Annual Environmental Report

2019

Dundalk

D0053-01

CONTENTS

1 EXECUTIVE SUMMARY AND INTRODUCTION TO THE 2019 AER

This Annual Environmental Report has been prepared for D0053-01, Dundalk, in Louth in accordance with the requirements of the wastewater discharge licence for the agglomeration. Specified reports where relevant are included as an appendix to the AER.

1.1 ANNUAL STATEMENT OF MEASURES

A summary of any improvements undertaken is provided where applicable.

Sole Pressure Assessment is scheduled for 2020.

1.2 TREATMENT SUMMARY

The agglomeration is served by a wastewater treatment plant(s)

- DUNDALK WWTP with a Plant Capacity PE of 120000, the treatment type is 3NP - Tertiary N&P removal

1.3 ELV OVERVIEW

The overall compliance of the final effluent with the Emission Limit Values (ELVs) is shown below. More detailed information on the below ELV's can be found in Section 2.

Discharge Point Reference	Treatment Plant	Discharge Type	Compliance Status	Parameters failing if relevant
TPEFF2100D0053SW001	DUNDALK WWTP	Treated	Non-Compliant	Total Nitrogen mg/l Total Phosphorus (as P) mg/l

1.4 LICENCE SPECIFIC REPORTING INCLUDED IN AER

Assessment / Report	Included in AER
There are no Licence Specific Reports included in the AER.	

2 TREATMENT PLANT PERFORMANCE AND IMPACT SUMMARY

2.1 DUNDALK WWTP - TREATED DISCHARGE

2.1.1 INFLUENT MONITORING SUMMARY - DUNDALK WWTP

A summary of influent monitoring for the treatment plant is presented below. This monitoring is primarily undertaken in order to determine the overall efficiency of the plant in removing pollutants from the raw wastewater.

Parameters	Number of Samples	Annual Max	Annual Mean
BOD, 5 days with Inhibition (Carbonaceous BOD) mg/l	26	570	120.28
Total Nitrogen mg/l	26	57.1	26.96
Suspended Solids mg/l	26	662	194.1
Total Phosphorus (as P) mg/l	26	9.11	4.25
COD-Cr mg/l	26	1016	371.55
Hydraulic Capacity	N/A	48218	29127

If other inputs in the form of sludge / leachate are added to the WWTP then these are included in Section 2.1.5 if applicable.

Significance of Results:

The annual mean hydraulic loading is less than the peak Treatment Plant Capacity. The annual maximum hydraulic loading is less than the peak Treatment Plant Capacity. Further details on the plant capacity and efficiency can be found under the sectional ‘Operational Performance Summary’.

2.1.2 EFFLUENT MONITORING SUMMARY - TPEFF2100D0053SW001

Parameter	WWDL ELV (Schedule A)	ELV with Condition 2 Interpretation included Note 1	Interim % reduction from influent concentration	Number of sample results	Number of exceedances	Number of with Condition 2 Interpretation included	Annual Mean	Overall Compliance (Pass/Fail)
COD-Cr mg/l	125	250	N/A	26	N/A	N/A	27.19	Pass
Suspended Solids mg/l	35	87.5	N/A	26	N/A	N/A	7.26	Pass
BOD, 5 days with Inhibition (Carbonaceous BOD) mg/l	25	50	N/A	26	N/A	N/A	4.29	Pass
Total Nitrogen mg/l	10	12	N/A	26	7	3	7.23	Fail
pH pH units	6-9	6-9	N/A	27	N/A	N/A	7.57	Pass
Total Phosphorus (as P) mg/l	1	1.2	N/A	26	5	3	0.67	Fail
Total Oxidised Nitrogen (as N) mg/l	N/A	N/A	N/A	21	N/A	N/A	4.55	
Dissolved Inorganic Nitrogen (as N) mg/l	N/A	N/A	N/A	27	N/A	N/A	5.82	
ortho-Phosphate (as P) - unspecified mg/l	N/A	N/A	N/A	26	N/A	N/A	0.38	

Parameter	WWDL ELV (Schedule A)	ELV with Condition 2 Interpretation included Note 1	Interim % reduction from influent concentration	Number of sample results	Number of exceedances	Number of with Condition 2 Interpretation included	Annual Mean	Overall Compliance (Pass/Fail)
Conductivity @25°C µS/cm	N/A	N/A	N/A	1	N/A	N/A	2680	
Ammonia-Total (as N) mg/l	N/A	N/A	N/A	26	N/A	N/A	1.47	
Silver - filtered µg/l	N/A	N/A	N/A	1	N/A	N/A	0.14	
Conductivity 20 C µS/cm	N/A	N/A	N/A	26	N/A	N/A	2208.17	

Notes:
1 – This represents the Emission Limit Values after the Interpretation provided for under Condition 2 of the licence is applied

Cause of Exceedance(s):

Adverse weather and inadequate operations.

Significance of Results:

The WWTP is non-compliant with the ELV's set in the Wastewater Discharge Licence. The impact on receiving waters is assessed further in Section 2.

2.1.3 AMBIENT MONITORING SUMMARY FOR THE TREATMENT PLANT DISCHARGE TPEFF2100D0053SW001

A summary of monitoring from ambient monitoring points associated with the wastewater discharge is provided in the sections below. For discharges to rivers upstream (U/S) and downstream (D/S) location data is provided. For other ambient points in lakes, coastal or transitional waters, monitoring data from the most appropriate monitoring station is selected.

The table below provides details of ambient monitoring locations and details of any designations as sensitive areas.

Ambient Monitoring Point from WWDL (or as agreed with EPA)	Irish Grid Reference	River Station Code	Bathing Water	Drinking Water	FWPM	Shellfish	WFD Status
Upstream	307227.17, 307718.49	TW21006031CN3003	N	N	N	Y	Poor
Downstream	308206.9, 307908.33	TW21006031CN3004	N	N	N	Y	Poor
Downstream	308745.37, 307876.19	TW21006030CN2004	N	N	N	Y	Moderate

The results for ambient results and / or additional monitoring data sets are included in the **Appendix 7.1 - Ambient monitoring summary.**

Significance of Results:

The WWTP discharge was not compliant with the ELV's set in the wastewater discharge licence.

The ambient monitoring results does not meet the required EQS. The EQS relates to the Oxygenation and Nutrient Conditions set out in the Surface Water Regulations 2009.

Based on ambient monitoring results a deterioration in Chlorophyll Median (at Stations CN030 and CN110), Chlorophyll 95% (at Stations CN040 and CN110), concentrations downstream of the effluent discharge is noted.

A deterioration in water quality has been identified, however it is not known if it or is not caused by the WWTP.

Other causes of deterioration in water quality in the area are unknown.

The discharge from the wastewater treatment plant does have an observable negative impact on the Water Framework Directive status.

2.1.4 OPERATIONAL PERFORMANCE SUMMARY - DUNDALK WWTP

2.1.4.1 Treatment Efficiency Report - DUNDALK WWTP

Treatment efficiency is based on the removal of key pollutants from the influent wastewater by the treatment plant. In essence the calculation is based on the balance of load coming into the plant versus the load leaving the plant. The efficiency is presented as a percentage removal rate.

A summary presentation of the efficiency of the treatment process including information for all the parameters specified in the licence is included below:

Parameter	Influent mass loading (kg/year)	Effluent mass emission (kg/year)	Efficiency (% reduction of influent load)
TN	290562	70596	76
cBOD	1296381	41891	97
COD	4004729	265620	93
SS	2092073	70949	97
TP	45847	6593	86

Note: The above data is based on sample results for the number of dates reported

2.1.4.2 Treatment Capacity Report Summary - DUNDALK WWTP

Treatment capacity is an assessment of the hydraulic (flow) and organic (the amount of pollutants) load a treatment plant is designed to treat versus the current loading of that plant.

DUNDALK WWTP	
Peak Hydraulic Capacity (m^3/day) - As Constructed	56706
DWF to the Treatment Plant (m^3/day)	18902
Current Hydraulic Loading - annual max (m^3/day)	48218

DUNDALK WWTP	
Average Hydraulic loading to the Treatment Plant (m^3/day)	29127
Organic Capacity (PE) - As Constructed	120000*
Organic Capacity (PE) - Collected Load (peak week)[Note1]	54,816
Organic Capacity (PE) - Remaining	65,184
Will the capacity be exceeded in the next three years? (Yes/No)	No

Nominal design capacities can be based on conservative design principles. In some cases assessment of existing plants has shown organic capacities significantly higher than the nominal design capacity. Accordingly plants that appear to be overloaded when comparing a collected peak load with the nominal design capacity can be fully compliant due to the safety factors in the original design.

* Organic Capacity Design is under detailed review by IW.

2.1.5 SLUDGE / OTHER INPUTS - DUNDALK WWTP

'Other inputs' to the waste water treatment plant are summarised in table below

Input type	Quantity	Unit	P.E.	% of load to WWTP	Included in Influent Monitoring (Y/N)?	Is there a leachate/sludge acceptance procedure for the WWTP?	Is there a dedicated leachate/sludge acceptance facility for the WWTP? (Y/N)
Other	23847.1	Weight (Tonnes)	290	0.22	Yes	Yes	No

3 COMPLAINTS AND INCIDENTS

3.1 COMPLAINTS SUMMARY

A summary of complaints of an environmental nature is included below.

Number of Complaints	Nature of Complaint	Number Open Complaints	Number Closed Complaints
18	Blocked Sewer	1	17

3.2 REPORTED INCIDENTS SUMMARY

Environmental incidents that arise in an agglomeration are reported on an on-going basis in accordance with our waste water discharge licences. Where an incident occurs and it is reportable under the licence, it is reported to the Environmental Protection Agency through their Environmental Data Exchange Network, or in some instances by telephone. Some incidents which arise in the agglomeration are recorded by Irish Water but may not be reportable under our licence for example where the incident does not have an impact on environmental performance.

A summary of reported incidents is included below.

3.2.1 SUMMARY OF INCIDENTS

Incident Type	Cause	No. of incident occurrences	Recurring (Y/N)	Closed (Y/N)
Breach of ELV	Adverse Weather	1	No	Yes
Breach of ELV	Inadequate Operational Procedures / Training	1	No	Yes
Spillage	Broken Sewer Pipe	1	Yes	Yes

Incident Type	Cause	No. of incident occurrences	Recurring (Y/N)	Closed (Y/N)
Breach of ELV	Inadequate Operational Procedures / Training	1	Yes	Yes
Spillage	Broken Sewer Pipe	1	No	Yes
Uncontrolled release	EO caused by pump failure	1	No	Yes
Abatement Equipment offline	Screen maintenance issue	1	No	Yes
Breach of ELV	WWTP upgrade required to meet ELV	1	Yes	No
Abatement Equipment offline	Plant or equipment breakdown at WWTP	1	No	No

3.2.2 SUMMARY OF OVERALL INCIDENTS

Question	Answer
Number of Incidents in 2019	9
Number of Incidents reported to the EPA via EDEN in 2019	9
Explanation of any discrepancies between the two numbers above	N/A

4 INFRASTRUCTURAL ASSESSMENTS AND PROGRAMME OF IMPROVEMENTS

4.1 STORM WATER OVERFLOW IDENTIFICATION AND INSPECTION REPORT

A summary of the operation of the storm water overflows and their significance where known is included below:

4.1.1 SWO IDENTIFICATION

WWDL Name / Code for Storm Water Overflow	Irish Grid Ref.	Included in Schedule A4 of the WWDL	Significance of the overflow(High / Medium / Low)	Assessed against DoEHLG Criteria	No. of times activated in 2019 (No. of events)	Total volume discharged in 2019 (m3)	Monitoring Status
SWO-1	308182.947, 307800.365	Yes	Low	Not Meeting	Unknown	Unknown	Not Monitored
SWO-3	305504.19, 307941.72	Yes	Low	Not Meeting	Unknown	Unknown	Not Monitored
SWO-4	305589, 310049	Yes	Low	Meeting	Unknown	Unknown	Not Monitored
SWO-5	304255, 308441	Yes	Low	Meeting	Unknown	Unknown	Not Monitored
SWO-6	303201, 309018	Yes	Low	Meeting	Unknown	Unknown	Not Monitored
SWO-7	304053, 306069	No	Low	Meeting	Unknown	Unknown	Not Monitored
SWO-8	306263.34,	No	Unknown	Not Meeting	Unknown	Unknown	Not

WWDL Name / Code for Storm Water Overflow	Irish Grid Ref.	Included in Schedule A4 of the WWDL	Significance of the overflow(High / Medium / Low)	Assessed against DoEHLG Criteria	No. of times activated in 2019 (No. of events)	Total volume discharged in 2019 (m3)	Monitoring Status
	306860.22						Monitored
SWO-9	307652, 307277	No	Low	Meeting	Unknown	Unknown	Not Monitored
TBC	303214, 309006	No	Low	Meeting	Unknown	Unknown	Not Monitored
TBC	304614.422, 306107.675	No	Low	Meeting	Unknown	Unknown	Not Monitored
TBC	TBC	No	Low	Not Meeting	Unknown	Unknown	Not Monitored
TBC	TBC	No	Low	Not yet Assessed	Unknown	Unknown	Unknown
TBC	TBC	No	Low	Meeting	Unknown	Unknown	Not Monitored
TBC	TBC	No	Unknown	Not yet Assessed	Unknown	Unknown	Unknown
TBC	306279, 307784	No	Low	Meeting	Unknown	Unknown	Not Monitored

SWO Summary	
How much sewage was discharged via SWOs in the agglomeration in the year (m3)?	Unknown
Is each SWO identified as not meeting DoEHLG Guidance included in the Programme of Improvements?	Yes
The SWO Assessment included the requirements of relevant of WWDL schedules?	Yes
Have the EPA been advised of any additional SWOs / changes to Schedule C3 and A4 under Condition 1.7?	No

4.2 REPORT ON PROGRESS MADE AND PROPOSALS BEING DEVELOPED TO MEET THE IMPROVEMENT PROGRAMME REQUIREMENTS

4.2.1 SPECIFIED IMPROVEMENT PROGRAMME SUMMARY

A wastewater discharge licence may require a number of reports on specific subject areas to be prepared for the agglomeration in question. These reports are submitted to the EPA as part of the Annual Environmental Report. This section provides list of the various reports required for this agglomeration and a brief summary of their recommendations.

Specified Improvement Programmes (under Schedule A and C of WWDL)	Description	Licence Schedule	Licence Completion Date	Date Expired? (N/NA/Y)	Status of Works	Timeframe for Completing the Work	Comments
D0053-SIP:01	Installation of nutrient removal (nitrogen and phosphorus) processes at WWTP	C	31/12/2013	Yes	Works Completed		
D0053-SIP:02	SW8 - Installation of 1,500 m3 storm water balancing tank at Coe's	C	31/12/2020	No	At Planning Stage	31/12/2021	Drainage Area Plan (DAP) Investigation

Specified Improvement Programmes (under Schedule A and C of WWDL)	Description	Licence Schedule	Licence Completion Date	Date Expired? (N/NA/Y)	Status of Works	Timeframe for Completing the Work	Comments
	Road Pumping Station						to be competed. Completion date refers to completion of DAP.

A summary of the status of any improvements identified by under Condition 5.2 is included below.

4.2.2 IMPROVEMENT PROGRAMME SUMMARY

Improvement Identifier	Improvement Description / or any Operational Improvements	Improvement Source	Expected Completion Date	Comments
D0053-IP:22	A DAP is ongoing for Dundalk which includes Blackrock. The DAP will encompass both Storm Water Overflow and network assessments and will therefore comprehensively identify the need to carry out separate Storm Water Overflow or Sewer Integrity Assessments at this time.	Other	31/12/2020	

4.2.3 SEWER INTEGRITY RISK ASSESSMENT

The utilisation of multiple capital maintenance programmes and the outputs of the workshops with the Local Authority Operations Staff held under the programme can be used to satisfy the requirements of Condition 5 regarding network integrity. Improvement works identified by way of these programmes and workshops will be included in the Improvements Summary Table.

5 LICENCE SPECIFIC REPORTS

A wastewater discharge licence may require a number of reports on specific subject areas to be prepared for the agglomeration in question. These reports are submitted to the EPA as part of the Annual Environmental Report. This section provides list of the various reports required for this agglomeration and a brief summary of their recommendations.

Licence Specific Report	Required by licence	Year included in AER	Included in this AER	Reference to relevant section of AER
Priority Substances Assessment	Yes	2014	No	
Shellfish Impact Assessment	Yes	2016	No	

5.1 PRIORITY SUBSTANCES ASSESSMENT

The Priority Substances Assessment Report has been included in the AER 2014.

5.2 SHELLFISH IMPACT ASSESSMENT

The Shellfish Impact Assessment Report has been included in the AER 2016.

6 CERTIFICATION AND SIGN OFF

6.1 SUMMARY OF AER CONTENTS

Parameter	Answer
Does the AER include an Executive Summary?	Yes
Does the AER include an assessment of the performance of the Waste Water Works (i.e. have the results of assessments been interpreted against WWDL requirements and or Environmental Quality Standards)?	Yes
Is there a need to advise the EPA for consideration of a Technical Amendment / Review of the licence?	No
List reason e.g. additional SWO identified	N/A
Is there a need to request/advise the EPA of any modification to the existing WWDL with respect to condition 4 changes to monitoring location, frequency etc	No
List reason e.g. changes to monitoring requirements	N/A
Have these processes commenced?	N/A
Are all outstanding reports and assessments from previous AERs included as an appendix to this AER	N/A

I certify that the information given in this Annual Environmental Report is truthful, accurate and complete:

Date: 06/03/2020

This AER has been produced by Irish Water's Environmental Information System (EIMS) and has been electronically signed off in that system for and on behalf of,

Katherine Walshe

Acting Head of Environmental Regulation.

7 APPENDIX

Appendix
Appendix 7.1 - Ambient monitoring summary

D0053-01 Dundalk Ambient Monitoring Data 2019

Ambient Monitoring Report Summary Table

Ambient Monitoring Point from WWDL (or as agreed with EPA)	Irish Grid Reference	EPA Feature Coding Tool code	Bathing Water	Drinking Water	FWPM	Shellfish	Current WFD Status
Castletown Estuary (Transitional Water) (CN030)	307227.17, 307718.49	TW21006031 CN3003	N	N	N	Y	Poor
Castletown Estuary (Transitional Water) (CN040)	308206.9, 307908.33	TW21006031 CN3004	N	N	N	Y	Poor
Dundalk Bay Inner (Transitional Waters) (CN110)	308745.37, 307876.19	TW21006030 CN2004	N	N	N	Y	Moderate

The results for the monitoring data sets are included below. This assessment is based on the 2016-2018 EPA TraC datasets.

Ambient Monitoring Summary

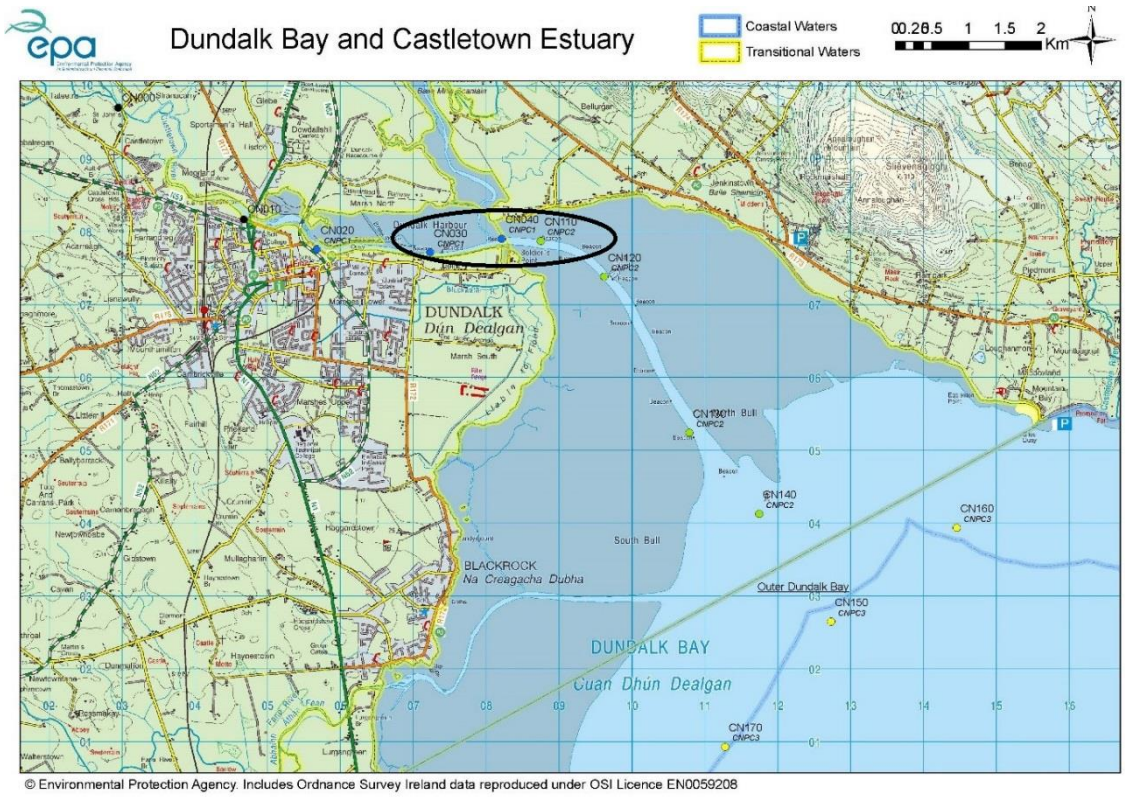

Figure 1: Location of the three transitional water sampling stations in the Castletown Estuary (CN030 and CB040) and Inner Dundalk Bay (CN110)

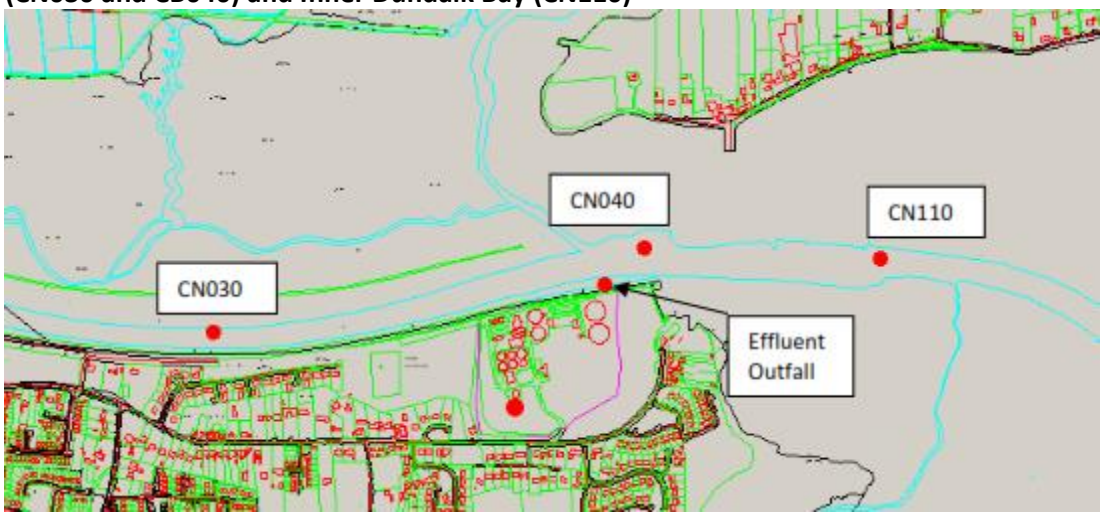

Figure 2: Location of the three transitional water sampling stations in the Castletown Estuary (CN030 and CB040) and Inner Dundalk Bay (CN110) in relation to the effluent outfall.

Based on the above and the effluent compliance results, the discharge from the wastewater treatment plant may be having an observable negative impact on the water quality of the Castletown Estuary and Inner Dundalk Bay.

The discharge from the wastewater treatment plant may be contributing to the WFD status of the Castletown Estuary and Inner Dundalk Bay.

Dundalk Shellfish Waters are located ca. 3.5km south of the primary discharge. It was noted in the 2013 Shellfish Assessment and recent the Stage 2 Scoping Assessment Report prepared by IW that Dundalk WWTP is the most likely of the WWTPs in the environs to have an effect on the Shellfish waters on Dundalk Bay due to outflow levels and oceanography of the bay. The results from this study show that in general the microbiological results of shellfish flesh of species collected within Dundalk Bay Shellfish Waters are good, but that on occasion levels may be above the Class B standard. It is likely that discharge from Dundalk WWTP may contribute to these high microbiological levels in the shellfish, however, these levels are within acceptable limits and the shellfish remain fit for human consumption after appropriate treatment. It is most likely that the high microbiological values occur during periods of heavy rainfall as it is during such periods that waters from Dundalk town have the greatest chance of reaching and affecting the shellfish production areas. Detailed assessments of impacts are currently ongoing to confirm any impacts.

It is important to have an understanding of the physical oceanographic processes that regulate the dispersion of both marine and fresh waters in Dundalk Bay. Sea water circulation in Dundalk Bay is driven primarily by tidal forcing: the flooding tide rises from the south and fills the bay from the southeast at Dunany Point. The tide flows in a clockwise direction flowing eastwards by Giles Quay and then heads north past Carlingford Lough. The ebbing tide follows the reverse order to this flow pattern. This pattern can be altered by both wind direction and fresh water inflow rates of the main rivers into the bay e.g. the Castletown, Fane and Glyde Rivers. Strong Easterly winds will increase surface flows and keep the freshwater close to the shore while strong Westerly winds will reduce flow rates but force fresh water in an Easterly direction. The outfall from the Dundalk Waste Water Treatment Plant (WWTP) is located in the Castletown River and dilution and dispersion of the effluent into the sea will depend on the stage of the tide, tidal height, freshwater flows and wind speed and direction. Summers river flows are typically less than Winter flows and the spatial extent of the plume (and therefore the distribution of bacteria and nutrients) will therefore be smaller in Summer months. Specifically, in relation to bacteria, Summer conditions are also less favourable to bacteria in that suspended solids (to which bacteria can attach) loadings are lower and because of this, water transparency levels are better thereby allowing ultraviolet (UV) rays to penetrate deeper into the water column. Bacteria are very sensitive to UV rays and are killed by even small dosages. It is apparent therefore that during later Spring through to late Summer/early Autumn, water chemistry in the eastern part of Dundalk Bay is unlikely to be affected by water from the WWTP. As most of the conditions during the remaining part of the year are more suitable for water from the WWTP to affect a greater area of Dundalk Bay. The only condition that will be less suitable during this part of the year is the fact that there is more freshwater being delivered to the coast thereby increasing the dilution factor. Clearly Stations (EPA CODE) CN030 and CN040 are much more under the influence of the Castletown River rather than a marine influence – this only applies during flood tide periods. However, the opposite is the case for CN110 which may be only seasonally affected by the Castletown River.

D0053-01 Dundalk - 2016-2018 TrAC Data

Water Body_Name	Station_No	Sample Label	Data Source	Date_Surveyed	Salinity	DO_saturation	DO_mgL	BOD	MRP (µg/l)	chl_a	DIN	Season
Castletown Estuary	CN030	CN030BR	EPA Data	11/02/2016	30.64	96.4	9.8	0.5	44	5	0.53	Winter
Castletown Estuary	CN030	CN030SR	EPA Data	11/02/2016	24.81	94.5	10.1	0.5	48	2.4	0.9	Winter
Castletown Estuary	CN030	CN030B	EPA Data	11/02/2016	10.16	91.5	11		60	14	1.4	Winter
Castletown Estuary	CN030	CN030S	EPA Data	11/02/2016	2.62	94.7	12		43	4.2	2.6	Winter
Castletown Estuary	CN030	CN030BR	EPA Data	21/06/2016	32.73	103.6	8.3	0.5	32	6.1	0.152	Summer
Castletown Estuary	CN030	CN030B	EPA Data	21/06/2016	32.22	97.4	7.8	3.2	54	9.2	0.196	Summer
Castletown Estuary	CN030	CN030S	EPA Data	21/06/2016	32.01	97.4	7.8	1.1	54	5.4	0.196	Summer
Castletown Estuary	CN030	CN030SR	EPA Data	21/06/2016	30.37	98	7.9	0.5	75	6.1	0.55	Summer
Castletown Estuary	CN030	CN030B	EPA Data	28/07/2016	29.9	75.5	6	1.3	94	19	1.08	Summer
Castletown Estuary	CN030	CN030BR	EPA Data	28/07/2016	24.3	86.2	7.1	1.6	100	20	1.1	Summer
Castletown Estuary	CN030	CN030S	EPA Data	28/07/2016	14.02	70.2	6.2	1.8	100	17	1.35	Summer
Castletown Estuary	CN030	CN030SR	EPA Data	28/07/2016	8.66	80.3	7.2	1.5	120	18	1.45	Summer
Castletown Estuary	CN030	CN030BR	EPA Data	06/09/2016	28.56	92.2	7.3	1.1	58	7.8	0.257	Summer
Castletown Estuary	CN030	CN030SR	EPA Data	06/09/2016	27.69	91.1	7.2	1.2	76	4	0.57	Summer
Castletown Estuary	CN030	CN030B	EPA Data	06/09/2016	18.42	77.8	6.5	1.2	91	22	0.83	Summer
Castletown Estuary	CN030	CN030S	EPA Data	06/09/2016	17.06	76.9	6.5	1.2	120	11	1.09	Summer
Castletown Estuary	CN030	CN030B	EPA Data	24/05/2017	31.4	99.8	8.3	1.6	16	12	0.021	Summer
Castletown Estuary	CN030	CN030S	EPA Data	24/05/2017	30.3	102.9	8.4	1	19	13	0.023	Summer
Castletown Estuary	CN030	CN030B	EPA Data	05/07/2017	28.6	111.4	9.1	2.8	16	56	0.019	Summer
Castletown Estuary	CN030	CN030S	EPA Data	05/07/2017	27.6	114.2	9.4	1.4	210	7.3	1.94	Summer
Castletown Estuary	CN030	CN030B	EPA Data	05/09/2017	29.3	90.9	7.6	1.4	17	65	0.355	Summer
Castletown Estuary	CN030	CN030S	EPA Data	05/09/2017	21.7	95.8	8.3	1.8	40	16	0.297	Summer
Castletown Estuary	CN030	CN030B	EPA Data	16/11/2017	29.93	97.1	9.3	1.4	22	18	0.278	Winter
Castletown Estuary	CN030	CN030S	EPA Data	16/11/2017	24.38	96.4	9.6	1.4	58	8.5	0.85	Winter
Castletown Estuary	CN030	CN030B	EPA Data	29/05/2018	32.69	106.9	8.7	0.5	17	0.5	0.158	Summer
Castletown Estuary	CN030	CN030S	EPA Data	29/05/2018	32.29	110.3	8.8	0.5	27	1.2	0.339	Summer
Castletown Estuary	CN030	CN030B	EPA Data	11/07/2018	33.66	100	7.5	0.5	31	15	0.031	Summer
Castletown Estuary	CN030	CN030S	EPA Data	11/07/2018	33.33	102.4	7.6	1.4	43	17	0.028	Summer
Castletown Estuary	CN030	CN030B	EPA Data	26/09/2018	31.93	95.9	8.5	0.5	43	21	0.037	Summer
Castletown Estuary	CN030	CN030S	EPA Data	26/09/2018	31.5	96.9	8.5	0.5	35	15	0.041	Summer
	MEDIAN				**29.6**	**96.4**	**8.3**	**1.2**	**46**	**12.5**	**0.35**	
	95%ile				**33.06**	**110.905**		**2.45**				
	5%ile				**9.335**	**76.13**						
	90%ile									**21.1**		

	Salinity Based Threshold	CN030 Result	
Salinity =	**29.6**		
DIN-	0.633	0.35	Pass
MRP-	47	46	Pass
Chloro. Median	11.7	**12.5**	Fail
Chloro 90 percentile	23.3	21.1	Pass
DO%sat 5 percentile	77	76.13	Pass
DO%sat 95 percentile	123	110.905	Pass
BOD	4	2.45	Pass

Water Body_Name	Station_No	Sample Label	Data Source	Date_Surveyed	Salinity	DO_saturation	DO_mgL	BOD	MRP (µg/l)	chl_a	DIN	Season
Castletown Estuary	CN040	CN040BR	EPA Data	11/02/2016	32.56	97.8	9.7	0.5	36	3.1	0.274	Winter
Castletown Estuary	CN040	CN040SR	EPA Data	11/02/2016	32.09	97.3	9.7	0.5	25	3.5	0.246	Winter
Castletown Estuary	CN040	CN040B	EPA Data	11/02/2016	30.06	96.6	9.9	0.5	39	6.3	0.344	Winter
Castletown Estuary	CN040	CN040S	EPA Data	11/02/2016	27.59	95	10	0.5	38	2.1	0.82	Winter
Castletown Estuary	CN040	CN040BR	EPA Data	21/06/2016	33.09	106.7	8.5	0.5	33	5.5	0.114	Summer
Castletown Estuary	CN040	CN040B	EPA Data	21/06/2016	32.74	104.1	8.3	0.5	38	8.2	0.13	Summer
Castletown Estuary	CN040	CN040S	EPA Data	21/06/2016	32.14	101.5	8.2	0.5	47	5.5	0.186	Summer
Castletown Estuary	CN040	CN040SR	EPA Data	21/06/2016	31.66	103.2	8.2	0.5	55	5.9	0.292	Summer
Castletown Estuary	CN040	CN040B	EPA Data	28/07/2016	22.78	79	6.7	1.7	73	24	0.66	Summer
Castletown Estuary	CN040	CN040S	EPA Data	28/07/2016	19.35	80.4	6.9	1	91	18	1.08	Summer
Castletown Estuary	CN040	CN040BR	EPA Data	28/07/2016	14.24	86.3	7.4	3.2	120	20	1.5	Summer
Castletown Estuary	CN040	CN040SR	EPA Data	28/07/2016	14.06	87	7.5	2.2	120	21	1.94	Summer
Castletown Estuary	CN040	CN040BR	EPA Data	06/09/2016	31.36	100.8	7.9	0.5	41	3.5	0.078	Summer
Castletown Estuary	CN040	CN040SR	EPA Data	06/09/2016	29.9	98.4	7.7	1.1	44	12	0.126	Summer
Castletown Estuary	CN040	CN040B	EPA Data	06/09/2016	22.49	82.7	6.8	1.2	87	11	0.58	Summer
Castletown Estuary	CN040	CN040S	EPA Data	06/09/2016	21.29	77.4	6.4	1.4	96	14	0.74	Summer
Castletown Estuary	CN040	CN040B	EPA Data	24/05/2017	31.7	100.9	8.4	1.5	15	7.7	0.033	Summer
Castletown Estuary	CN040	CN040S	EPA Data	24/05/2017	29.3	101.8	8.4	1.8	370	13	2.53	Summer
Castletown Estuary	CN040	CN040B	EPA Data	05/07/2017	29.6	114.3	9.3	3.1	26	35	0.021	Summer
Castletown Estuary	CN040	CN040S	EPA Data	05/07/2017	29.4	114.9	9.4	2.4	8	46	0.017	Summer
Castletown Estuary	CN041	CN040B	EPA Data	05/09/2017	30.3	96.6	8	1	18	54	0.355	Summer
Castletown Estuary	CN042	CN040S	EPA Data	05/09/2017	27.2	100.8	8.5	1.3	20	47	0.307	Summer
Castletown Estuary	CN043	CN040B	EPA Data	16/11/2017	30.52	97.8	9.3	1.3	22	20	0.276	Winter
Castletown Estuary	CN040	CN040S	EPA Data	16/11/2017	27.35	97.8	9.5	1.4	28	9.5	0.47	Winter
Castletown Estuary	CN040	CN040B	EPA Data	29/05/2018	33.13	107.8	8.8	0.5	6.3	0.5	0.029	Summer
Castletown Estuary	CN040	CN040S	EPA Data	29/05/2018	32.81	111.1	8.9	0.5	10	0.5	0.044	Summer
Castletown Estuary	CN040	CN040B	EPA Data	11/07/2018	33.73	102.5	7.7	0.5	20	3.6	0.046	Summer
Castletown Estuary	CN040	CN040S	EPA Data	11/07/2018	28.68	100.1	7.7	1.2	400	8.5	1.255	Summer
Castletown Estuary	CN040	CN040B	EPA Data	26/09/2018	32.4	99.1	8.7	0.5	27	19	0.023	Summer
Castletown Estuary	CN040	CN040S	EPA Data	26/09/2018		99.4	10.4	0.5	240	22	0.36	Summer
	MEDIAN				**30.06**	**99.25**	**8.40**	**1.00**	**38.00**	**10.25**	**0.284**	
	95%ile				**33.114**	**112.86**		**2.785**				
	5%ile				**16.284**	**79.63**						
	90%ile									**36.1**		

	Salinity Based Threshold	CN040 Result	
Salinity =	**30.06**		
DIN-	0.569	0.284	Pass
MRP-	46	38	Pass
Chloro. Median	11.4	10.25	Pass
Chloro 90 percentile	22.8	**36.1**	Fail
DO%sat 5 percentile	77	79.63	Pass
DO%sat 95 percentile	123	112.86	Pass
BOD	4	2.785	Pass

Water Body_Name	Station_No	Sample Label	Source	Date_Surveyed	Salinity	DO_saturation	DO_mgL	BOD	MRP (ug/l)	chl_a	DIN mg/l N	Season
Inner Dundalk Bay	CN110	CN110B	EPA Data	26/09/2018	32.52	100.9	8.8		22	29	0.02	Summer
Inner Dundalk Bay	CN110	CN110S	EPA Data	26/09/2018	31.76	101	8.9		22	25	0.02	Summer
Inner Dundalk Bay	CN110	CN110C	EPA Data	11/07/2018	33.72	103.6	7.8		7.4	3.2	0.026	Summer
Inner Dundalk Bay	CN110	CN110C	EPA Data	11/07/2018	33.53	103.3	7.7		7.4	3.2	0.026	Summer
Inner Dundalk Bay	CN110	CN110B	EPA Data	29/05/2018	33.11	105.8	8.6		6.1	1	0.04	Summer
Inner Dundalk Bay	CN110	CN110S	EPA Data	29/05/2018	33.08	107.4	8.6		7.7	1.5	0.036	Summer
Inner Dundalk Bay	CN110	CN110B	EPA Data	16/11/2017	31.42	98.3	9.3		19	15	0.213	Winter
Inner Dundalk Bay	CN110	CN110S	EPA Data	16/11/2017	27.41	98	9.6		27	15	0.388	Winter
Inner Dundalk Bay	CN110	CN110B	EPA Data	05/09/2017	31.1	94.3	7.8		20	47	0.375	Summer
Inner Dundalk Bay	CN110	CN110S	EPA Data	05/09/2017	30.2	107.8	8.9		15	54	0.365	Summer
Inner Dundalk Bay	CN110	CN110C	EPA Data	05/07/2017	31.1	111.9	9.1		8.3	23	0.01	Summer
Inner Dundalk Bay	CN110	CN110C	EPA Data	05/07/2017	30.7	115.9	9.4		8.3	23	0.01	Summer
Inner Dundalk Bay	CN110	CN110B	EPA Data	24/05/2017	32.2	102.3	8.5		7.5	5.8	0.021	Summer
Inner Dundalk Bay	CN110	CN110S	EPA Data	24/05/2017	31.8	103.3	8.5		11	6.1	0.021	Summer
Inner Dundalk Bay	CN110	CN110BR	EPA Data	06/09/2016	31.69	105.6	8.2		39	16	0.065	Summer
Inner Dundalk Bay	CN110	CN110SR	EPA Data	06/09/2016	31.23	107.9	8.4		34	14	0.05	Summer
Inner Dundalk Bay	CN110	CN110B	EPA Data	06/09/2016	22.85	80.6	6.6		80	15	0.56	Summer
Inner Dundalk Bay	CN110	CN110S	EPA Data	06/09/2016	22.45	78.4	6.4		82	15	0.55	Summer
Inner Dundalk Bay	CN110	CN110B	EPA Data	28/07/2016	27.36	91.9	7.5		62	21	0.45	Summer
Inner Dundalk Bay	CN110	CN110S	EPA Data	28/07/2016	22.09	84.5	7.1		77	20	0.84	Summer
Inner Dundalk Bay	CN110	CN110BR	EPA Data	28/07/2016	18.64	96.2	8.1		90	24	1.36	Summer
Inner Dundalk Bay	CN110	CN110SR	EPA Data	28/07/2016	17.91	95.5	8.1		92	22	1.33	Summer
Inner Dundalk Bay	CN110	CN110BR	EPA Data	21/06/2016	33.13	108.9	8.7		33	5.8	0.105	Summer
Inner Dundalk Bay	CN110	CN110B	EPA Data	21/06/2016	32.74	108.1	8.7		34	6.2	0.123	Summer
Inner Dundalk Bay	CN110	CN110S	EPA Data	21/06/2016	32.52	106.6	8.6		56	6	0.194	Summer
Inner Dundalk Bay	CN110	CN110SR	EPA Data	21/06/2016	32.13	106.7	8.5		46	6.3	0.193	Summer
Inner Dundalk Bay	CN110	CN110SR	EPA Data	11/02/2016	31.88	97	9.8		29	3.5	0.296	Winter
Inner Dundalk Bay	CN110	CN110B	EPA Data	11/02/2016	31.79	97	9.8	0.5	32	3.2	0.296	Winter
Inner Dundalk Bay	CN110	CN110S	EPA Data	11/02/2016	31.74	97.1	9.8	0.5	28	2.1	0.296	Winter
Inner Dundalk Bay	CN110	CN110B	EPA Data	11/02/2016	31.68	97.1	9.8	0.5	32	3.2	0.296	Winter
Inner Dundalk Bay	CN110	CN110BR	EPA Data	11/02/2016					36	3.2	0.291	Winter
	MEDIAN				**31.715**	**101.65**	**8.6**	**0.5**	**29**	**14**	**0.194**	
	95%ile				**33.35**	**110.55**	**9.8**	**0.5**	**86**	**38**	**1.085**	
	5%ile				**20.1925**	**82.355**	**6.825**	**0.5**	**7.4**	**1.8**	**0.015**	
	90%ile									**25**		

	Salinity Based Threshold	CN110 Result	
Salinity =	**31.715**		
DIN-	0.506	0.194	Pass
MRP-	44	29	Pass
Chloro. Median	11.1	**14.0**	**Fail**
Chloro 90 percentile	22.2	**25.0**	**Fail**
DO%sat 5 percentile	78	82.36	Pass
DO%sat 95 percentile	122	110.55	Pass
BOD	N/A	N/A	N/A