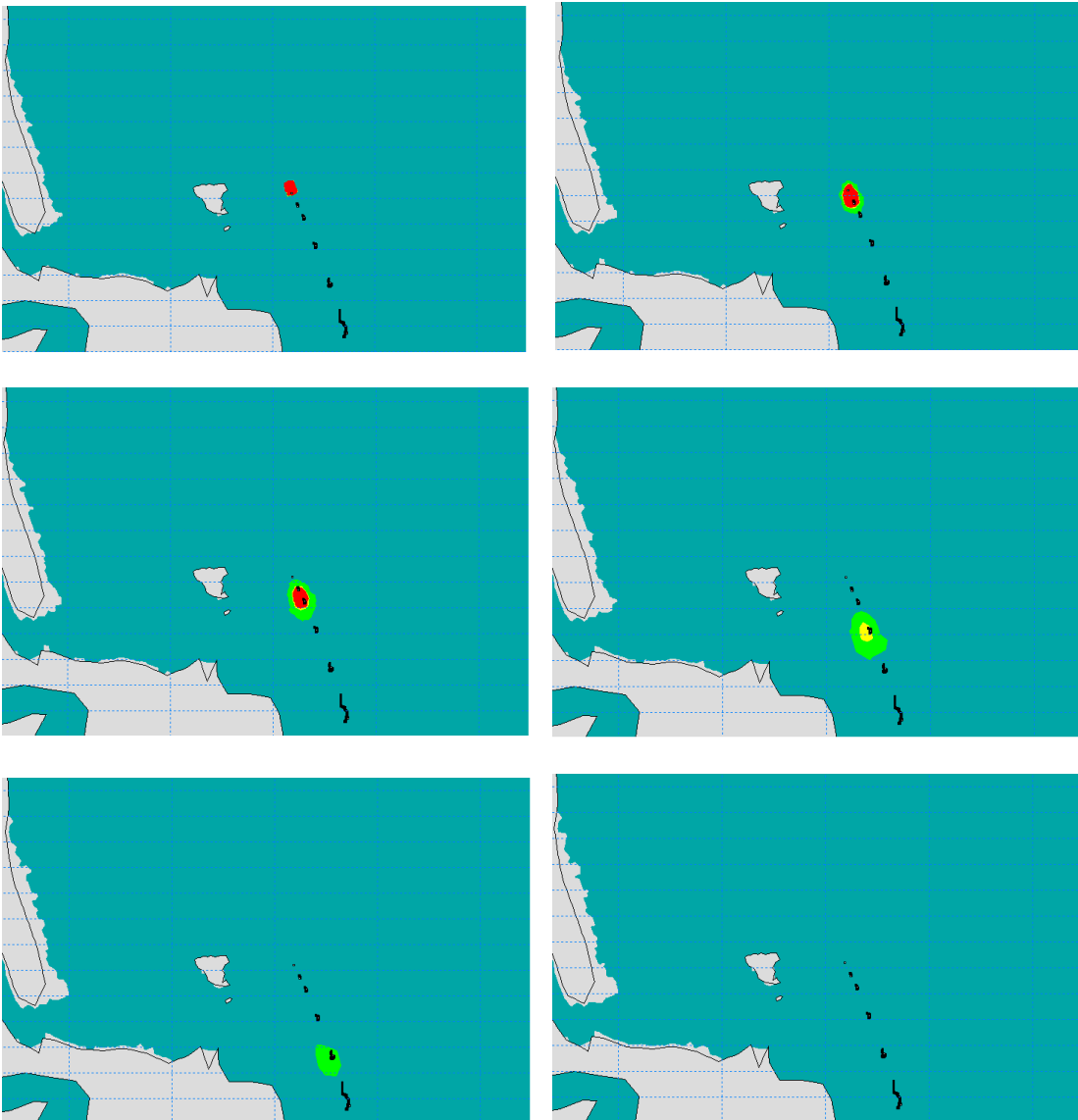


Figure A1.16 - Dye Release, Spring 2

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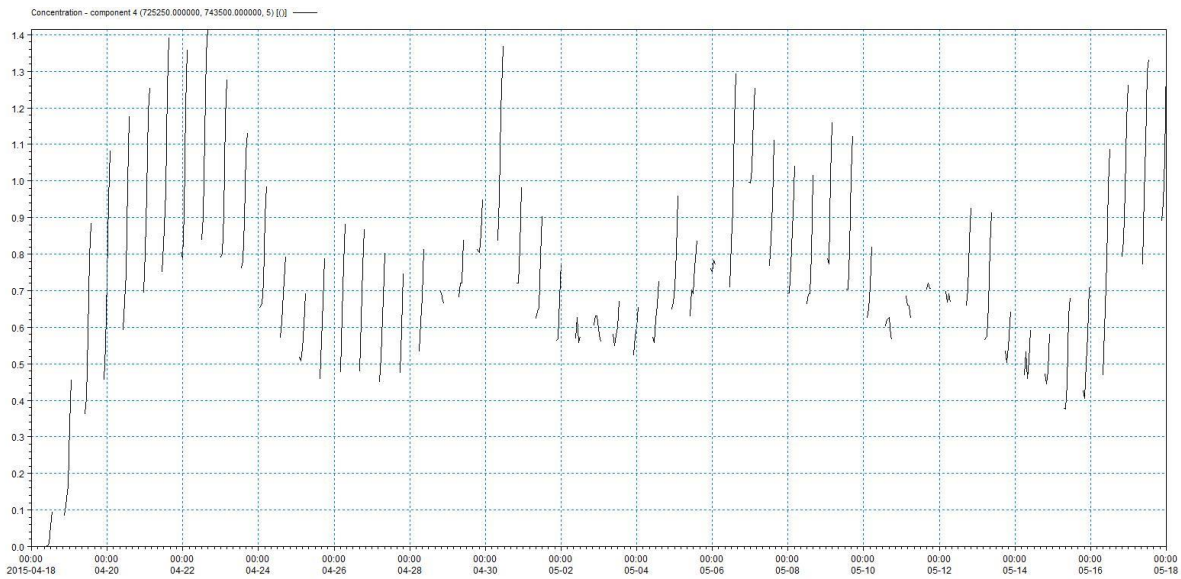


Figure A1.21 – Dye Release, Neap 3

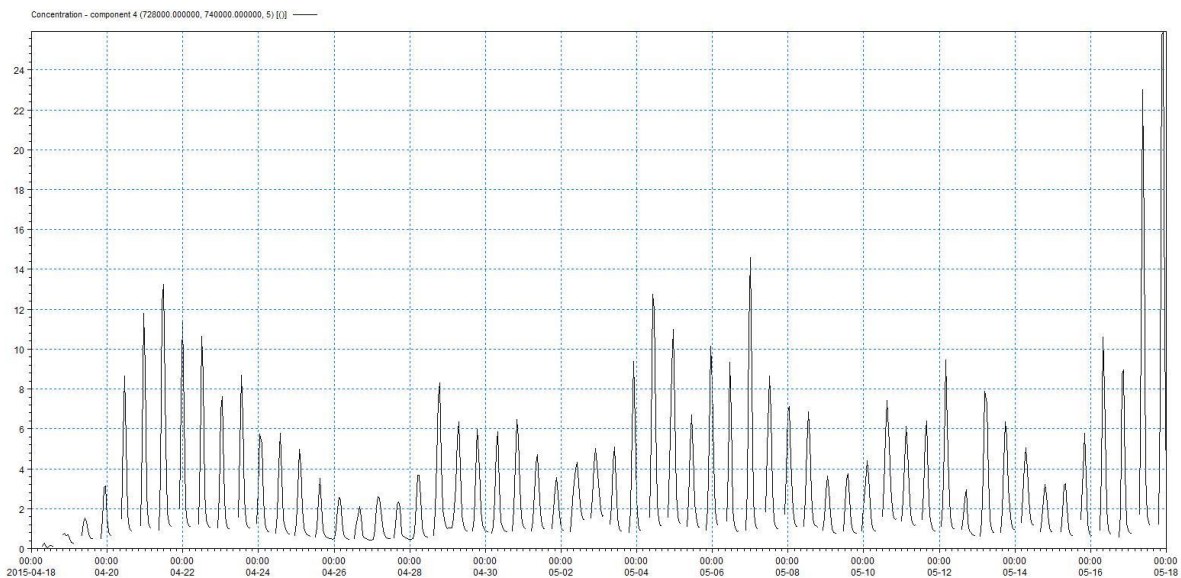


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11. These diagrams show that the model is capable of representing dispersion plumes in the area of interest around Ireland's Eye, both to the west and east of the island. The information published in the EIAR and Appendices shows that the model accurately represented the advection and dispersion of solute plumes throughout the area of interest.
12. Specifically responding to Cllr Healy request that modelling results have been inadequately presented, I submit the following assessment at Velvet Strand, Claremont, Bascadden Beach and Irelands Eye (closest location to outfall) for the proposed discharge subject to UV treatment.

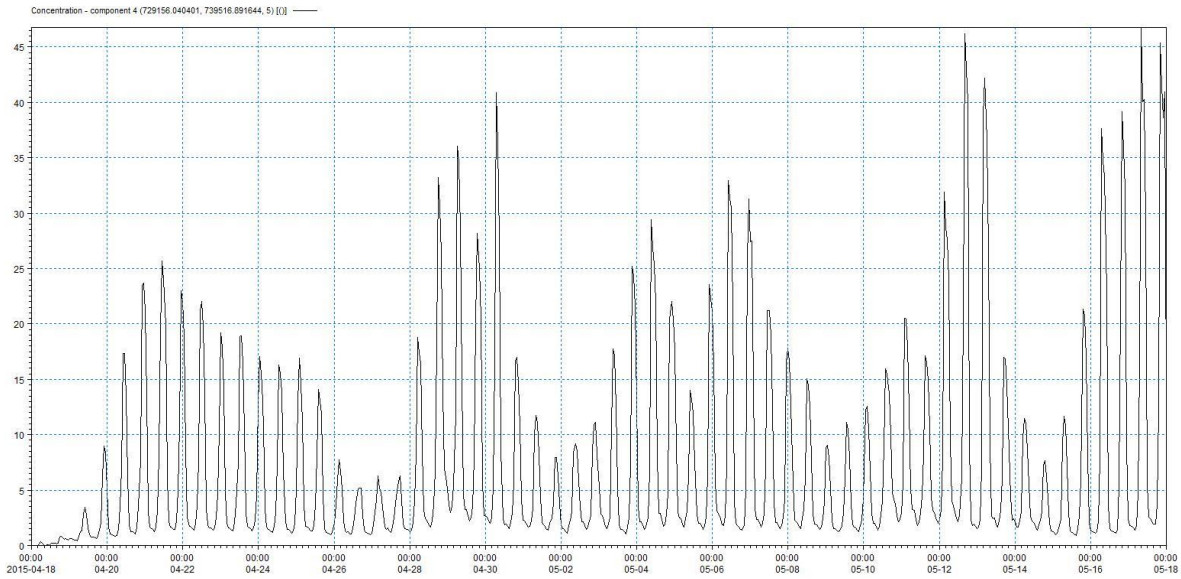


**Velvet Strand**

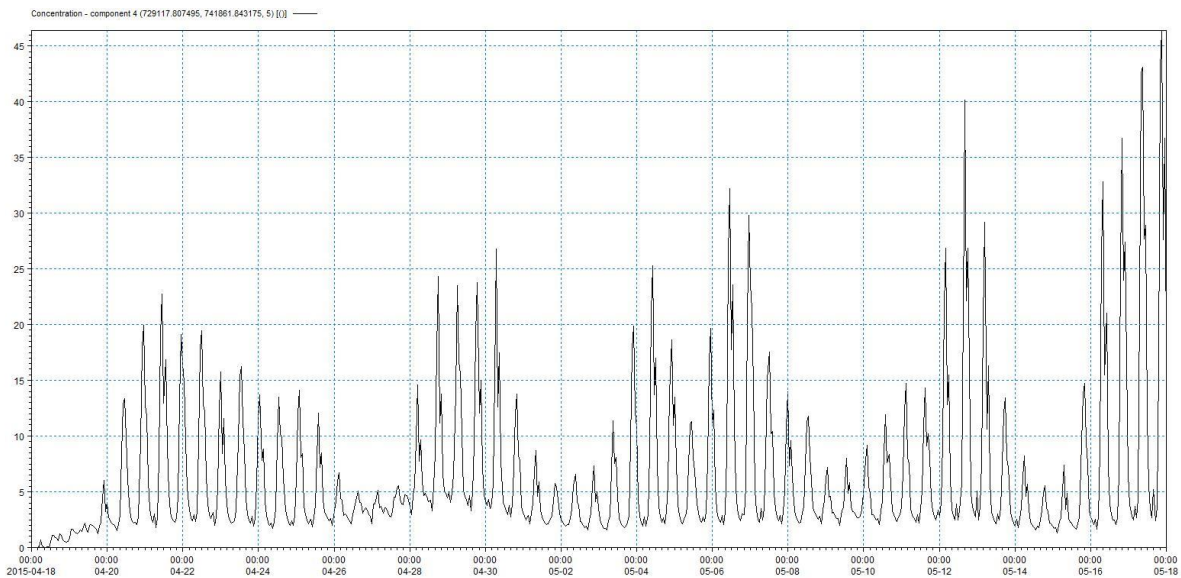


**Claremont**

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### Balscadden



### Irelands Eye

13. With respect Inspector, all 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 ASA reports, the EIAR and associated Appendices which have been subject to various rounds of public consultation. The original assertion in the EIAR remain valid; the model as developed, calibrated and applied, represents the best available representation of the circulation patterns throughout the area of interest.
14. The modelling results presented in the EIAR have shown that the location for the Proposed project outfall will not impinge on the Excellent bathing waters status at any of the designated beaches. Out of an abundance of caution, the inclusion of UV treatment on the effluent will ensure the outfall will not impact the Class A designated shellfish waters.