Attachment F.1

Attachment F.1

- Report on Marine Outfall Studies

Document Ref 1030-1/07

Report
on
Marine Outfall Studies
at
Ballydehob, Co. Cork.

Prepared for:

RPS Consulting Engineers,
Inishmore,
Ballincollig,
Co. Cork.

Prepared by:

Irish Hydrodata Limited,
Ballygarvan,
Co. Cork.

September 2007

CONTENTS

1. Introduction

RPS Consulting Engineers Ltd commissioned Irish Hydrodata Limited to investigate the impact on the marine environment of proposed treated wastewater discharges from the town and environs of Ballydehob to Ballydehob Bay, Co. Cork.

At present a municipal outfall discharges into the head of the bay close to the town. It is proposed to retain this outfall and to provide additional treatment for the effluent.

A number of field measurements were made in the bay to assist with the study. These included bathymetry, dye tracking and current metering.

This data was analysed and then incorporated into a computer model to simulate the impacts of the proposed discharges for a range of conditions. The results indicate likely levels of bacterial and BOD contamination of the surrounding waters.

Ballydehob Bay joins Roaringwater Bay approximately 2.7km to the south of the town. Inner Roaringwater Bay is used extensively for longline mussel cultivation and is a licensed aquaculture area. (Figure 1.1)

A significant freshwater flow enters at the head of Ballydehob Bay. This originates from a number of rivers which join just upstream of the town and have their origins in approximately $36km^2$ of hilly catchment. The average daily flow is estimated to be $0.8m^3/s$ and the 7-day low flow about $0.08m^3/s$.

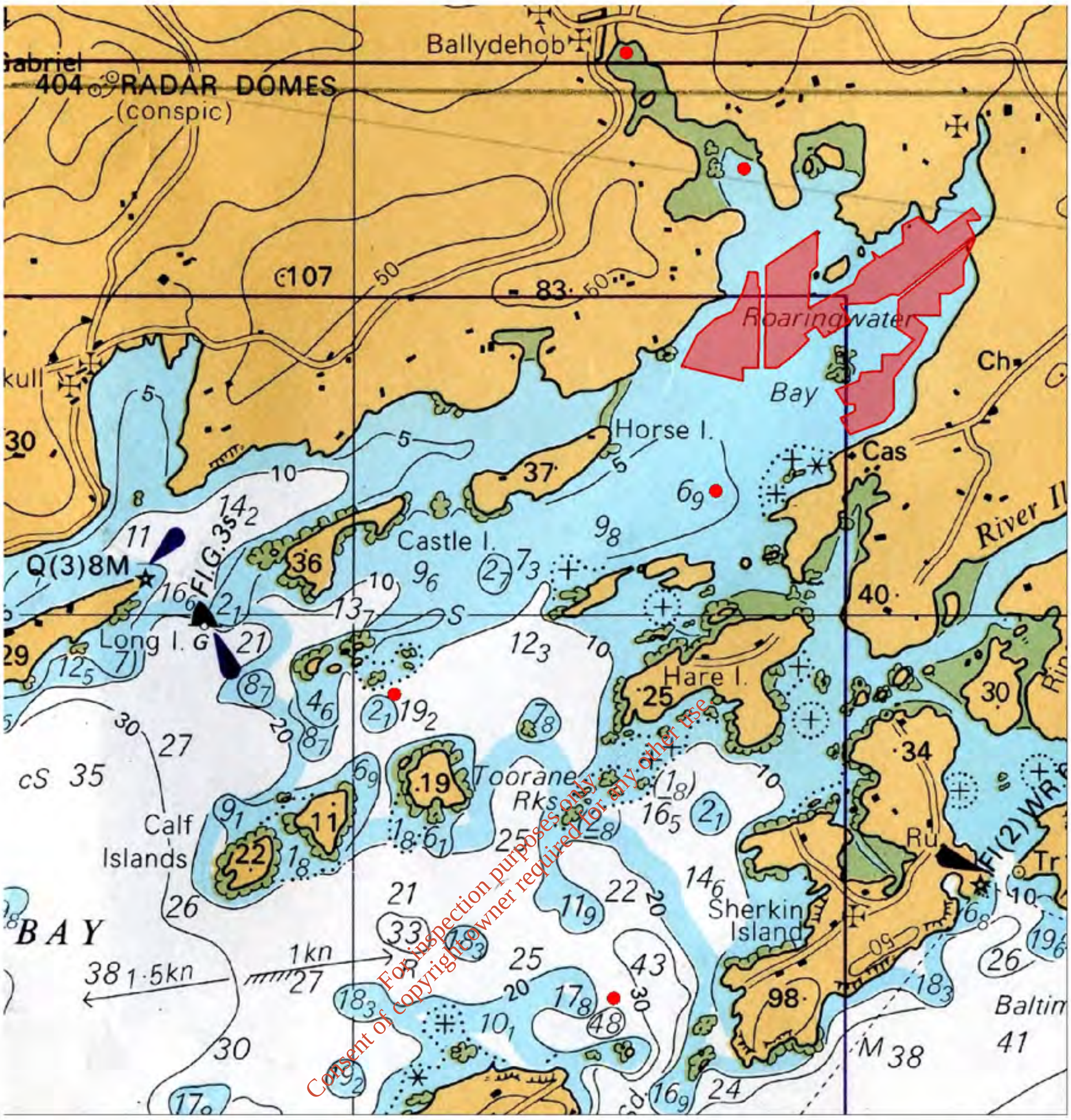

Figure 1.1 – Ballydehob and Roaringwater Bays showing aquaculture areas (shaded red).

2. Field Survey Works

Field measurements were made during May 2007. Calm or light wind conditions were the primary objective for field works to ensure that worst case situations as regards mixing were achieved.

Bathymetry

Echo sounding was conducted over the area shown in Figure 2.1. The channel and adjoining mudflats were mapped. Data was reduced to Admiralty Chart datum (CD) which is defined as +0.58m OD Poolbeg at Schull. The survey data has shown that the main channel extending from the town to the open waters is deeper than indicated on the Admiralty Chart for the area (No 2129, ref:1) and remains substantially wet on all but large spring tides.

Current Meter and Tidal Data

Two recording current meters (Interocean S4) was deployed at the locations shown in Figure 2.2. These recorded current speed and direction data at 10 minute intervals over a period of seven days. One meter was located at the outfall and the other approx 2km downstream in lower Ballydehob Bay.

Results are shown in Figures 2.3a and 2.3b. Measured current speeds at the outfall location are very low, about 0.05m/s on the flood and typically 0.1m/s on the ebb.

Current speeds at the outer location are stronger and more defined, reaching 0.2m/s to 0.3m/s on both the flood and ebb tides.

Data from a previous study in Roaringwater Bay, Figure 2.4 (ref:2) shows the currents here to be well defined but weak reaching peak values of 0.08m/s on springs and neaps in the inner parts of Roaringwater Bay off Ballydehob Bay.

Data from the tide gauges, located at the current meter sites (Figure 2.2), are shown in Figure 2.5. Both gauges show similar water elevation curves with the inner gauge bottoming out at 0.5m CD during low water on the spring tide. The data shows that ranges are similar to those contained in the Admiralty Tide Tables for the area (ref:3).

Dye Track Data

Releases of Rhodamine WT tracer dye (350ml) were made on two dates, one on springs and the other on neaps. The patches were tracked visually and later, as the concentrations reduced, tracking continued with Turners Designs Cyclops-7 fluorometer fitted to the survey vessel.

The dye releases on the 11th May (neap tide) showed patches following the channel southwards towards the open sea. At four hours after release and about 1 hour before low water, the leading edge of the patch had travelled 1.5km downstream as shown in Figure 2.6. Trace concentrations were recorded in the channel back upstream to the outfall. Winds on the day were southwesterly F4 to F5.

The patches released during the spring tide on 17th May followed similar trajectories as those observed on the neap. Trace amounts of dye were detected outside the bay in the shellfish cultivation areas at low water (Figure 2.7a-c). Winds on the day were westerly F1 to F2.

Drogue Data

Drogue tracking was not really practical in the bay due to the shallow bathymetry and limited water depth outside the main channel even at high water. However an attempt was made around high water during the spring tide of the 17th. Surface floats were released and tracked for a short period until they went aground. The trajectories are shown in Figure 2.8 and are similar to those followed by the dye patches. Typical speeds were 0.20m/s.

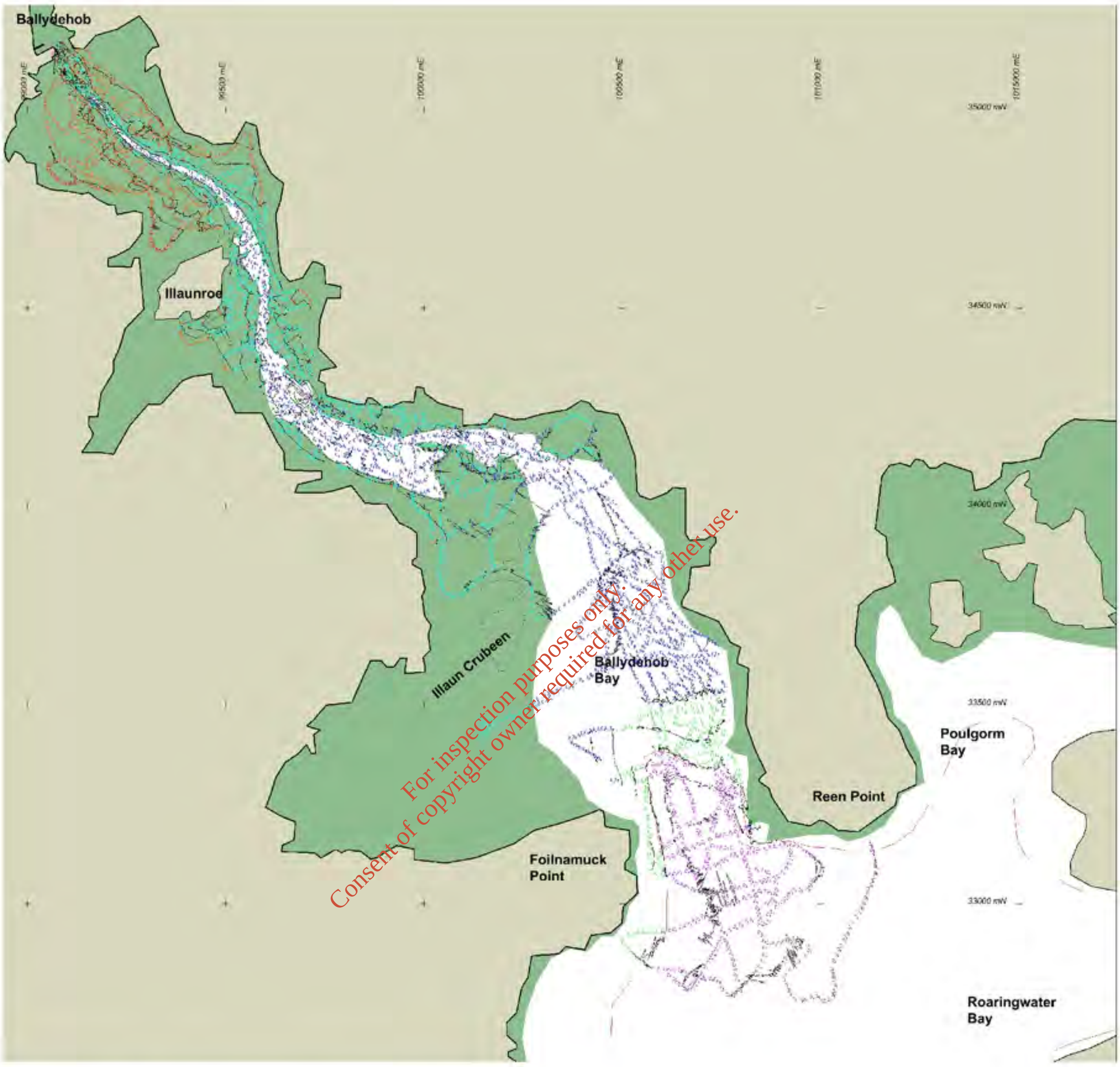

Figure 2.1 – Schematic of Bathymetric Survey Extents

Figure 2.2 – Current Meter Locations (green areas are above chart datum and dry on big spring tides)

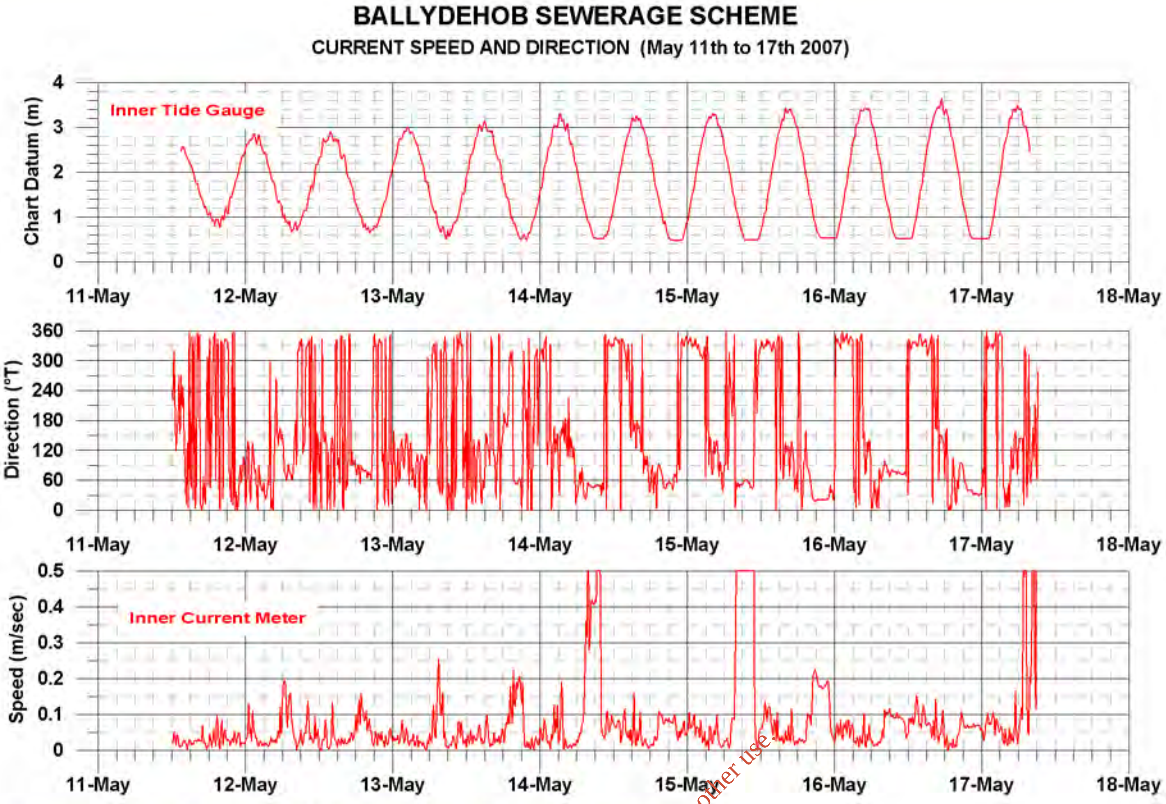

Figure 2.3a – Current Meter at Outfall (inner) Location

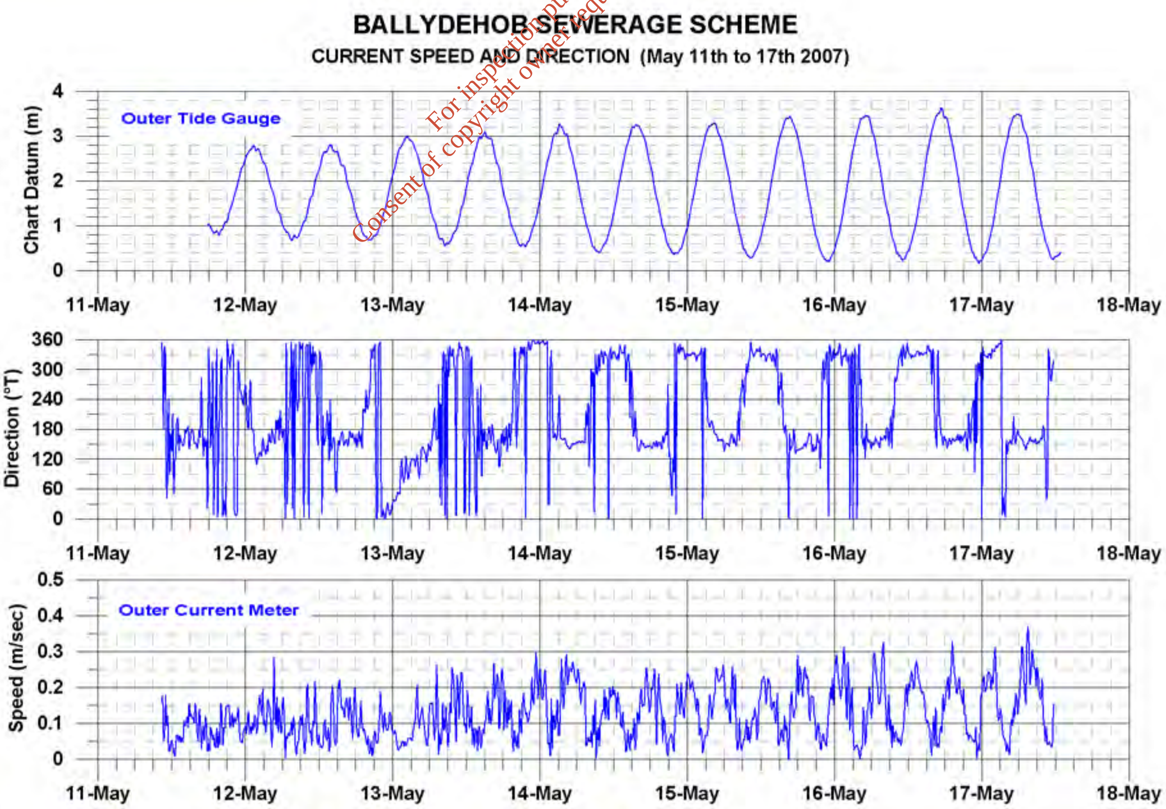

Figure 2.3b – Current Meter at Outer Bay Location

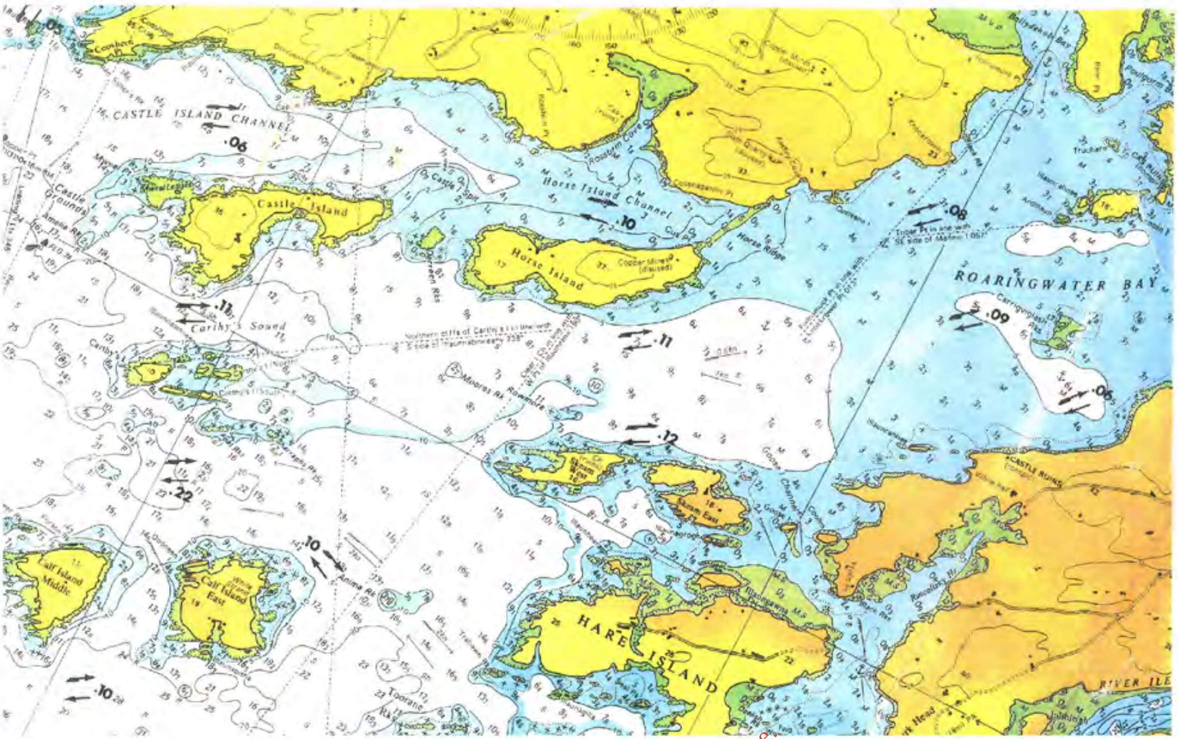

Figure 2.4 – Roaringwater Bay Current Data (ref:2)

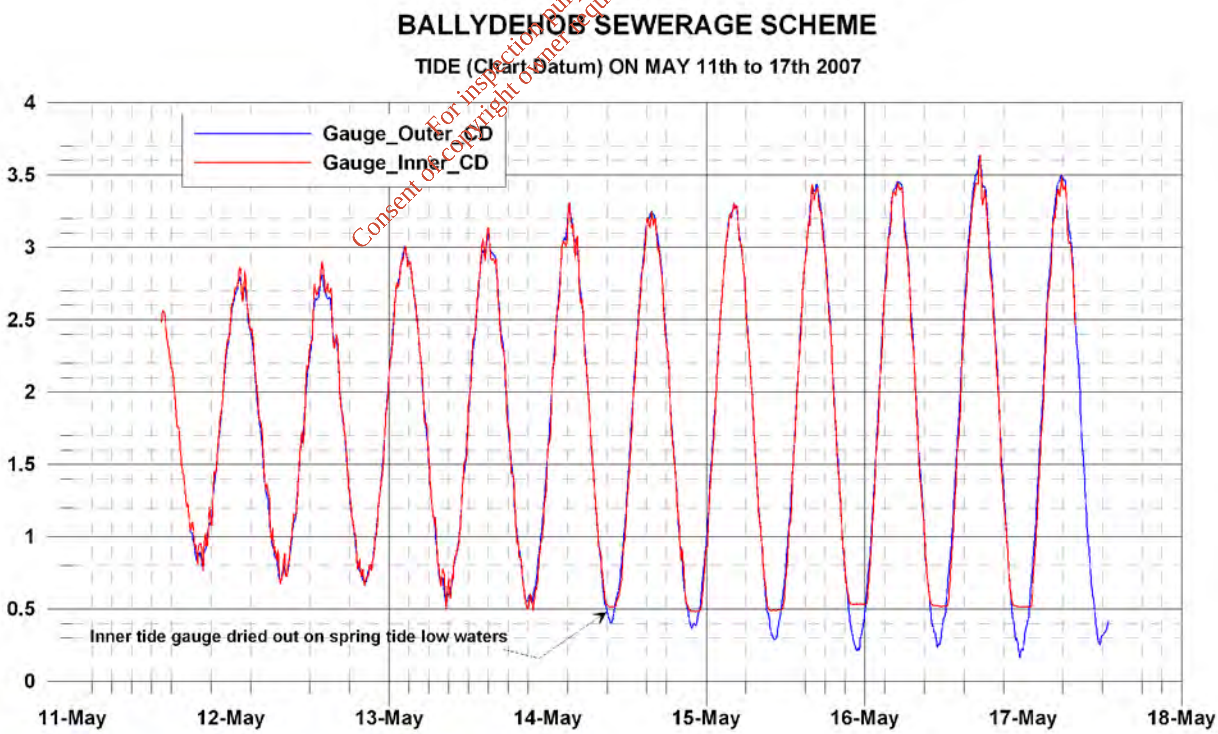

Figure 2.5 – Comparison of Tide Gauge Data

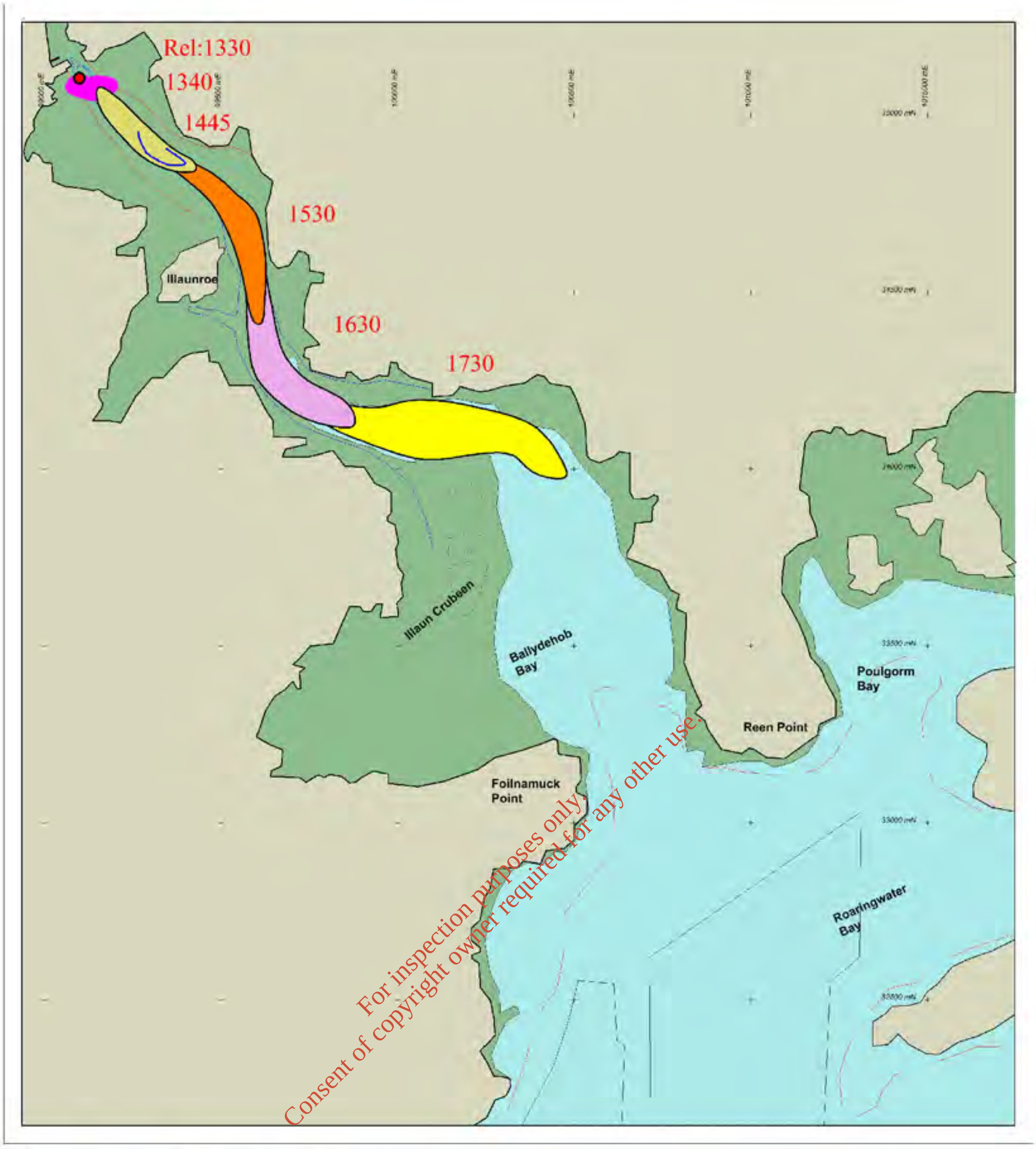

Figure 2.6 – Neap Tide Dye Release, patch positions 1330hrs to 1730hrs.

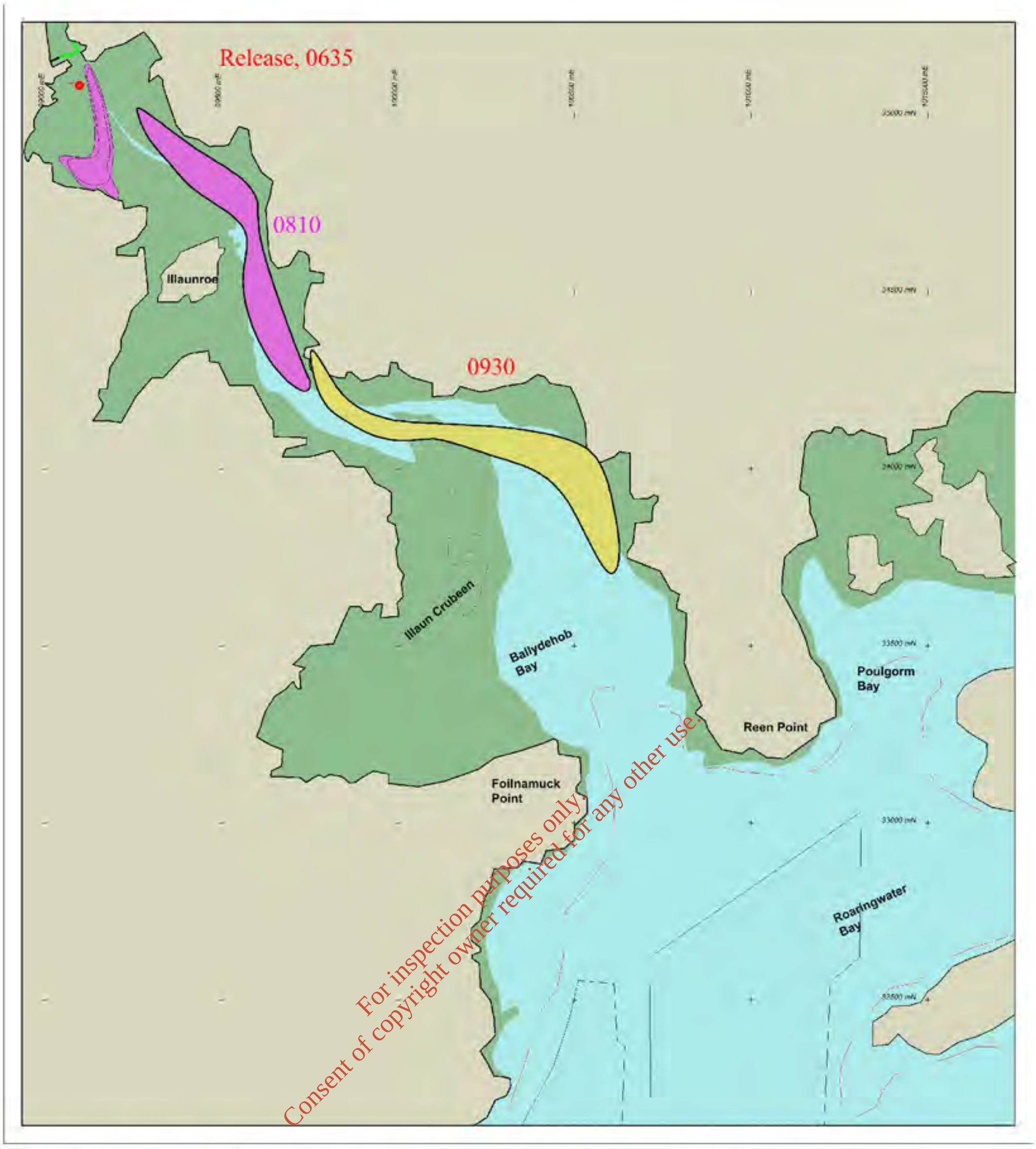

Figure 2.7a – Spring Tide Dye Release, patch positions 0635hrs to 0930hrs.

Figure 2.7b – Spring Tide Dye Release (contd), patch position at 1134hrs.

Figure 2.7c – Spring Tide Dye Release (contd), patch position at 1230hrs.

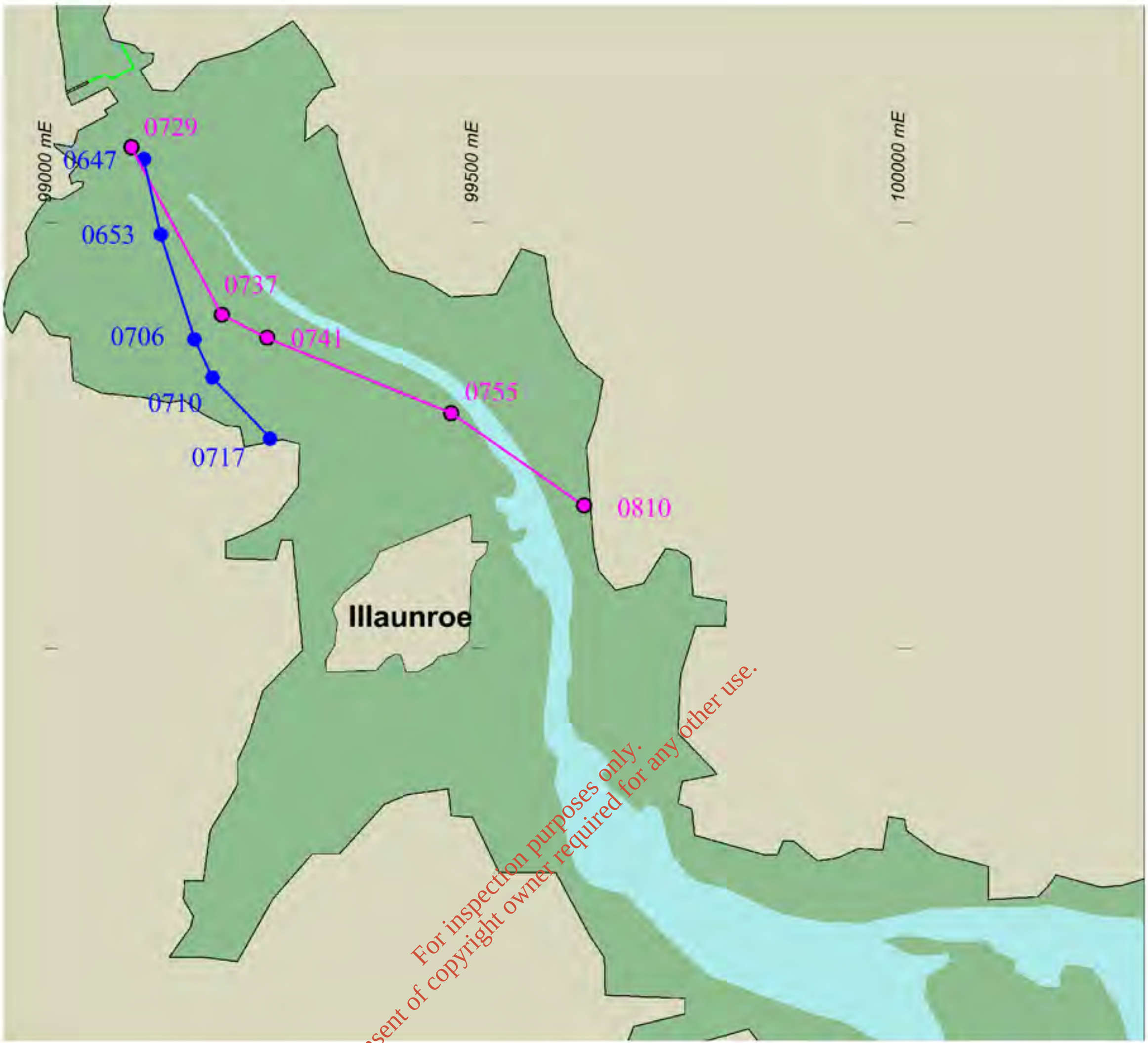

Figure 2.8 – Drogue Tracks on Spring Tide (17th May)

3. Modelling of Effluent Discharges

The on-site measurements described previously together with general oceanographic data were used to develop a numerical model of the bay area to simulate the likely fate of effluent discharging from the outfall. Both bacterial and BOD contamination were considered with the former being the most significant in view of the faecal coliform concentrations in the treated effluent source and the proximity of the shellfish cultivation areas.

Effluent Characteristics

Effluent from the town will be subjected to treatment before being discharged to the sea via the outfall. The proposed design standard is 25/35 and design flow rates and bacterial concentrations are as follows:

Flow Rate:	12 litres /second;
Faecal Coliforms at outfall:	5×10^5 fc /100ml;
Bacterial Decay Time:	12 hours.

Freshwater input from the river will provide beneficial dilution to the effluent stream. An estimate of the minimum dilution available can be made from the 7-day low flow in the river (0.08m^3/s.). The highest concentrations in the river channel after mixing and at low tide will thus be:

Faecal Coliforms:	6.5×10^4 fc /100ml;
BOD:	3.3 mg/l;
SS:	4.6 mg/l.

Effluent Simulations

Simulations of effluent discharges were undertaken with a 2-D dispersion modelling package comprising a 2-D hydrodynamic flow module (ref:4) to simulate water movements and a lagrangian particle track module (ref:5) to simulate dispersion of contaminants. The latter uses the flow fields from the 2-D flow model. The modelling approach is described in more detail in Appendix A.

The coastline for the 2-D flow model was taken from Admiralty Chart No. 2129. Depth data was obtained both from this chart and from the bathymetric survey carried out as part of the field works (Section 2). Depths were interpolated onto a mesh of 25m square cells for input to the model. Model boundary conditions were chosen such that both neap and spring tide flow fields were simulated.

Flow fields for the spring and neap tides were generated at intervals of 1/12th of a tidal cycle i.e. 3726 seconds for 20 tidal cycles.

The 2-D flow model was calibrated against current data recorded during the field works. Figure 3.1 compares modelled currents with those measured at the outer meter during spring tides.

The dye test data acquired during the field work was used to calibrate the Lagrangian Particle Track model. Figure 3.2 shows a modelled series of a patch of particles which may be compared with the field results as presented in Figure 2.7a-c relating to the dye release on 17th of May 2007.

BALLYDEHOB SEWERAGE SCHEME

Model Flow Field - Spring Tide (A_sp)

Current Speed, Direction and Tide at Model Cell (140,255)

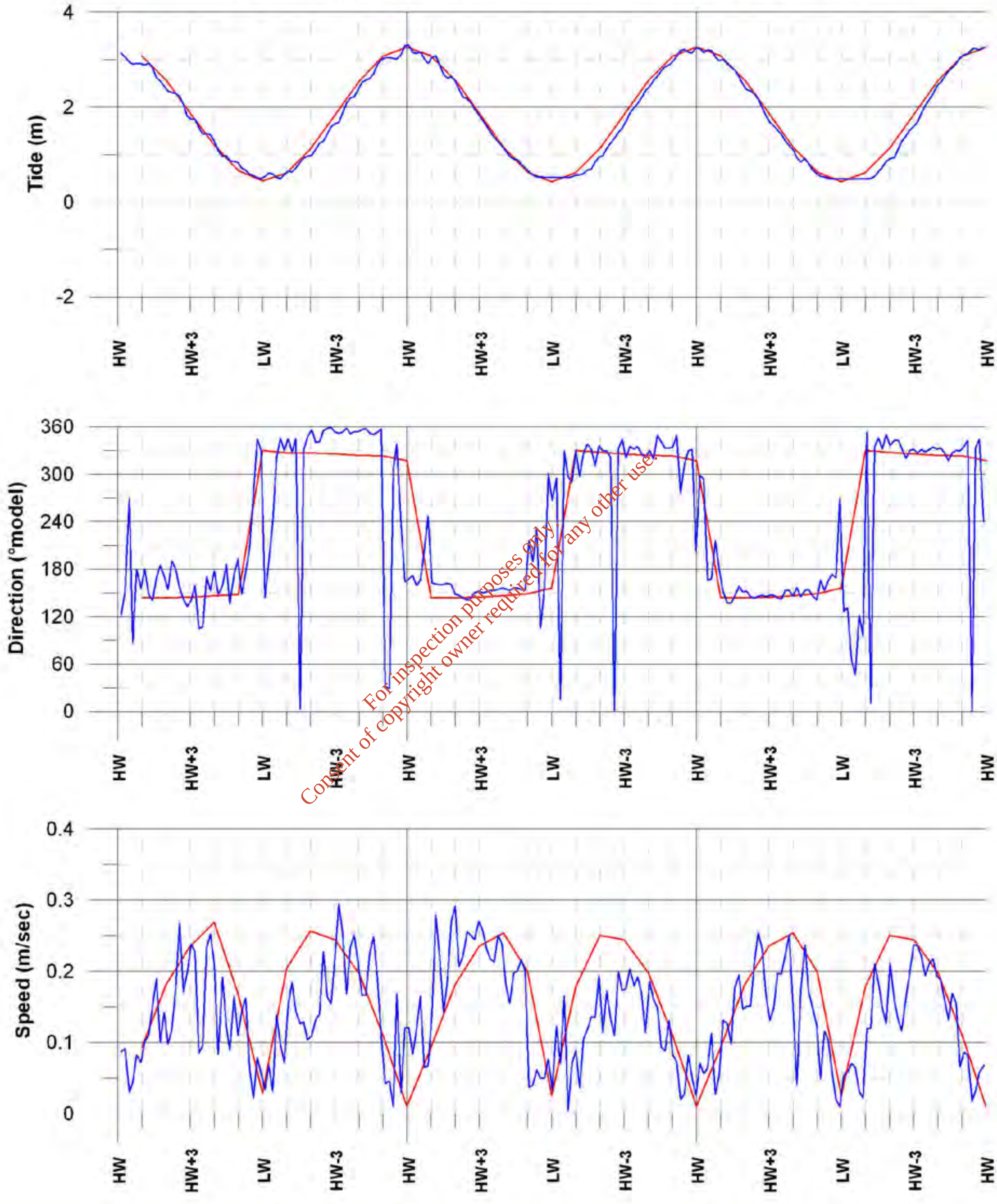

Figure 3.1 – Comparison of Modelled and Measured Current Speed.

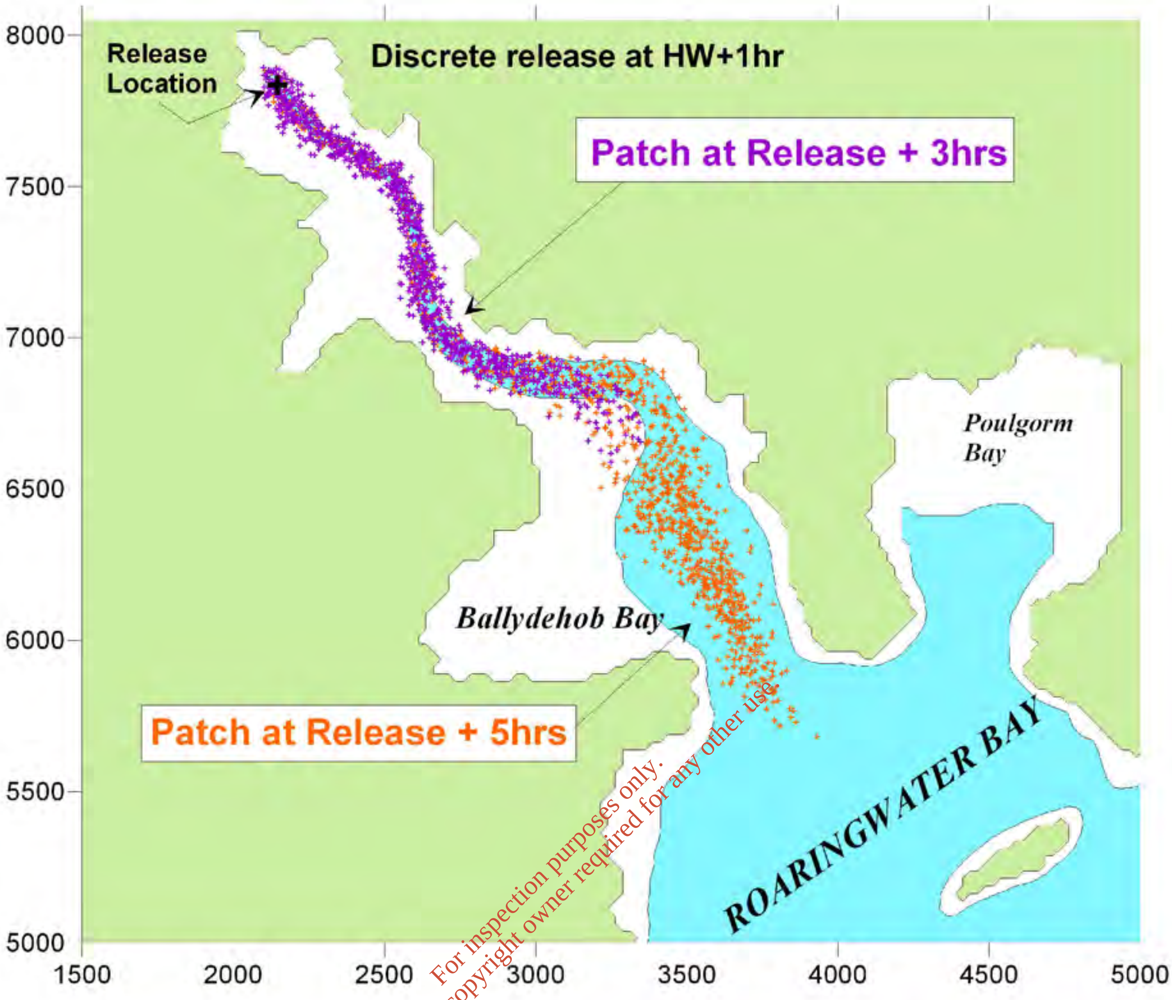

Figure 3.2 – Simulated Spring Tide (17th May) Dye Release.

4. MODEL RESULTS

The 2-D dispersion model was used to simulate eight different cases. A continuous discharge of effluent from the outfall was simulated on both spring and neap tides for both calm and windy conditions (approx. Force 4, 6m/sec).

Wind effects were simulated by increasing the diffusion co-efficient to increase mixing. Faecal coliforms were treated as a rapidly decaying contaminant with a T_{90} of 12 hours. BOD was treated as a slowly decaying contaminant with a T_{90} of 5 days. The model runs for faecal coliforms all simulated 3no. tidal cycles of real time in order for the model to reach a steady state. The BOD model runs simulated 20no. tidal cycles (approx. 10.5 days) in order to attain steady state.

Model Run	Tide	Wind	Decay Time (T_{90})	Release Type
AN01	Neap	Calm	12hrs (for fc)	Continuous discharge
AS02	Spring	Calm	12hrs (for fc)	Continuous discharge
AN02	Neap	Wind	12hrs (for fc)	Continuous discharge
AS03	Spring	Wind	12hrs (for fc)	Continuous discharge
AN03	Neap	Calm	5 days (for BOD)	Continuous discharge
AS04	Spring	Calm	5 days (for BOD)	Continuous discharge
AN04	Neap	Wind	5 days (for BOD)	Continuous discharge
AS05	Spring	Wind	5 days (for BOD)	Continuous discharge

Table 4.1 - Model Runs

The model results are presented in two formats:

1) as contour plots of contaminant concentration. These plots show the spatial variation of the effluent plume within the bay at low tide;

2) as timeseries of concentration at selected locations.

The timeseries output was devised to facilitate comparison of the time-varying effects of the effluent plumes for the different tide and wind combinations (neap+calm, neap+wind, spring+calm, spring+wind). A methodology was prepared whereby a number of inspection strips were chosen within which the timeseries of plume concentration were extracted for each hour of a tidal cycle.

The strip locations were chosen in the main to identify the plume concentrations at different locations within the bay and in particular at the licensed aquaculture area (Figure 1.2). The strip locations are shown on the plume plots (eg Figure 4.1).

The concentration in each strip is calculated as the average concentration within the volume of the plume footprint rather than the volume of the strip itself since the plume does not necessarily fill each model cell within the strip. The maximum concentration within any single model cell in the strip is also extracted.

Results - Faecal Coliforms

Model Case: Neap Tide, Calm

A plot of the faecal coliform distribution (fc/100ml) along Ballydehob Bay at LW is presented in Figure 4.1a. The 5 fc/100ml contour was chosen arbitrarily as the minimum value. The time-series of concentration of faecal coliforms for neap tide and calm wind conditions is presented in Figure 4.1b.

Model Case: Spring Tide, Calm

A plot of the faecal coliform distribution (fc/100ml) along Ballydehob Bay at LW is presented in Figure 4.2a. The time-series of concentration of faecal coliforms for spring tide and calm wind conditions is presented in Figure 4.2b.

Model Case: Neap Tide with Wind

A plot of the faecal coliform distribution (fc/100ml) at LW is presented in Figure 4.3a. The time-series of concentration of faecal coliforms for neap tide and windy conditions is presented in Figure 4.3b.

Model Case: Spring Tide with Wind

A plot of faecal coliform distribution (fc/100ml) at LW is presented in Figure 4.4a. The timeseries of concentration of faecal coliforms for neap tide and calm wind conditions is presented in Figure 4.4b.

The results for faecal coliforms (fc/100ml) for each simulated case are summarised in Table 4.2 which presents the maximum value encountered in each model inspection strip (I.S.).

Model Case	I.S. 1	I.S. 2	I.S. 3	I.S. 4
Neap + calm	220	10	-	-
Spring + calm	350	220	30	<5
Neap + Wind	230	75	10	5
Spring + Wind	250	125	30	20

Table 4.2 - Maximum Concentrations of Faecal Coliform (fc/100ml)

Results - Biochemical Oxygen Demand (BOD)

Model Case: Neap Tide, Calm

A plot of the BOD distribution (mg/l) along Ballydehob Bay at LW is presented in Figure 4.5a. The time-series of concentration of BOD for neap tide and calm wind conditions is presented in Figure 4.5b.

Model Case: Spring Tide,Calm

A plot of the BOD distribution (mg/l) at LW is presented in Figure 4.6a. The time-series of concentration of BOD for neap tide and calm wind conditions is presented in Figure 4.6b.

Model Case: Neap Tide with Wind

A plot of the BOD distribution (mg/l) at LW is presented in Figure 4.7a. The time-series of concentration of BOD for neap tide and calm wind conditions is presented in Figure 4.7b.

Model Case: Spring Tide with Wind

A plot of the BOD distribution (mg/l) at LW is presented in Figure 4.8a. The time-series of concentration of BOD for neap tide and calm wind conditions is presented in Figure 4.8b.

The results for simulations of BOD (mg/l) are summarised in Table 4.3 which presents the maximum value encountered in each model inspection strip.

Model Case	I.S. 1	I.S. 2	I.S. 3	I.S. 4
Neap + calm	0.13	0.02	<0.01	<0.01
Spring + calm	0.08	0.06	0.02	<0.01
Neap + Wind	0.04	0.02	<0.01	<0.01
Spring + Wind	0.03	0.02	<0.01	<0.01

Table 4.3 - Maximum Concentrations of BOD (mg/litre)

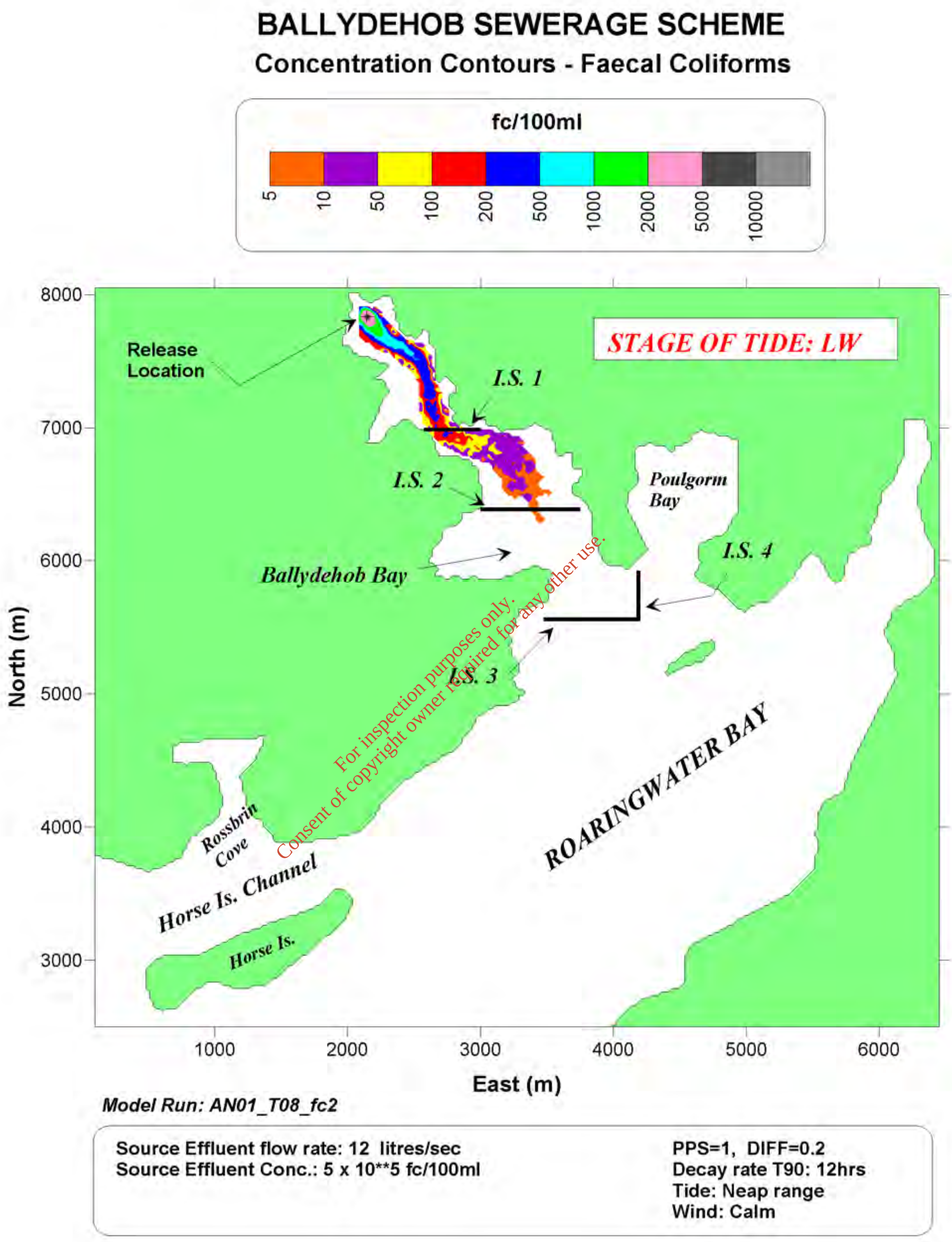

Figure 4.1a – Predicted Plume at Low Water on a Neap Tide with Calm Conditions.

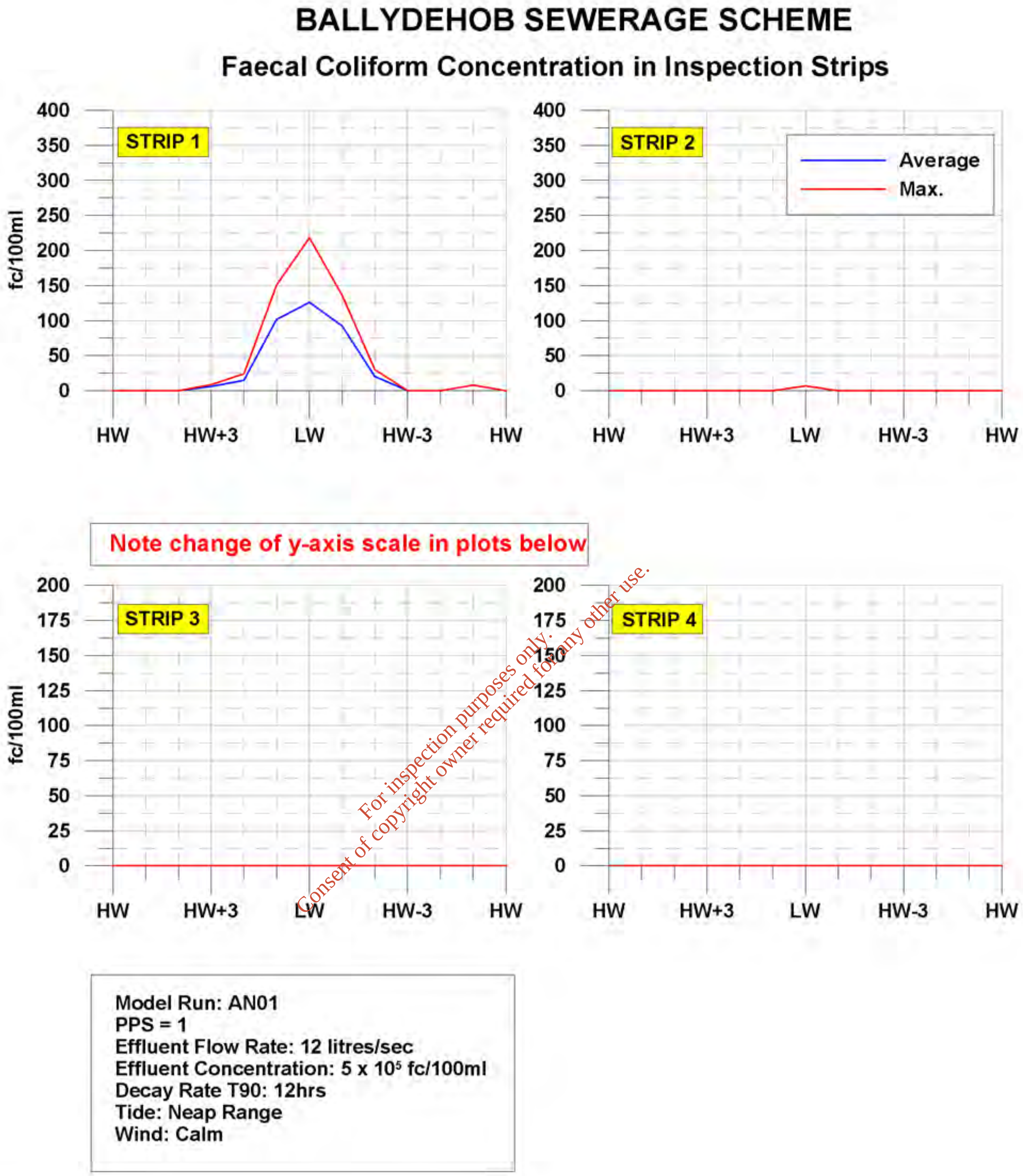

Figure 4.1b – Time series of concentration of faecal coliforms in model strips on a Neap Tide with Calm Conditions.

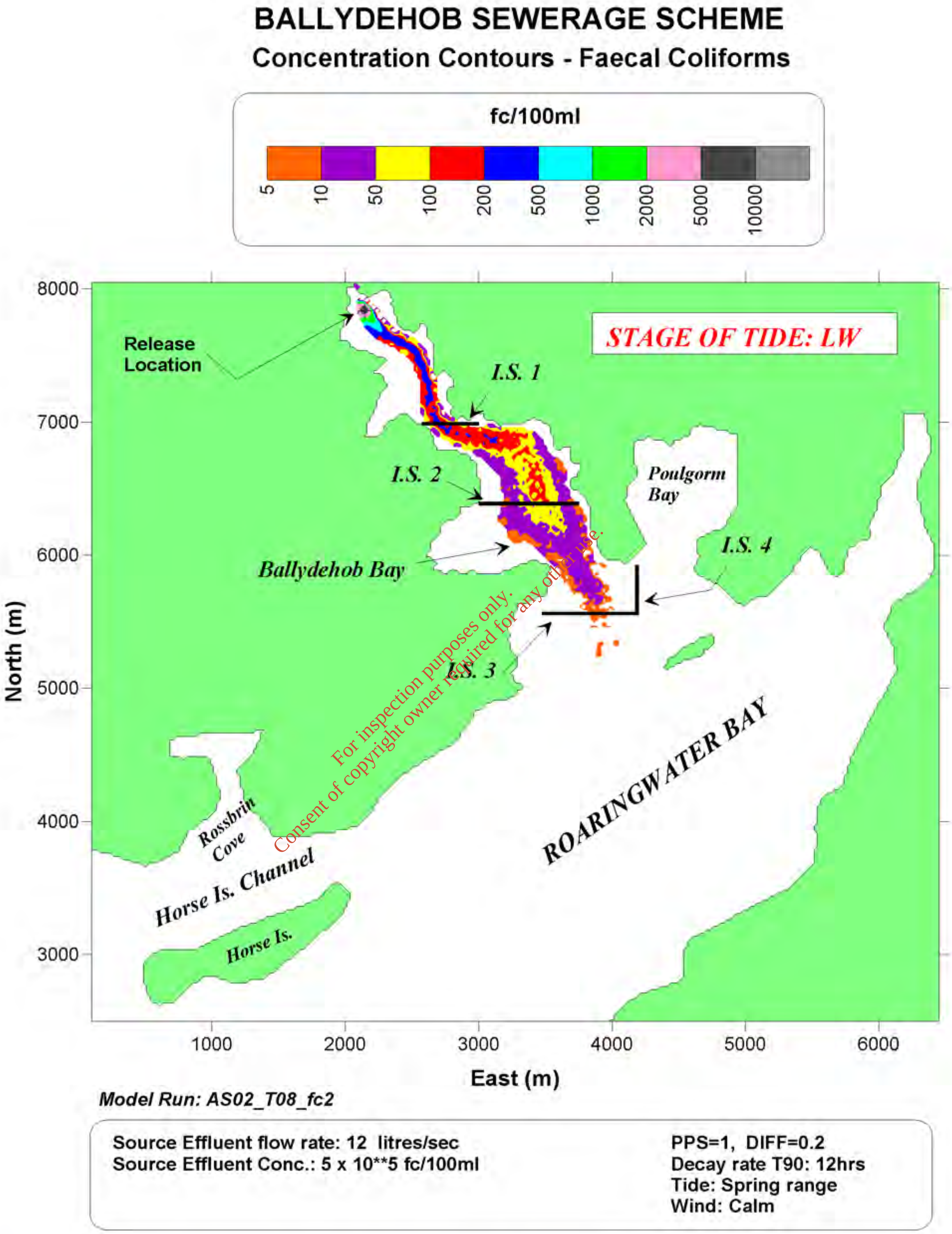

Figure 4.2a – Predicted Plume at Low Water on a Spring Tide with Calm Conditions.

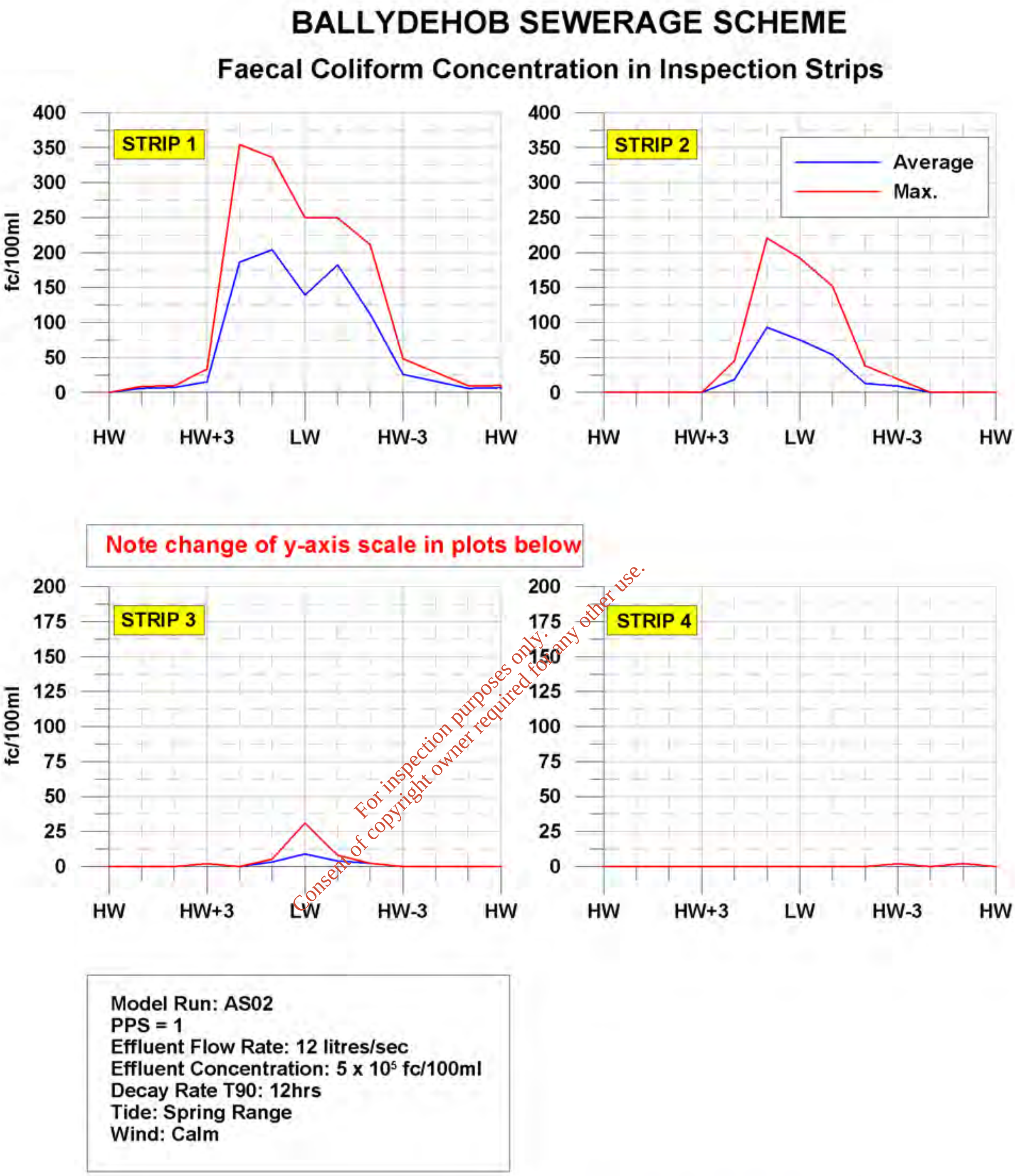

Figure 4.2b – Time series of concentration of faecal coliforms in model strips on a Spring Tide with Calm Conditions.

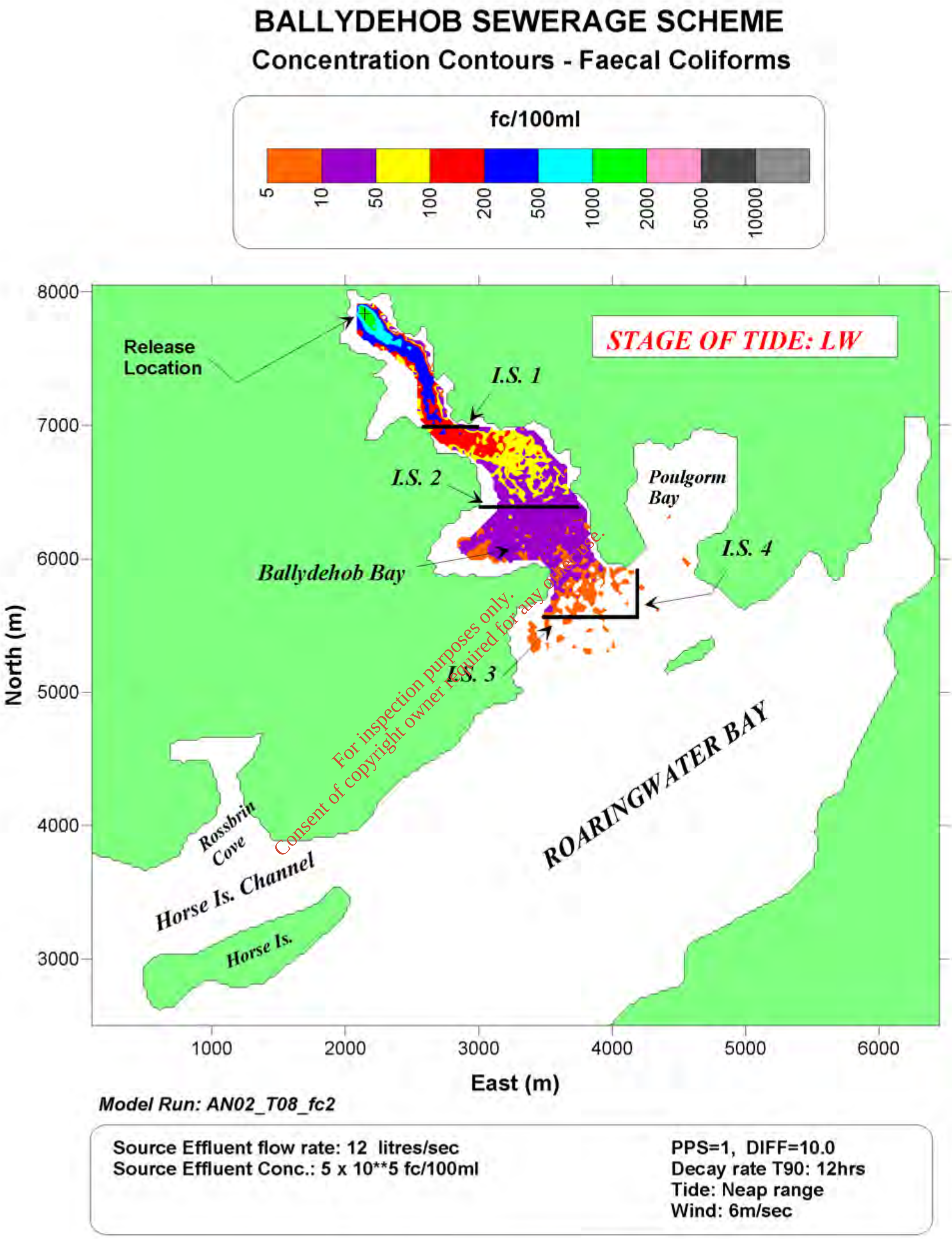

Figure 4.3a – Predicted Plume at Low Water on a Neap Tide with Windy Conditions.

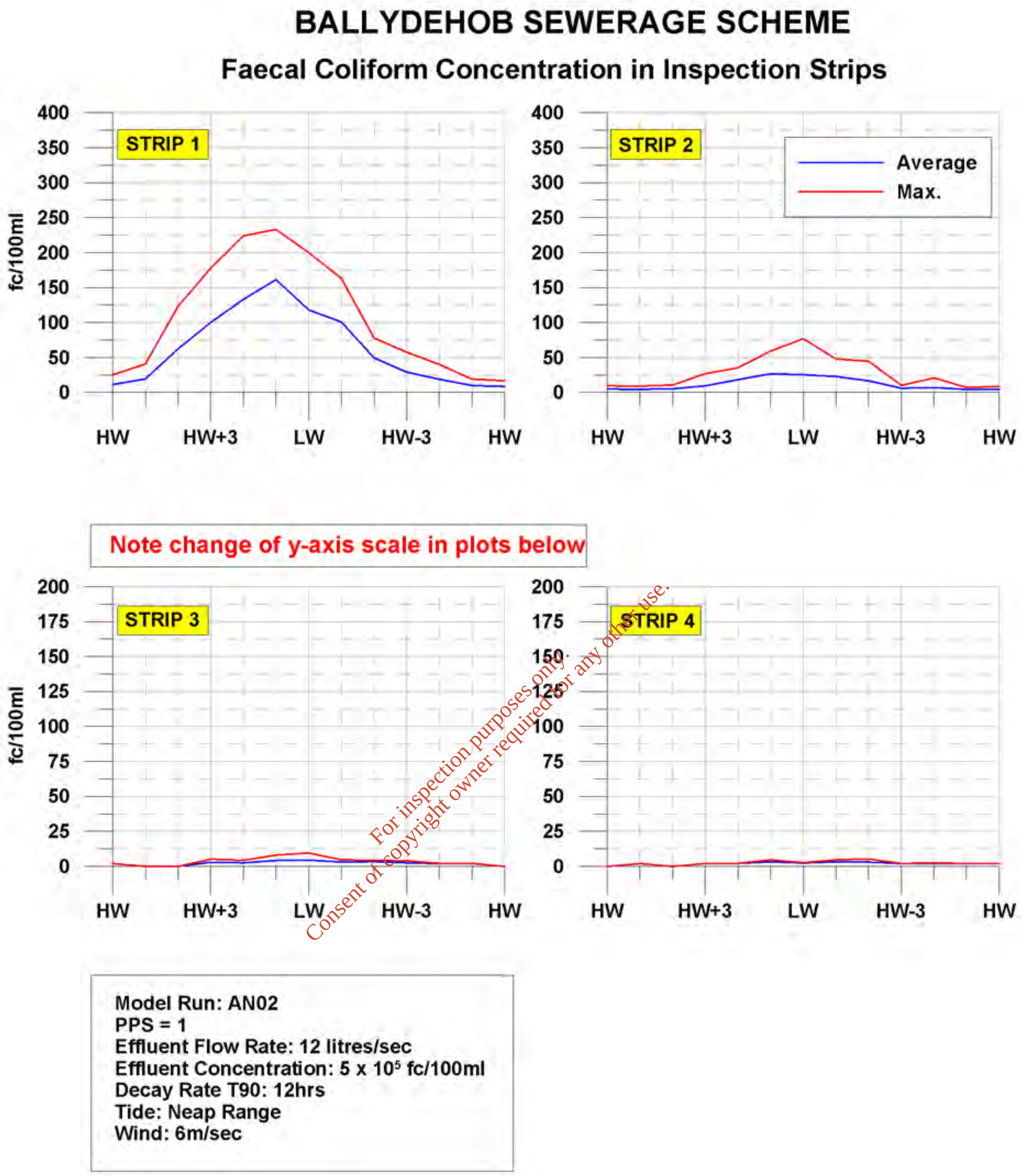

Figure 4.3b – Time series of concentration of faecal coliforms in model strips on a Neap Tide with Windy Conditions.

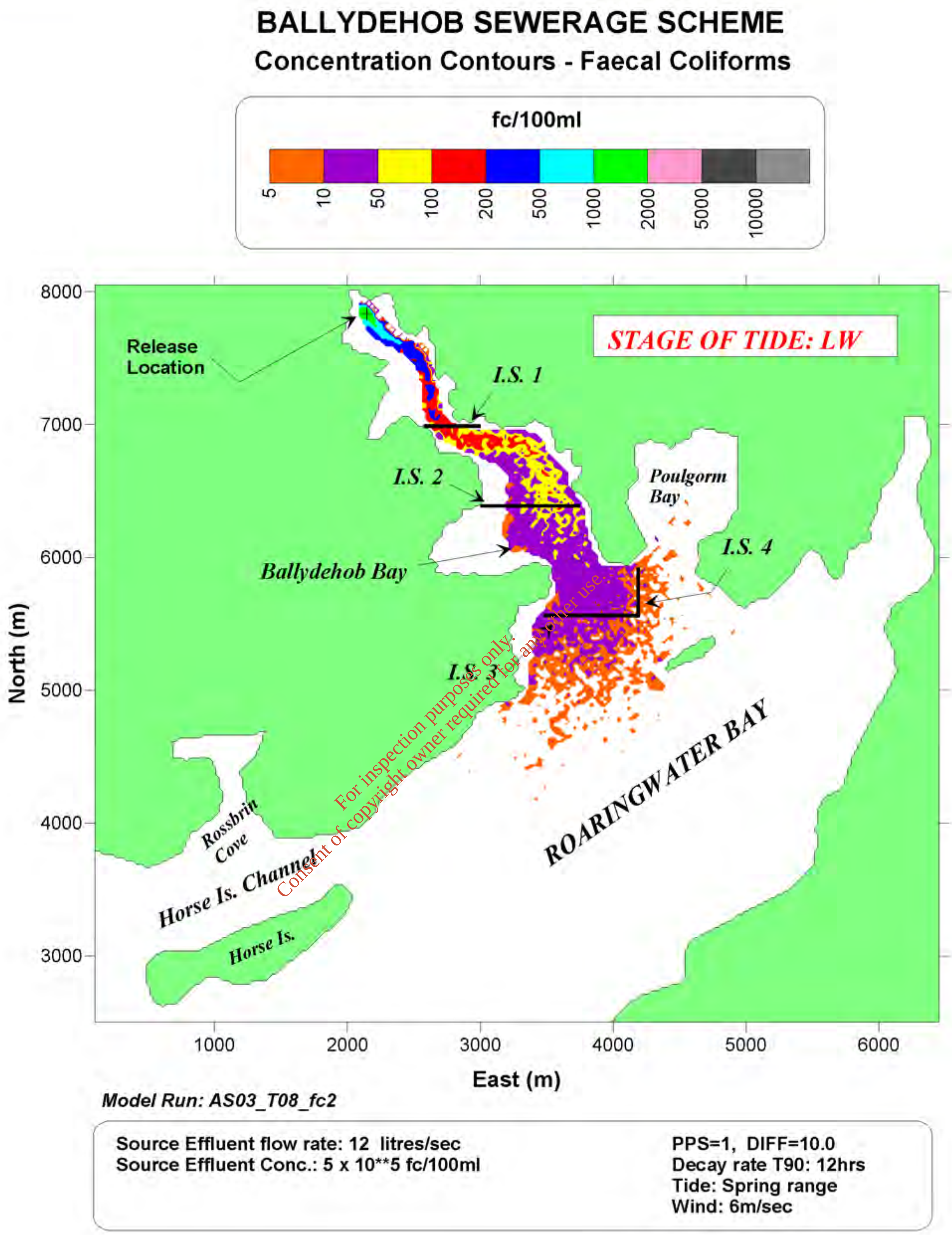

Figure 4.4a – Predicted Plume at Low Water on a Spring Tide with Windy Conditions.

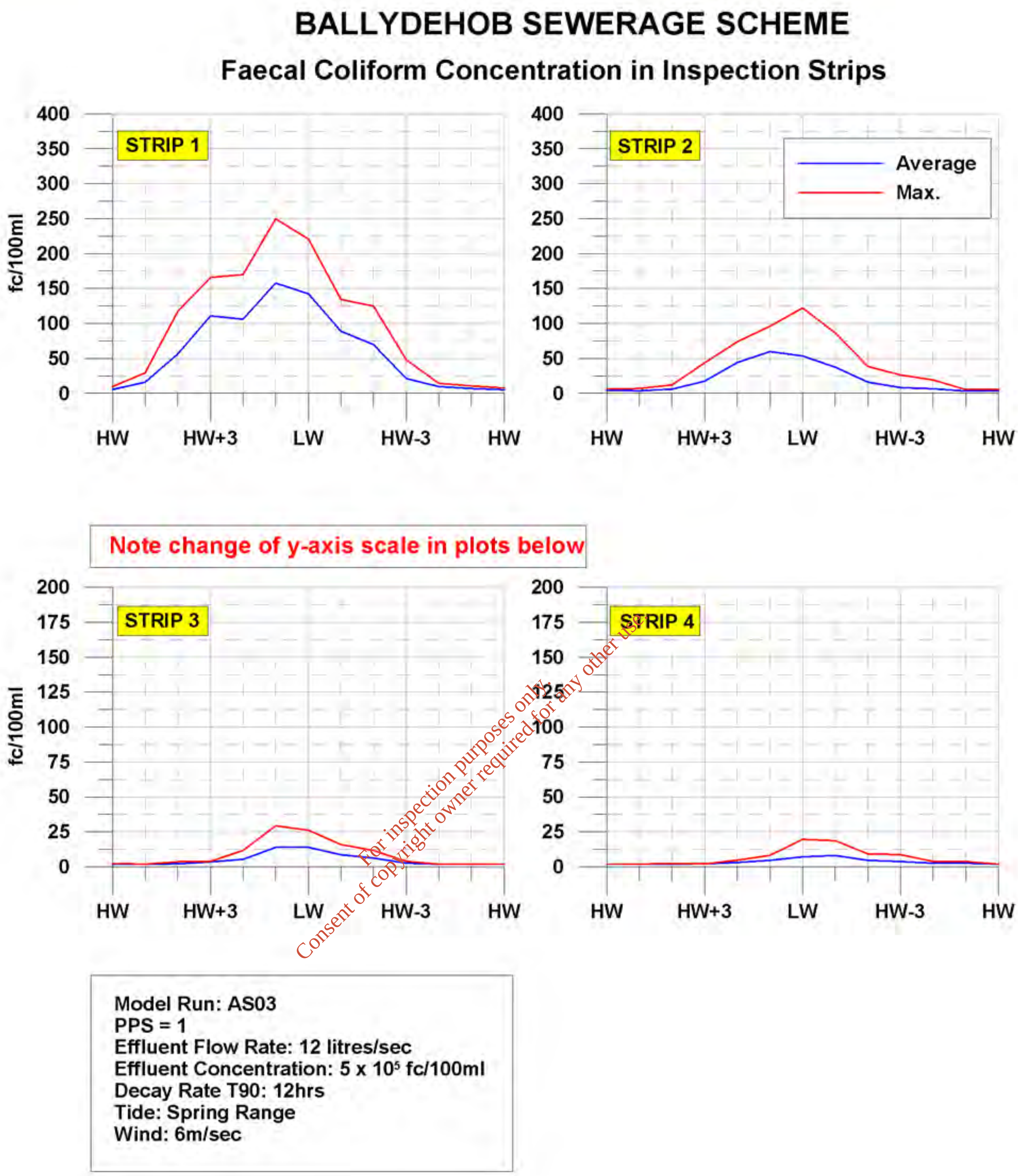

Figure 4.4b – Time series of concentration of faecal coliforms in model strips on a Spring Tide with Windy Conditions.

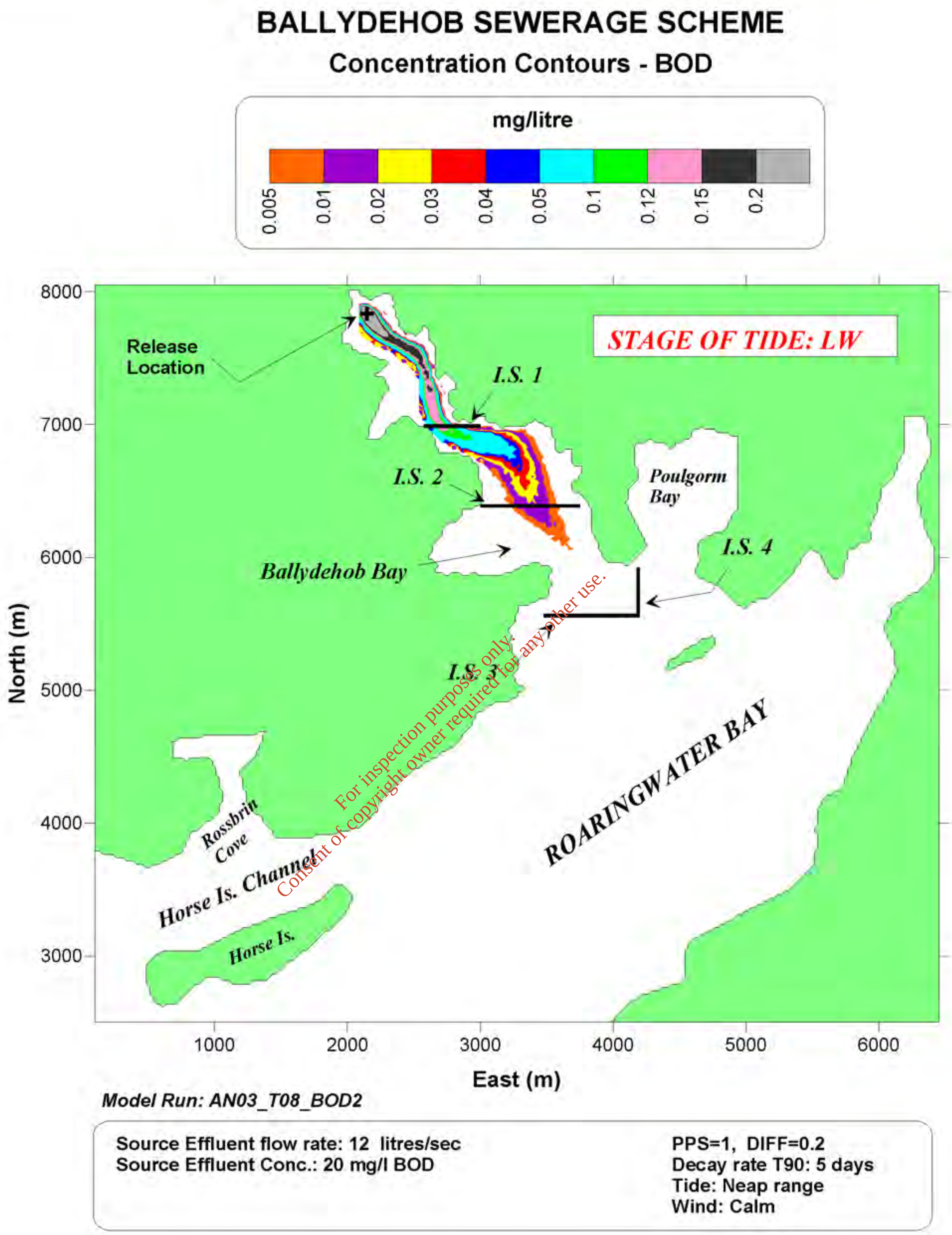

Figure 4.5a – Predicted Plume at Low Water on a Neap Tide with Calm Conditions.

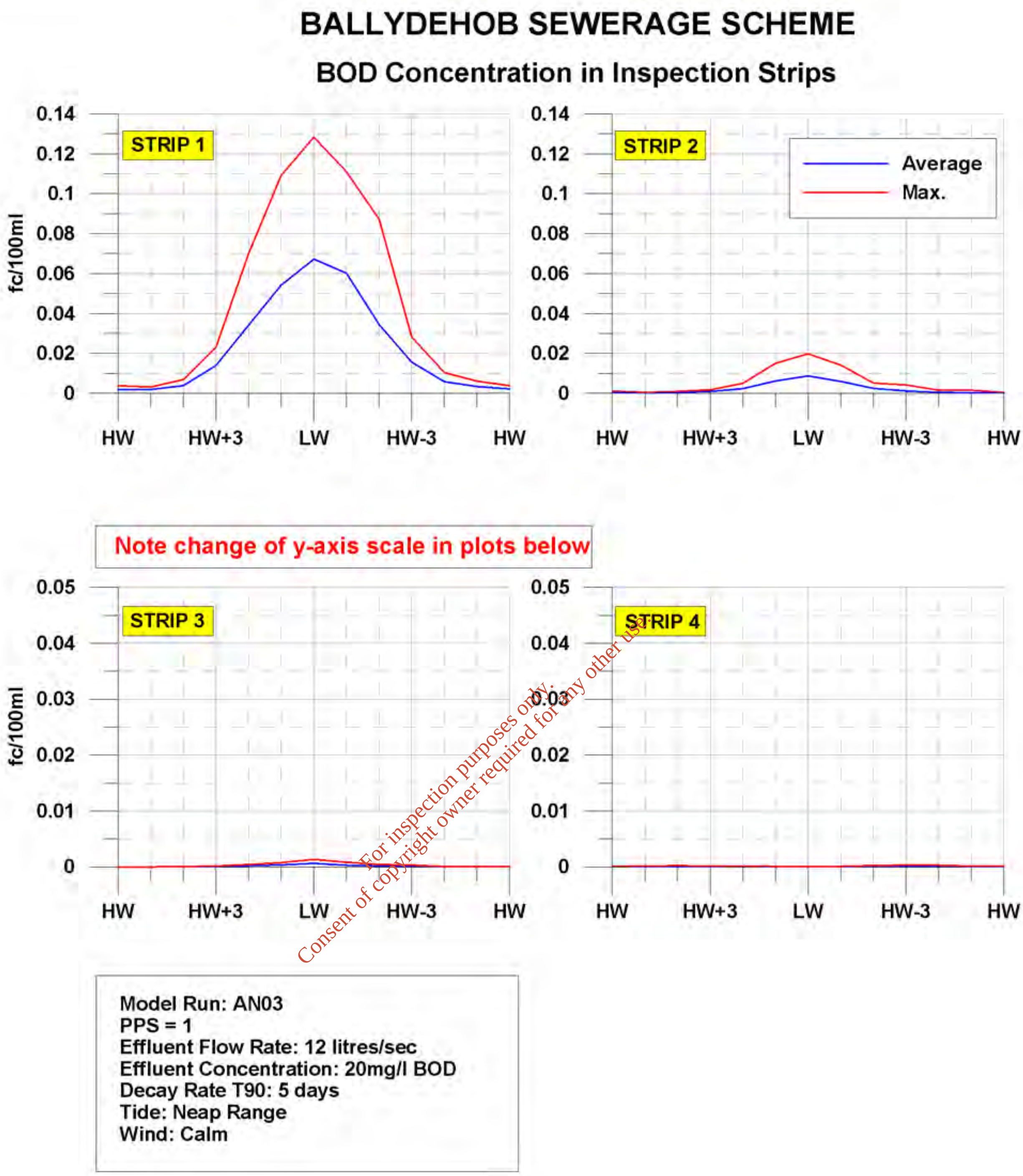

Figure 4.5b – Time series of concentration of BOD in model strips on a Neap Tide with Calm Conditions.

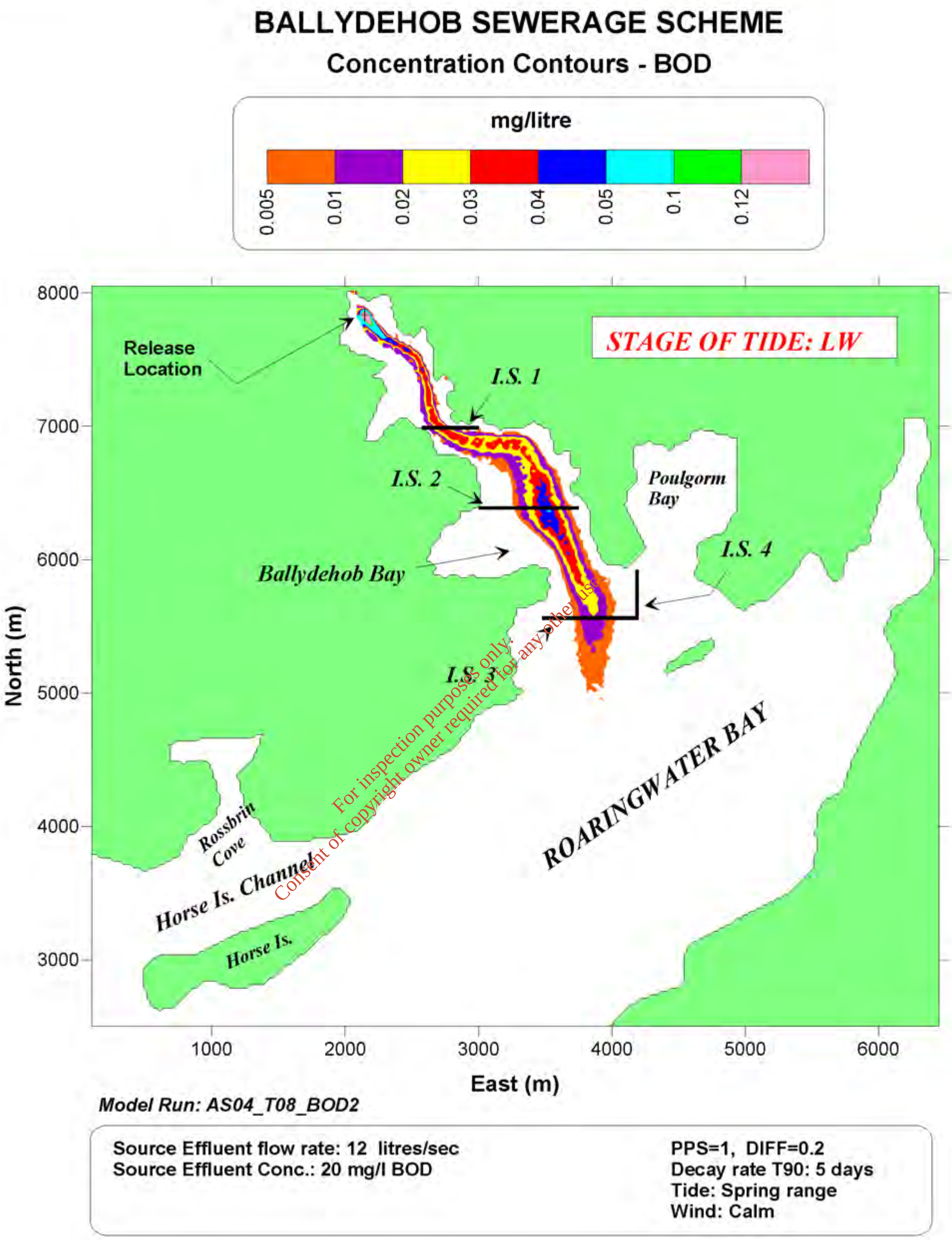

Figure 4.6a – Predicted Plume at Low Water on a Spring Tide with Calm Conditions.

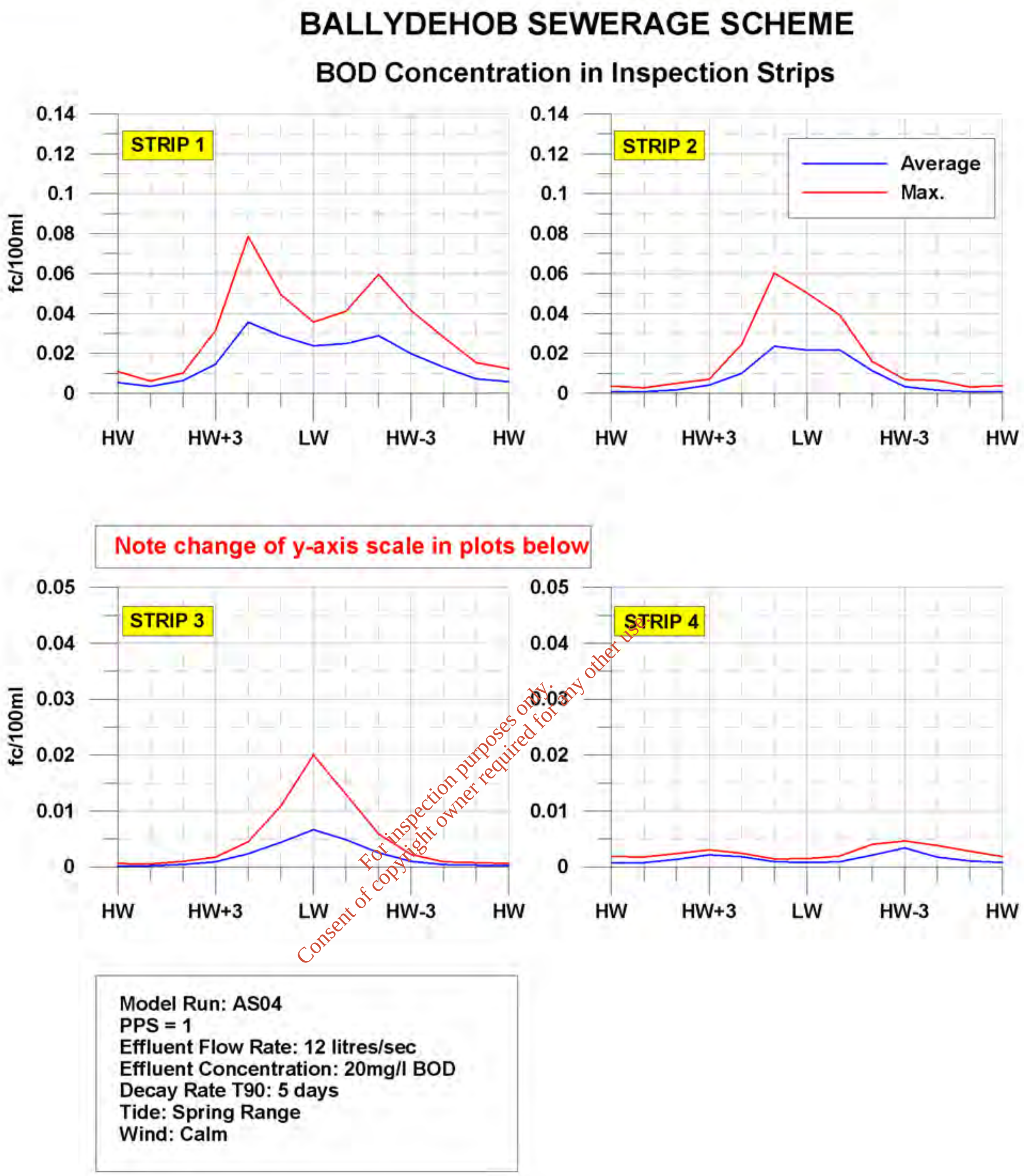

Figure 4.6b – Time series of concentration of BOD in model strips on a Spring Tide with Calm Conditions.

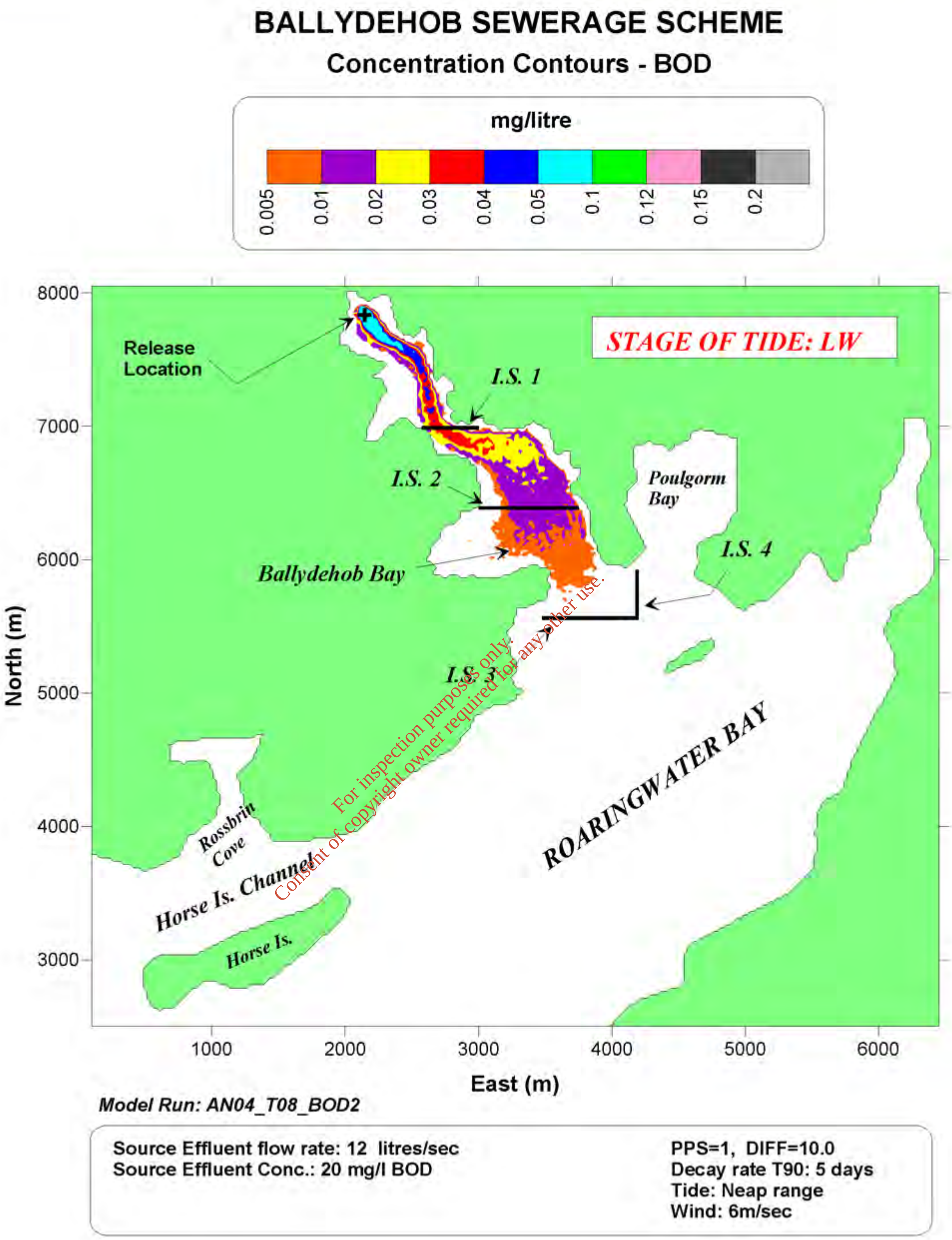

Figure 4.7a – Predicted Plume at Low Water on a Neap Tide with Windy Conditions.

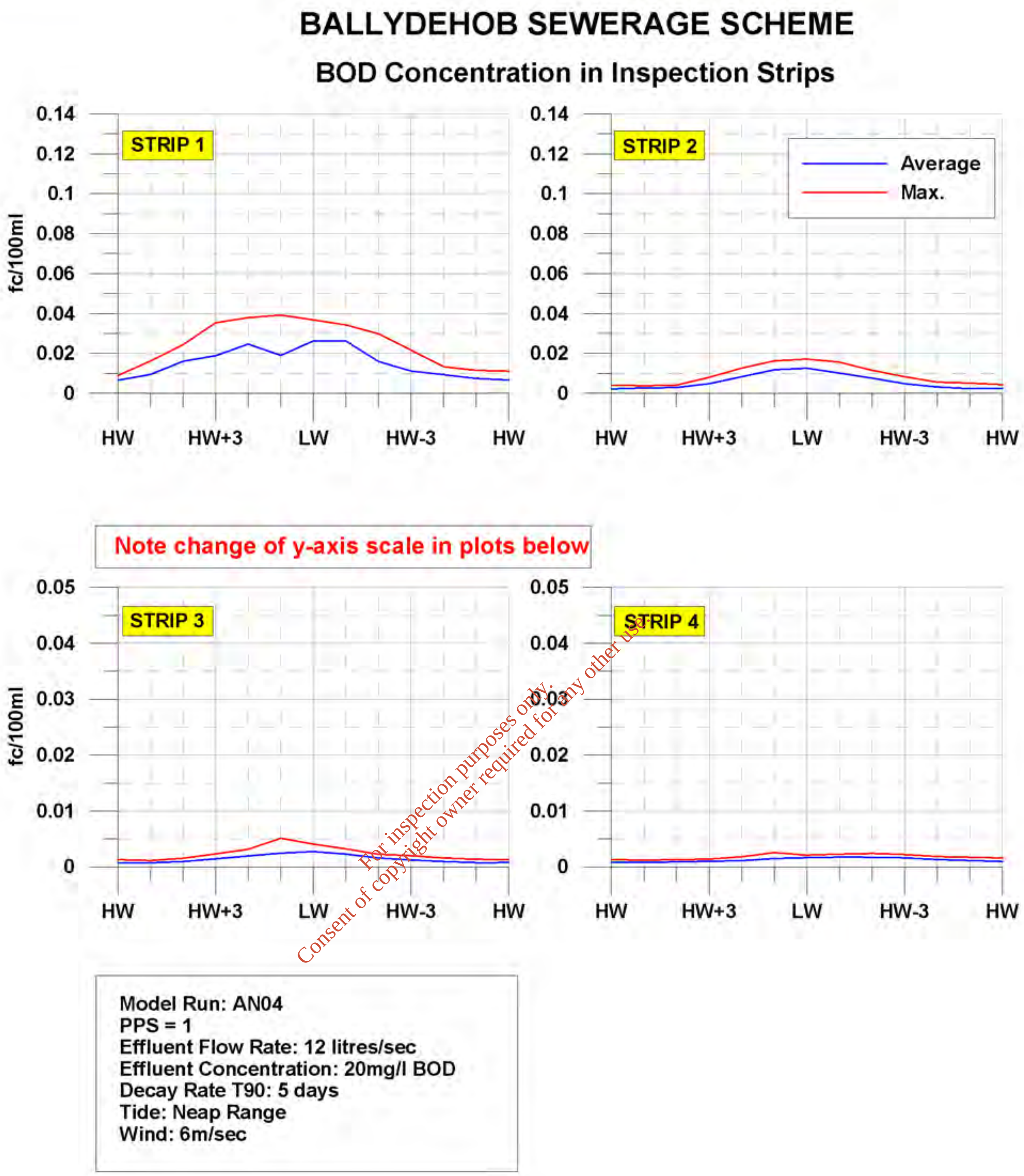

Figure 4.7b – Time series of concentration of BOD in model strips on a Neap Tide with Windy Conditions.

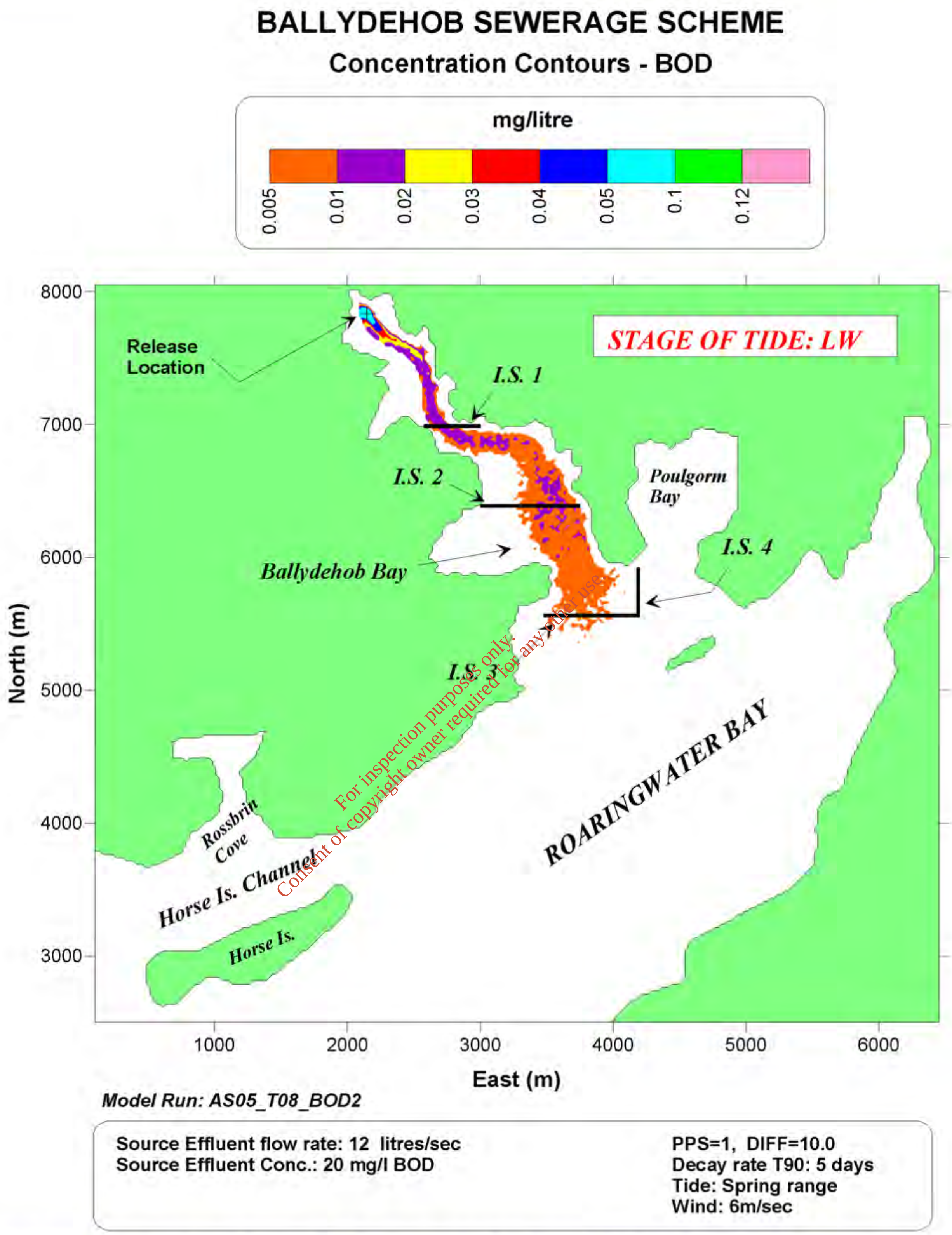

Figure 4.8a – Predicted Plume at Low Water on a Spring Tide with Windy Conditions.

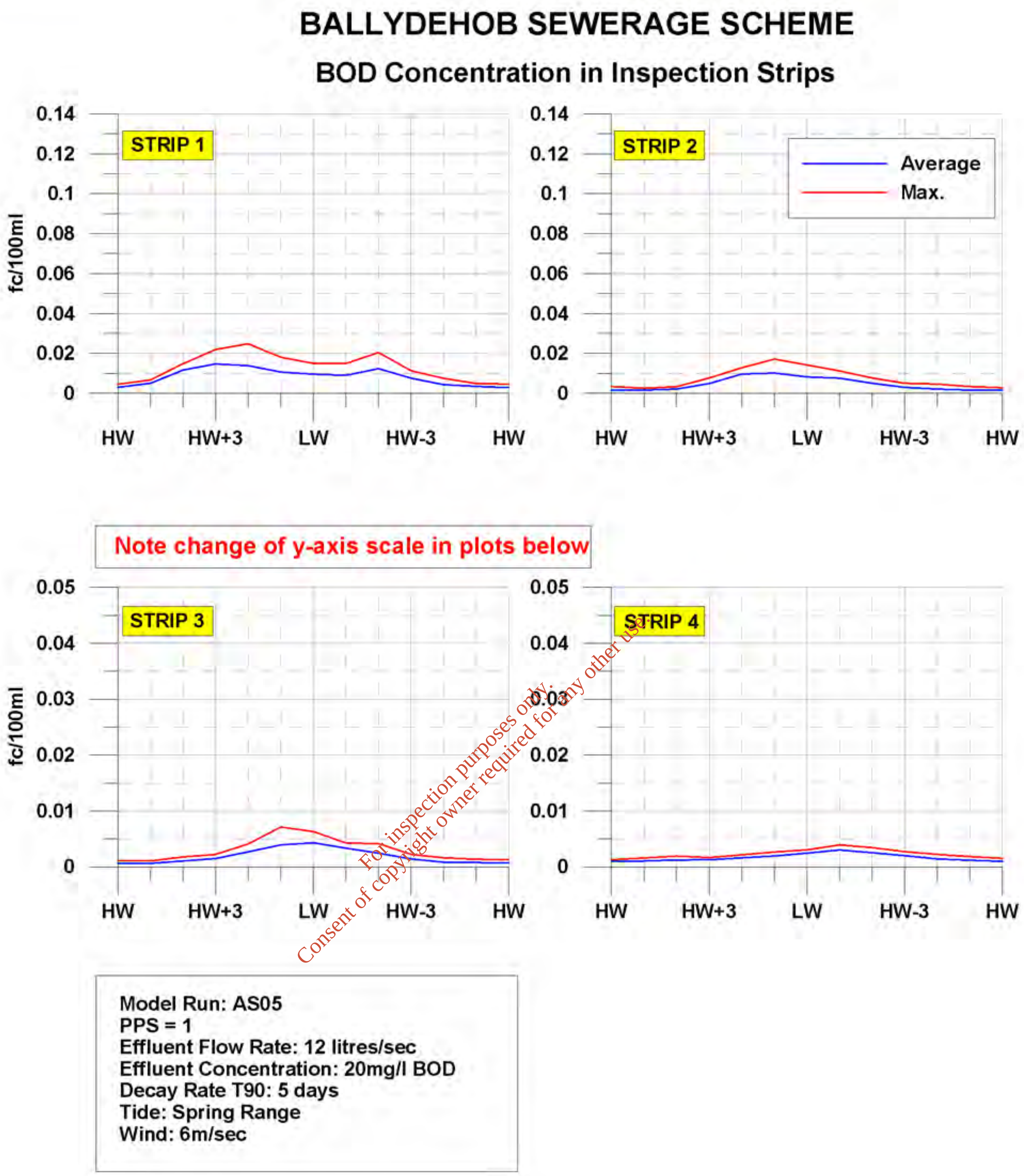

Figure 4.8b – Time series of concentration of BOD in model strips on a Spring Tide with Windy Conditions.

5. CONCLUSIONS

Effluent discharged from the municipal outfall just downstream of the town will be carried seaward along Ballydehob Bay towards Roaringwater Bay. As it travels downstream the effluent will mix with the bay waters. These waters are made up of saline sea water and fresh water from the river entering at Ballydehob.

Tracer studies using Rhodamine dye have shown that effluent discharged around high water on a spring tide will just reach Reen Point and Roaringwater Bay at low tide, having travelled a distance of about 2.7km. During neap tides the observed travel distances were less.

Simulations of the discharge have been conducted with a numerical dispersion model. These have shown that the main impact of the discharge will largely be confined to Ballydehob Bay itself. During calm conditions the effluent plume remains relatively compact while during windy conditions it disperses more widey. In both instances by the time the plume reaches Reen Point its bacterial levels are substantially reduced due to a combination of decay and dispersion. BOD levels reduce rapidly with distance from the outfall and quickly fall below normal background levels (1-2mg/l).

There are no designated bathing areas in the vicinity of Ballydehob Bay. Inner Roaringwater Bay, to the south west of Reen Point, is a designated aquaculture site. The models show that elevated bacterial levels will be experienced in this area as a result of the outfall discharges during spring tides and also during windy conditions. The predicted peak bacterial levels are 30 fc/100ml.

The EU Shellfish directive provides a guideline faecal coliform limit of <300 fc/100ml for designated shellfish waters. The DCMNR SHELLSAN guidelines set limits for faecal coliform levels in shellfish tissue and while they do not specifically apply to the surrounding waters they do provide an indication of likely acceptable coliform levels. SHELLSAN categories are:

- Approved :< 14 fc/100ml,
- Conditional: 14-140 fc/100ml
- Restricted :> 140 fc/100ml

While the predicted faecal coliform levels in the aquaculture area are within EU limits the tendency in recent times has been to aim for lower limits and therefore consideration should be given to applying additional treatment to reduce the concentrations in the effluent discharge.

6. REFERENCES

[1] *Admiralty Chart No 2129*, Long Island to Castlehaven.

[2] *Irish Hydrodata Ltd, 1989*, Roaringwater Bay Circulation Study, Bord Iascaigh Mhara.

[3] *Admiralty Tide Tables Vol 1, 2007*
UK. Hydrographic Office, 2007.

[4] *User Manual for Numerical Hydrodynamic Models of Marine Systems and Associated Plotting Package.*
J.R. Hunter, 1995

[5] *User Manual for Two-Dimensional Lagrangian Particle Tracking Model.*
J.R. Hunter, 1995

APPENDIX A

MODELLING APPROACH

A two dimensional depth averaged flow model (M2D [4]) was used to simulate the tidal circulations in the study area and provide an hourly flow pattern for both the spring and neap tidal cycles.

The model used for predicting the effluent dispersion patterns (TRACK, [5]) is based on the concept of particle tracking. With this technique, a cloud of discrete particles simulates the continuum of dispersing contaminant. The model operates on the same grid as that employed in the flow model.

2D - FLOW MODEL (M2D)

Model Framework

In the 2D models the bathymetry was defined on a rectangular grid with cells of horizontal dimension 25m x 25m within the coastal area.

Current Analysis Method

The computer model (M2D) was used to determine the current flow patterns based on the bathymetric grid described above. The model is based on a finite difference solution of the equations of motion of fluid flow and incorporates non-linear effects, wind induced currents and drying bank features. The area to be modelled is divided into a large number of discrete cells which represent the shape and bathymetry of the site. Boundary conditions are then applied in the form of tidal oscillations and the equations of motion solved for each cell at successive time steps.

2 D - Flow Model Calibration

Calibration of the model is achieved by comparing predicted current speeds with field measurements and adjusting model coefficients as required. The method is robust in that once bathymetry and tidal elevations are specified to a reasonable accuracy and typical model coefficients employed, good predictions will be obtained without the need for specific adjustments.

2D - DISPERSION MODEL (TRACK)

Model Approach

Dispersion was simulated using the particle tracking model TRACK. In the model the discharge of effluent material is represented by a number of discrete particles. As the simulation progresses through time a series of particles are released at the outfall location. During each time step the particles are moved horizontally by the current flows. In addition to these advective steps, each particle is moved by random steps in order to simulate the effects of diffusion.

The particle step length which simulated diffusion in the models was selected randomly in the range +/- infinity according to an appropriate Gaussian probability density function.

Dispersion Coefficients

In shallow coastal waters, dispersion results from a combination of physical mechanisms. These principally relate to the current and the manner in which it varies both vertically and laterally. The greater the 'velocity shear' the more rapid will be the dilution of the effluent. The horizontal diffusion coefficient was determined from the effective value arising from the shear dispersion caused by the vertical profile of tidal velocity. The effect of wind is to promote more rapid mixing. This may be simulated by an increased diffusion coefficient.

Decay

The process of bacterial decay was included in the model by evaluation of the probability of decay for each particle during each time step. This was expressed as a function of T90 where T90 is the time for 90 percent decay. In the simulations produced for this study, the decay time for faecal coliforms was defined to be 12 hours and so the results achieved equilibrium within 10% after one tide and within 1% after two tides.

Model Simulations

The faecal coliform simulations made by the model were of 37.44 hours duration (three tidal cycles) using a time step of 20 seconds. At each time step, 20 particles were released giving a total of 134136 particles overall. However, due to the effects of decay (T90 = 12 hours) there were approximately 18700 particles remaining in the model at the end of each simulation.

Dispersion Model Calibration

Verification of the combined flow/particle track dispersion model was achieved by comparing simulated dye releases with field data.

Attachment G.1

Attachment G.1

- Likely Timeframe completion
- Details of approved funding.

1. Likely Timeframe for completion of Works

The likely timeframe for the carrying out of these works is as follows:

1. **Approval of Preliminary Report** by DOEHLG May 2009
2. **Contract Documents ,Preparation of Brief,design,planning** for Scheme to go forward as Design, Build,OperateScheme by **June 2011**
3. **Tender Process December 2011**
5. **Start construction** - **Jan 2012**
6. **Completion of Works** - **Oct 2012**

2.0 Details of Funding

The WSIP approved funding was €683,000. Please see WSIP approved funding overleaf.

Cork County

Water Services Investment Programme 2007 - 2009

Schemes at Construction

Schemes at Construction	W/S	Est. Cost
Cork North		
Mitchelstown Sewerage Scheme (Nutrient Removal)	S	221,000
Cork South		
Ballyvourney/ Ballymakeery Sewerage Scheme	S	3,049,000
Cobh/ Midleton/ Carrigtwohill Water Supply Scheme	W	10,135,000
Cork Lower Harbour Sewerage Scheme (Crosshaven SS) (G)	S	4,850,000
Cork Water Strategy Study (G)	W	941,000
Kinsale Sewerage Scheme	S	20,000,000
Midleton Sewerage Scheme (Infiltration Reduction) (G)	S	2,078,000
		41,274,000

Schemes to start 2007

Cork North		
North Cork Grouped DBO Wastewater Treatment Plant (Buttevant, Doneraile & Kilbrin)	S	5,150,000
Cork West		
Skibbereen Sewerage Scheme	S	20,000,000
		25,150,000

Schemes to start 2008

Cork North		
Mallow/ Ballyviniter Regional Water Supply Scheme (H)	W	8,652,000
Mallow Sewerage Scheme (H)	S	5,408,000
Cork South		
Ballincollig Sewerage Scheme (Nutrient Removal) (G)	S	948,000
Ballingeary Sewerage Scheme	S	1,296,000
Bandon Sewerage Scheme Stage 2	S	14,729,000
City Environs (CASP) Strategic Study (G)	S	153,000
Cloghroe Sewerage Scheme (Upgrade)	S	683,000
Coachford Water Supply Scheme	W	1,318,000
Garrettstown Sewerage Scheme	S	2,153,000
Inniscarra Water Treatment Plant Extension Phase 1	W	2,678,000
Little Island Sewerage Scheme (G)	S	2,200,000
Cork West		
Bantry Sewerage Scheme	S	7,148,000
Dunmanway Sewerage Scheme	S	2,153,000
Leap/ Baltimore Water Supply Scheme	W	6,365,000
Schull Water Supply Scheme	W	5,253,000
		61,137,000

Schemes to start 2009

	W/S	Est. Cost
Cork North		
Banteer/Dromahane Regional Water Supply Scheme	W	1,576,000
Conna Regional Water Supply Scheme Extension	W	2,627,000
Cork NE Water Supply Scheme	W	4,326,000
Cork NW Regional Water Supply Scheme	W	6,046,000
Millstreet Wastewater Treatment Plant (Upgrade)	S	1,628,000
Cork South		
Ballincollig Sewerage Scheme (Upgrade) (G)	S	22,248,000
Cork Lower Harbour Sewerage Scheme (excl. Crosshaven SS)	S	73,542,000
Shannagarry/ Garryvoe/ Ballycotton Sewerage Scheme	S	3,780,000
Youghal Sewerage Scheme	S	14,420,000
Cork West		
Ballydehob Sewerage Scheme	S	683,000
Bantry Water Supply Scheme	W	14,935,000
Clonakilty Sewerage Scheme (Plant Capacity Increase)	S	3,677,000
Courtmacsherry/ Timoleague Sewerage Scheme	S	2,472,000
Dunmanway Regional Water Supply Scheme Stage 1	W	12,669,000
		164,629,000

Serviced Land Initiative

Cork North		
Ballyclough Water Supply Scheme	W	139,000
Ballyhooley Improvement Scheme	W/S	139,000
Broghill-Rathgoggin Sewerage Scheme	S	406,000
Bweeng Water Supply Scheme	W	115,000
Churchtown Sewerage Scheme (incl. Water)	W/S	543,000
Clondulane Sewage Treatment Plant	S	417,000
Freemount Sewerage Scheme	S	150,000
Pike Road Sewerage Scheme (incl. Water)	W/S	2,080,000
Rathcormac Sewerage Scheme (incl. Water)	W/S	555,000
Spa Glen Sewerage Scheme	S	736,000
Uplands Fermoy Sewerage Scheme (incl. Water)	W/S	1,174,000
Watergrasshill Water Supply Scheme (incl. Sewerage) (G)	W/S	4,151,000
Cork South		
Ballincollig Sewerage Scheme (Barry's Rd Foul and Storm Drainage) (G)	S	1,164,000
Belgooley, Water Supply Scheme (incl. Sewerage)	W/S	2,913,000
Blarney Water Supply Scheme (Ext. to Station Rd) (G)	W	416,000
Carrigtwohill Sewerage Scheme (Treatment and Storm Drain) (G)	S	7,632,000
Castlemartyr Wastewater Treatment Plant Extension	S	1,200,000
Crookstown Sewerage Scheme (incl. Water)	W/S	1,200,000
Dripsey Water Supply Scheme (incl. Sewerage)	W/S	1,112,000
Glounthane Sewerage Scheme (G)	S	1,576,000
Innishannon Sewerage Scheme	S	277,000
Innishannon Wastewater Treatment Plant	S	694,000
Kerrypike Sewerage Scheme	S	832,000
Kerrypike Water Supply Scheme	W	416,000
Killeagh Wastewater Treatment Plant Extension	S	1,200,000
Killeagh Water Supply Scheme (includes Sewerage)	W/S	485,000
Killeens Sewerage Scheme	S	420,000
Kilnagleary Sewerage Scheme	S	694,000
Midleton Wastewater Treatment Plant Extension	S	4,050,000

Cork County contd.

Water Services Investment Programme 2007 - 2009

	W/S	Est. Cost
Mogeely, Castlemartyr & Ladysbridge Water Supply Scheme	W	2,566,000
North Cobh Sewerage Scheme (G)	S	3,193,000
Riverstick Water Supply Scheme (incl. Sewerage)	W/S	525,000
Rochestown Water Supply Scheme	W	2,700,000
Saleen Sewerage Scheme	S	1,051,000
Youghal Water Supply Scheme	W	2,300,000
Cork West		
Castletownshend Sewerage Scheme	S	1,576,000
		50,797,000
Rural Towns & Villages Initiative		
Cork North		
Buttevant Sewerage Scheme (Collection System)	S	2,446,000
Doneraile Sewerage Scheme (Collection System)	S	1,738,000
Cork South		
Innishannon (Ballinadee/ Ballinspittle/ Garrettstown) Water Supply Scheme	W	6,726,000
Cork West		
Ballylicky Sewerage Scheme	S	2,153,000
Baltimore Sewerage Scheme	S	3,162,000
Castletownbere Sewerage Scheme	S	5,202,000
Schull Sewerage Scheme	S	3,523,000
		24,950,000
Schemes to Advance through Planning		
Cork North		
Mitchelstown North Galtees Water Supply Scheme	W	3,152,000
Mitchelstown Sewerage Scheme	S	3,000,000
Newmarket Sewerage Scheme	S	3,152,000

	W/S	Est. Cost
Cork South		
Carrigtwohill Sewerage Scheme (G)	S	20,000,000
Cork Sludge Management (G)	S	14,420,000
Cork Water Supply Scheme (Storage - Mount Emla, Ballincollig & Chetwind) (G)	W	8,500,000
Inniscarra Water Treatment Plant (Sludge Treatment)(G)	W	5,356,000
Macroom Sewerage Scheme	S	5,150,000
Minane Bridge Water Supply Scheme	W	1,421,000
Cork West		
Bantry Regional Water Supply Scheme (Distribution)	W	9,455,000
Cape Clear Water Supply Scheme	W	1,679,000
Castletownbere Regional Water Supply Scheme	W	8,405,000
Glengarriff Sewerage Scheme	S	2,500,000
Roscarberry/Owenahincha Sewerage Scheme	S	1,576,000
Skibbereen Regional Water Supply Scheme Stage 4	W	7,880,000
		95,646,000
Water Conservation Allocation		**12,206,000**
Asset Management Study		**300,000**
South Western River Basin District (WFD) Project[1]		**9,400,000**
Programme Total		**485,489,000**

[1] This project is being led by Cork County Council on behalf of other authorities in the River Basin District

(H) Refers to a Hub as designated in the National Spatial Strategy

(G) Refers to a Gateway as designated in the National Spatial Strategy

Agglomeration details

Leading Local Authority	Cork County Council
Co-Applicants	
Agglomeration	Ballydehob
Population Equivalent	805
Level of Treatment	Primary
Treatment plant address	Cork County Council, Store Road, Ballydehob, Co. Cork.
Grid Ref (12 digits, 6E, 6N)	098960 / 035286 (Verifed using GPS)
EPA Reference No:	

Contact details

Contact Name:	Declan Groarke
Contact Address:	Water Services Section Cork County Council Western Division The Courthouse Skibbereen Co Cork
Contact Number:	028-21299
Contact Fax:	028-21295
Contact Email:	declan.groarke@corkcoco.ie

Table D.1(i)(a): EMISSIONS TO SURFACE/GROUND WATERS (Primary Discharge Point)

Discharge Point Code: SW-1

Local Authority Ref No:	SW01 BALL	
Source of Emission:	Open Pipe	
Location:	Ballydehob	
Grid Ref (12 digits, 6E, 6N)	099090 / 035099 (Verifed using GPS)	
Name of Receiving waters:	Ballydehob Bay	
Water Body:	River Water Body	
River Basin District	South Western RBD	
Designation of Receiving Waters:	SAC, pNHA	
Flow Rate in Receiving Waters:	0	$m^3.sec^{-1}$ Dry Weather Flow
	0	$m^3.sec^{-1}$ 95% Weather Flow
Additional Comments (e.g. commentary on zero flow or other information deemed of value)	Where zero flow indicated, flow rate not applicable as receiving waters tidal. Otherwise, where zero indicated information not available.	

Emission Details:

(i) Volume emitted			
Normal/day	201.3 m^3	Maximum/day	603.8 m^3
Maximum rate/hour	25.2 m^3	Period of emission (avg)	60 min/hr 24 hr/day 365 day/yr
Dry Weather Flow	0.006 m^3/sec		

Table D.1(i)(b): EMISSIONS TO SURFACE/GROUND WATERS - Characteristics of The Emission (Primary Discharge Point)

Discharge Point Code: SW-1

Substance	As discharged			
	Unit of Measurement	Sampling Method	Max Daily Avg.	kg/day
pH	pH	Grab	= 9	
Temperature	°C	Grab	= 25	
Electrical Conductivity (@ 25°C)	µS/cm	Grab	= 0	
Suspended Solids	mg/l	Grab	= 250	50.3
Ammonia (as N)	mg/l	Grab	= 0	0
Biochemical Oxygen Demand	mg/l	Grab	= 210	42.3
Chemical Oxygen Demand	mg/l	Grab	= 460	92.3
Total Nitrogen (as N)	mg/l	Grab	= 50	10.07
Nitrite (as N)	mg/l	Grab	= 0	0
Nitrate (as N)	mg/l	Grab	= 0	0
Total Phosphorous (as P)	mg/l	Grab	= 12	2.42
OrthoPhosphate (as P)	mg/l	Grab	= 10	2.01
Sulphate (SO_4)	mg/l	Grab	= 0	0
Phenols (Sum)	µg/l	Grab	= 0	0

For Orthophosphate: this monitoring should be undertaken on a sample filtered on 0.45µm filter paper
For Phenols: USEPA Method 604, AWWA Standard Method 6240, or equivalent.

Table D.1(i)(c): DANGEROUS SUBSTANCE EMISSIONS TO SURFACE/GROUND WATERS - Characteristics of The Emission (Primary Discharge Point)

Discharge Point Code: SW-1

Substance	As discharged			
	Unit of Measurement	Sampling Method	Max Daily Avg.	kg/day
Atrazine	µg/l	Grab	= 0	0
Dichloromethane	µg/l	Grab	= 0	0
Simazine	µg/l	Grab	= 0	0
Toluene	µg/l	Grab	= 0	0
Tributyltin	µg/l	Grab	= 0	0
Xylenes	µg/l	Grab	= 0	0
Arsenic	µg/l	Grab	= 0	0
Chromium	µg/l	Grab	= 0	0
Copper	µg/l	Grab	= 0	0
Cyanide	µg/l	Grab	= 0	0
Flouride	µg/l	Grab	= 0	0
Lead	µg/l	Grab	= 0	0
Nickel	µg/l	Grab	= 0	0
Zinc	µg/l	Grab	= 0	0
Boron	µg/l	Grab	= 0	0
Cadmium	µg/l	Grab	= 0	0
Mercury	µg/l	Grab	= 0	0
Selenium	µg/l	Grab	= 0	0
Barium	µg/l	Grab	= 0	0

For Orthophosphate: this monitoring should be undertaken on a sample filtered on 0.45µm filter paper
For Phenols: USEPA Method 604, AWWA Standard Method 6240, or equivalent.

Table D.1(iii)(a): EMISSIONS TO SURFACE/GROUND WATERS (Storm Overflow)

Discharge Point Code: SW-2

Local Authority Ref No:	SW02 BALL	
Source of Emission:	450mm Pipe with non-return flap	
Location:	Ballydehob	
Grid Ref (12 digits, 6E, 6N)	098964 / 035318 (Verifed using GPS)	
Name of Receiving waters:	Ballydehob Bay	
Water Body:	Transitional Body	
River Basin District	South Western RBD	
Designation of Receiving Waters:	SAC, pNHA	
Flow Rate in Receiving Waters:	0	$m^3.sec^{-1}$ Dry Weather Flow
	0	$m^3.sec^{-1}$ 95% Weather Flow
Additional Comments (e.g. commentary on zero flow or other information deemed of value)	Do not have any information on stormwater overflows. Where zero flow is indicated for receiving waters, flow rate not applicable as receiving waters tidal.	

Emission Details:

(i) Volume emitted			
Normal/day	0 m^3	Maximum/day	0 m^3
Maximum rate/hour	0 m^3	Period of emission (avg)	0 min/hr 0 hr/day 0 day/yr
Dry Weather Flow	0 m^3/sec		

Table D.1(iii)(a): EMISSIONS TO SURFACE/GROUND WATERS (Storm Overflow)

Discharge Point Code: SW-3

Local Authority Ref No:	SW03 BALL	
Source of Emission:	225mm Open Pipe	
Location:	Ballydehob	
Grid Ref (12 digits, 6E, 6N)	098976 / 035430 (Verifed using GPS)	
Name of Receiving waters:	Ballydehob Bay	
Water Body:	Transitional Body	
River Basin District	South Western RBD	
Designation of Receiving Waters:	SAC, pNHA	
Flow Rate in Receiving Waters:	0	$m^3.sec^{-1}$ Dry Weather Flow
	0	$m^3.sec^{-1}$ 95% Weather Flow
Additional Comments (e.g. commentary on zero flow or other information deemed of value)	Do not have any information on stormwater overflows. Where zero flow is indicated for receiving waters, flow rate not applicable as receiving waters tidal.	

Emission Details:

(i) Volume emitted			
Normal/day	0 m^3	Maximum/day	0 m^3
Maximum rate/hour	0 m^3	Period of emission (avg)	0 min/hr 0 hr/day 0 day/yr
Dry Weather Flow	0 m^3/sec		

TABLE E.1(i): WASTE WATER FREQUENCY AND QUANTITY OF DISCHARGE – Primary and Secondary Discharge Points

Identification Code for Discharge point	Frequency of discharge (days/annum)	Quantity of Waste Water Discharged (m^3/annum)
SW-1	365	73474.5

TABLE E.1(ii): WASTE WATER FREQUENCY AND QUANTITY OF DISCHARGE – Storm Water Overflows

Identification Code for Discharge point	Frequency of discharge (days/annum)	Quantity of Waste Water Discharged (m³/annum)	Complies with Definition of Storm Water Overflow
SW-3	0	0	Yes
SW-2	0	0	Yes

TABLE F.1(i)(a): SURFACE/GROUND WATER MONITORING

Primary Discharge Point

Discharge Point Code:	SW-1
MONITORING POINT CODE:	aSW-1u
Grid Ref (12 digits, 6E, 6N)	099021 / 035445

Parameter	**Results (mg/l)**				**Sampling method**	**Limit of Quantitation**	**Analysis method / technique**
	01/01/09	28/01/09	12/02/09	12/03/09			
pH		= 7.1			Grab	2	Electrochemical
Temperature	= 0				Grab	0.5	Electrochemical
Electrical Conductivity (@ 25°C)		< 161			Grab	0.5	Electrochemical
Suspended Solids		< 2.5			Grab	0.5	Gravimetric
Ammonia (as N)		< 0.1			Grab	0.02	Colorimetric
Biochemical Oxygen Demand		< 1			Grab	0.06	Electrochemical
Chemical Oxygen Demand		< 21			Grab	8	Digestion & Colorimetric
Dissolved Oxygen	= 0				Grab	0	ISE
Hardness (as $CaCO_3$)	= 0				Grab	0	Titrimetric
Total Nitrogen (as N)		= 1.2			Grab	0.5	Digestion & Colorimetric
Nitrite (as N)		< 0.004			Grab	0.013	Colorimetric
Nitrate (as N)		= 1.08			Grab	0.04	Colorimetric
Total Phosphorous (as P)		< 0.2			Grab	0.2	Digestion & Colorimetric
OrthoPhosphate (as P)		< 0.05	< 0.05	< 0.05	Grab	0.02	Colorimetric
Sulphate (SO_4)		< 30			Grab	30	Turbidimetric
Phenols (Sum)		< 0.1			Grab	0.1	GC-MS2

For Orthophosphate: this monitoring should be undertaken on a sample filtered on 0.45µm filter paper
For Phenols: USEPA Method 604, AWWA Standard Method 6240, or equivalent.

Additional Comments:	Default value of 01/01/09 and 0 where results not available.

TABLE F.1(i)(b): SURFACE/GROUND WATER MONITORING (Dangerous Substances)

Primary Discharge Point

Discharge Point Code:	SW-1
MONITORING POINT CODE:	aSW-1u
Grid Ref (12 digits, 6E, 6N)	099021 / 035445

Parameter	**Results (µg/l)**				**Sampling method**	**Limit of Quantitation**	**Analysis method / technique**
	28/01/09	12/02/09	12/03/09				
Atrazine	< 0.01				Grab	0.96	HPLC
Dichloromethane	< 1				Grab	1	GC-MS1
Simazine	< 0.01				Grab	0.01	HPLC
Toluene	< 1				Grab	0.02	GC-MS1
Tributyltin	< 0.02				Grab	0.02	GC-MS1
Xylenes	< 1				Grab	1	GC-MS1
Arsenic	< 0.96				Grab	0.96	ICP-MS
Chromium	< 20	< 20	= 50.11		Grab	20	ICP-OES
Copper	< 20	< 20	< 20		Grab	20	ICP-OES
Cyanide	< 5				Grab	5	Colorimetric
Flouride	= 45				Grab	100	ISE
Lead	< 20	< 20	< 20		Grab	20	ICP-OES
Nickel	< 20	< 20	< 20		Grab	20	ICP-OES
Zinc	< 20	< 20	< 20		Grab	20	ICP-OES
Boron	< 20	= 20.8	= 583.6		Grab	20	ICP-OES
Cadmium	< 20	< 20	< 20		Grab	20	ICP-OES
Mercury	< 0.2				Grab	0.2	ICP-MS
Selenium	= 1.3				Grab	0.74	ICP-MS
Barium	= 60	< 20	< 20		Grab	20	ICP-OES

Additional Comments:	TBT value is 0.02ug/l as Sn saline interference in flouride test

Annex 2: Check List For Regulation 16 Compliance

Regulation 16 of the waste water discharge (Authorisation) Regulations 2007 (S.I. No. 684 of 2007) sets out the information which must, in all cases, accompany a discharge licence application. In order to ensure that the application fully complies with the legal requirements of regulation 16 of the 2007 Regulations, all applicants should complete the following.

In each case, refer to the attachment number(s), of your application which contains(s) the information requested in the appropiate sub-article.

Regulation 16(1) **In the case of an application for a waste water discharge licence, the application shall -**		**Attachment Number**	**Checked by Applicant**
(a)	give the name, address, telefax number (if any) and telephone number of the applicant (and, if different, of the operator of any treatment plant concerned) and the address to which correspondence relating to the application should be sent and, if the operator is a body corporate, the address of its registered office or principal office,	B.1	Yes
(b)	give the name of the water services authority in whose functional area the relevant waste water discharge takes place or is to take place, if different from that of the applicant,	Not Applicable	Yes
(c)	give the location or postal address (including where appropriate, the name of the townland or townlands) and the National Grid reference of the location of the waste water treatment plant and/or the waste water discharge point or points to which the application relates,	B.2	Yes
(d)	state the population equivalent of the agglomeration to which the application relates,	B.9(i)	Yes
(e)	specify the content and extent of the waste water discharge, the level of treatment provided, if any, and the flow and type of discharge,	C,D	Yes
(f)	give details of the receiving water body, including its protected area status, if any, and details of any sensitive areas or protected areas or both in the vicinity of the discharge point or points likely to be affected by the discharge concerned, and for discharges to ground provide details of groundwater protection schemes in place for the receiving water body and all associated hydrogeological and geological assessments related to the receiving water environment in the vicinity of the discharge.	F.1	Yes
(g)	identify monitoring and sampling points and indicate proposed arrangements for the monitoring of discharges and, if Regulation 17 does not apply, provide details of the likely environmental consequences of any such discharges,	E.3	Yes
(h)	in the case of an existing waste water treatment plant, specify the sampling data pertaining to the discharge based on the samples taken in the 12 months preceding the making of the application,	E.4	Yes
(i)	describe the existing or proposed measures, including emergency procedures, to prevent unintended waste water discharges and to minimise the impact on the environment of any such discharges,	G.3	Yes
(j)	give particulars of the nearest downstream drinking water abstraction point or points to the discharge point or points,	Not Applicable	Yes
(k)	give details, and an assessment of the effects, of any existing or proposed emissions on the environment, including any environmental medium other than those into which the emissions are, or are to be made, and of proposed measures to prevent or eliminate or, where that is not practicable, to limit any pollution caused in such discharges,	F.1	Yes
(l)	give detail of compliance with relevant monitoring requirements and treatment standards contained in any applicable Council Directives of Regulations,	E.1,E.4	Yes
(m)	give details of any work necessary to meet relevant effluent discharge standards and a timeframe and schedule for such work.	G.1	Yes
(n)	Any other information as may be stipulated by the Agency.	Not Applicable	Yes
Regulation 16(3) **Without prejudice to Regulation 16 (1) and (2), an application for a licence shall be accompanied by -**		**Attachment Number**	**Checked by Applicant**
(a)	a copy of the notice of intention to make an application given pursuant to Regulation 9,	B.8	Yes
(b)	where appropriate, a copy of the notice given to a relevant water services authority under Regulation 13,	Not Applicable	Yes
(c)	Such other particulars, drawings, maps, reports and supporting documentation as are necessary to identify and describe, as appropriate -	B	Yes
(c) (i)	the point or points, including storm water overflows, from which a discharge or discharges take place or are to take place, and	B.3, B.5	Yes
(c) (ii)	the point or points at which monitoring and sampling are undertaken or are to be undertaken,	E.3	Yes
(d)	such fee as is appropriate having regard to the provisions of Regulations 38 and 39.	B.9(iii)	Yes

Regulation 16(4) **An original application shall be accompanied by 2 copies of it and of all accompanying documents and particulars as required under Regulation 16(3) in hardcopy or in an electronic or other format as specified by the Agency.**		**Attachment Number**	**Checked by Applicant**
1	An Original Application shall be accompanied by 2 copies of it and of all accompanying documents and particulars as required under regulation 16(3) in hardcopy or in electronic or other format as specified by the agency.		Yes
Regulation 16(5) **For the purpose of paragraph (4), all or part of the 2 copies of the said application and associated documents and particulars may, with the agreement of the Agency, be submitted in an electronic or other format specified by the Agency.**		**Attachment Number**	**Checked by Applicant**
1	Signed original.		Yes
2	2 hardcopies of application provided or 2 CD versions of application (PDF files) provided.		Yes
3	1 CD of geo-referenced digital files provided.		Yes
Regulation 17 **Where a treatment plant associated with the relevant waste water works is or has been subject to the European Communities (Environmental Impact Assessment) Regulations 1989 to 2001, in addition to compliance with the requirements of Regulation 16, an application in respect of the relevant discharge shall be accompanied by a copy of an environmental impact statement and approval in accordance with the Act of 2000 in respect of the said development and may be submitted in an electronic or other format specified by the Agency**		**Attachment Number**	**Checked by Applicant**
1	EIA provided if applicable	Not Applicable	Yes
2	2 hardcopies of EIS provided if applicable.	Not Applicable	Yes
3	2 CD versions of EIS, as PDF files, provided.	Not Applicable	Yes
Regulation 24 **In the case of an application for a waste water discharge certificate of authorisation, the application shall –**		**Attachment Number**	**Checked by Applicant**
(a)	give the name, address, telefax number (if any) and telephone number of the applicant and the address to which correspondence relating to the application should be sent and, if the operator of the waste water works is a body corporate, the address of its registered office or principal office		
(b)	give the name of the water services authority in whose functional area the relevant waste water discharge takes place or is to take place, if different from that of the applicant,		
(c)	give the location or postal address (including where appropriate, the name of the townland or townlands) and the National Grid reference of the location of the discharge point or points to which the application relates,		
(d)	state the population equivalent of the agglomeration to which the application relates,		
(e)	in the case of an application for the review of a certificate, specify the reference number given to the relevant certificate in the register,		
(f)	specify the content and extent of the waste water discharge, the level of treatment provided and the flow and type of discharge,		
(g)	give details of the receiving water body, its protected area status, if any, and details of any sensitive areas or protected areas, or both, in the vicinity of the discharge point or points or likely to be affected by the discharge concerned,		
(h)	identify monitoring and sampling points and indicate proposed arrangements for the monitoring of discharges and of the likely environmental consequences of any such discharges,		
(i)	in the case of an existing discharge, specify the sampling data pertaining to the discharge based on the samples taken in the 12 months preceding the making of the application,		
(j)	describe the existing or proposed measures, including emergency procedures, to prevent unauthorised or unexpected waste water discharges and to minimise the impact on the environment of any such discharges,		
(k)	give particulars of the location of the nearest downstream drinking water abstraction point or points to the discharge point or points associated with the waste water works,		
(l)	give details of any designation under any Council Directive or Regulations that apply in relation to the receiving waters,		
(m)	give details of compliance with any applicable monitoring requirements and treatment standards,		
(n)	give details of any work necessary to meet relevant effluent discharge standards and a timeframe and schedule for such work,		
(o)	give any other information as may be stipulated by the Agency, and		
(p)	be accompanied by such fee as is appropriate having regard to the provisions of Regulations 38 and 39.		