LOWER LIFFEY VALLEY REGIONAL SEWERAGE SCHEME

ANNUAL ENVIRONMENTAL REPORT

2013

WWDA Licence No. D0004-01

February 2014

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Section 1. Introduction and background to the 2013 AER

1.1 Introduction

A Waste Water Discharge Authorisation was granted by the Environmental Protection Agency to Kildare County Council for the Lower Liffey Valley Sewerage Scheme served by Leixlip Waste Water Treatment Plant on 6th May, 2009.

The existing WWTP at Leixlip has a maximum treatment capacity of 80,000 p.e. The plant is divided into two treatment streams, the Main Plant (45,000 p.e.) and the Intel Plant (35,000 p.e.). The discharge from the Main Plant and the Intel Plant combine prior to discharge into the River Liffey.

This Annual Environmental Report (AER) is being submitted in compliance with the requirements of Condition 6.10 of the Waste Water Discharge Licence.

This AER contains information as requested in Schedule D of Licence number D0004-01 and concerns the period from January to December, 2013.

1.2 Summary report on 2013

In 2013 the plant performed to a very high standard with over 90% removal of BOD, COD, SS and Total Phosphorous. Only 42% of the Total Nitrogen was removed but this was due to the absence of nitrogen removal facilities in the Main Plant.

There were a total of 52 non-compliant sample results. All of these can be attributed to the absence of nitrogen removal facilities in the Main Plant. Upgrade works, including nitrogen removal, commenced in the WWTP in 2013.

With the exception of ammonia it was found that the licensed parameters had an acceptable level of impact on the receiving water. Ammonia in the discharge at SW1 did have an impact but this is to be addressed with the ongoing WWTP upgrade.

During 2013 there were no complaints of an environmental nature received by Kildare County Council.

3 incidents were not reported – all reportable incidents concerned the above mentioned 52 non-compliant sample results.

Schedule C Improvement Programmes failed to comply with the 31st January 2012 WWDL deadline. The most recent programme has a completion date for the waste water treatment plant upgrade of Q4 2015.

Section 2. Monitoring Reports Summary

2.1 Summary report on monthly influent monitoring

Table 1 - Influent Monitoring Summary Table – Main Plant

	BOD (mg/l)	COD (mg/l	SS (mg/l	TP (mg/l)	TN (mg/l)	Loading (m3/d)	Loading (PE/day)
Number of Samples	25	31	31	31	28	-	-
Maximum Result	588	1204	998	13	87	15735	82886
Annual Mean	212	489	268	6.4	59	8981	30288

Table 2 - Influent Monitoring Summary Table – Intel Plant

	BOD (mg/l)	COD (mg/l	SS (mg/l)	TP (mg/l)	TN (mg/l)	Loading (m3/d)	Loading (PE/day)
Number of Samples	23	29	29	29	27	-	-
Maximum Result	285	886	628	16.6	65	27329	99631
Annual Mean	133	310	191	4.6	39	17551	38596

The influent monitoring summary for both plants are provided above. The results are typical for Leixlip WWTP and while there were some significant peaks the peaks themselves generally did not result in any ELV non-compliances.

2.2 Discharges from the agglomeration

Table 3 – Effluent Monitoring Summary

	pH	BOD (mg/l)	COD mg/l	TSS (mg/l)	Ammonia (mg/l N)	Nitrate (mg/l N)	Nitrite (mg/l N)	TON (mg/l N0	Total Nitrogen (mg/l N)	Mercury (ug/l Hg)	Total P (mg/l)	Orthophosphate (mg/l P)	Fluoride (kg/d)	OFG's (mg/l)
WWDL ELV	6.0-9.0	8	100	15	2.75	14.9	1	na	na	na	0.5	0.39	180	15
ELV with Condition 2 interpre. Included	6.0-9.0	16	200	37.5	3.3	17.9	1.2	na	na	na	0.6	0.47	180	18
Number of sample results	63	53	44	63	44	44	44	44	41	11	44	41	41	4
Number of samples above WWDL ELV	0	0	0	0	4	41	7	0	0	0	0	0	0	0
Number of samples above ELV with Condition 2 interpretation included	0	0	0	0	2	39	6	0	0	0	0	0	0	0
Overall compliance	Pass	Pass	Pass	Pass	Fail	Fail	Fail	Pass	Pass	Pass	Pass	Pass	Pass	Pass

In 2013 there was not full compliance with regard to monitoring frequency or ELV compliance.

Monitoring Frequency:

Due to the Christmas holidays pH was not monitored in week 52. The remaining parameters were fully compliant with the WWDL monitoring frequency requirements.

ELV Compliance:

Nitrate failed to comply on 41 occasions while nitrite failed on 7 occasions. These failures can be attributed to the absence of nitrogen removal facilities in the Main Plant. There is no EQS for nitrate or nitrite but the Water Quality Management Plan for the Liffey Catchment set a 95 percentile limit for oxidised nitrogen of equal to or less than 5mg/l N – monitoring at aSW1d complied with this limit. Therefore it may be assumed that the impact was not significant.

Four ammonia non-compliances were also recorded and as per the nitrate and nitrite non-compliances these resulted from the absence of nitrogen removal facilities in the Main Plant. The River Liffey at aSW1u had a 95 percentile for ammonia of 0.1566mg/l N while at aSW1d it was found to be 0.1762mg/l N. Therefore both upstream and downstream can be classed as not of "Good Status".

The remaining licensed parameters had no significant impact on the EQS status of the receiving water and were at all times compliant with their ELV's.

Kildare County Council has a programme in place to upgrade the plant, including nitrogen removal, and the anticipated date that the effluent standards will comply with the proposed new limits are on completion of Section 2 of the works, i.e. in Q4 2015.

2.3 Ambient monitoring summary

Table 4 – Ambient Monitoring Report Summary

Ambient Monitoring Point from WWDL	Irish Grid Reference	EPA Feature Coding Tool code	Does assessment of the ambient monitoring results indicate that the discharge is impacting on water quality
aSW1u	301537E 235828N	RS09L011940	No
aSW1d	302295E 235179N	RS09L012040	Yes – Total ammonia. At aSW1d the 95%ile for total ammonia was >0.140mg/l N – not Good Status (also >0.140mg/l at aSW1u but this was

			not as a result of the discharge)

Ambient monitoring indicated that with the exception of ammonia the discharge had no significant impact on the EQS status of the receiving water at the discharge point.

2.4 Data collection and reporting requirements under the Urban Waste Water Treatment Directive

This data was previously submitted electronically as requested via EDEN.

2.5 Pollutant Release and Transfer Register (PRTR) – report for 2013

| PRTR# : D0004 | Facility Name : Leixlip Waste Water Treatment Plant | Filename : D0004_2013.xls | Return Year : 2013 | 24/02/2014 15:56

Environmental Protection Agency

Guidance to completing the PRTR workbook

AER Returns Workbook

Version 1.1.17

REFERENCE YEAR	2013

1. FACILITY IDENTIFICATION

Parent Company Name	Kildare County Council
Facility Name	Leixlip Waste Water Treatment Plant
PRTR Identification Number	D0004
Licence Number	D0004-01

Waste or IPPC Classes of Activity

No.	class_name
30.4	General

Address 1	Water Services Section,
Address 2	Aras Chill Dara
Address 3	Devoy Park, Naas
Address 4	Co. Kildare
	Kildare
Country	Ireland
Coordinates of Location	-6.47388 53.3636
River Basin District	IEEA
NACE Code	3700
Main Economic Activity	Sewerage
AER Returns Contact Name	Tom Sexton
AER Returns Contact Email Address	tsexton@kildarecoco.ie
AER Returns Contact Position	Plant Manager
AER Returns Contact Telephone Number	0872842803
AER Returns Contact Mobile Phone Number	0872842803
AER Returns Contact Fax Number	
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	6
User Feedback/Comments	Releases to air are up on 2012 because in 2012 tonnes of sludge instead of kg was included by error. Variation in other parameters were as a result of variations in reported results
Web Address	

2. PRTR CLASS ACTIVITIES

Activity Number	Activity Name
5(f)	Urban waste-water treatment plants

3. SOLVENTS REGULATIONS (S.I. No. 543 of 2002)

Is it applicable?	No
Have you been granted an exemption ?	
If applicable which activity class applies (as per Schedule 2 of the regulations) ?	
Is the reduction scheme compliance route being used ?	

4. WASTE IMPORTED/ACCEPTED ONTO SITE Guidance on waste imported/accepted onto site

Do you import/accept waste onto your site for on-site treatment (either recovery or disposal activities) ?	

This question is only applicable if you are an IPPC or Quarry site

4.1 RELEASES TO AIR Link to previous years emissions data | PRTR# : D0004 | Facility Name : Leixlip Waste Water Treatment Plant | Filename : D0004_2013.xls | Return Year : 2013 | 24/02/2014 15:56

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
01	Methane (CH4)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
02	Carbon monoxide (CO)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	895.0	906.0	0.0	11.0
03	Carbon dioxide (CO2)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	263653.0	821041.0	0.0	557388.0
05	Nitrous oxide (N2O)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	7.0	0.0	7.0
07	Non-methane volatile organic compounds (NMVOC)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	3.0	0.0	3.0
08	Nitrogen oxides (NOx/NO2)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	2736.0	2769.0	0.0	33.0
11	Sulphur oxides (SOx/SO2)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	3.0	0.0	3.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION C : REMAINING POLLUTANT EMISSIONS (As required in your Licence)

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

Additional Data Requested from Landfill operators

For the purposes of the National Inventory on Greenhouse Gases, landfill operators are requested to provide summary data on landfill gas (Methane) flared or utilised on their facilities to accompany the figures for total methane generated. Operators should only report their Net methane (CH4) emission to the environment under T(total) KG/yr for Section A: Sector specific PRTR pollutants above. Please complete the table below:

Landfill: Leixlip Waste Water Treatment Plant

Please enter summary data on the quantities of methane flared and / or utilised	**T (Total) kg/Year**	**M/C/E**	**Method Used**		**Facility Total Capacity m3 per hour**	
			Method Code	**Designation or Description**		
Total estimated methane generation (as per site model)	0.0				N/A	
Methane flared	0.0				0.0	(Total Flaring Capacity)
Methane utilised in engine/s	0.0				0.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	0.0				N/A	

4.2 RELEASES TO WATERS Link to previous years emissions data | PRTR# : D0004 | Facility Name : Leixlip Waste Water Treatment Plant | Filename : D0004_2013.xls | Return Year : 2013 | 24/02/2014 15:56

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT be submitted under AER / PRTR Reporting as this only concerns Releases from your facility

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
34	1,2-dichloroethane (EDC)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
25	Alachlor	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
26	Aldrin	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
61	Anthracene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.027	0.027	0.0	0.0
17	Arsenic and compounds (as As)	M	CRM	ICPMS	3.327	3.343	0.0	0.016
27	Atrazine	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.101	0.102	0.0	0.001
62	Benzene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.162	0.17	0.0	0.008
91	Benzo(g,h,i)perylene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.019	0.019	0.0	0.0
63	Brominated diphenylethers (PBDE)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
18	Cadmium and compounds (as Cd)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.498	0.511	0.0	0.013
28	Chlordane	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
29	Chlordecone	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
30	Chlorfenvinphos	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
79	Chlorides (as Cl)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	818519.625	821485.197	0.0	2965.572
31	Chloro-alkanes, C10-C13	E	ESTIMATE	EPA UWWTP Tool Version 5.0	2.025	2.035	0.0	0.01
32	Chlorpyrifos	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.001	0.001	0.0	0.0
19	Chromium and compounds (as Cr)	M	CRM	ICPMS	16.094	16.17	0.0	0.076
20	Copper and compounds (as Cu)	M	CRM	ICPMS	84.238	84.638	0.0	0.4
82	Cyanides (as total CN)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	28.27	28.398	0.0	0.128
33	DDT	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
70	Di-(2-ethyl hexyl) phthalate (DEHP)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	8.845	8.98	0.0	0.135
35	Dichloromethane (DCM)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.438	0.443	0.0	0.005
36	Dieldrin	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
37	Diuron	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.254	0.254	0.0	0.0
38	Endosulphan	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
39	Endrin	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
65	Ethyl benzene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.16	0.165	0.0	0.005
88	Fluoranthene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.023	0.024	0.0	0.001
83	Fluorides (as total F)	M	CRM	Colorimetry	13506.442	13570.546	0.0	64.104
40	Halogenated organic compounds (as AOX)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	23.016	23.125	0.0	0.109
41	Heptachlor	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
90	Hexabromobiphenyl	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
42	Hexachlorobenzene (HCB)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
43	Hexachlorobutadiene (HCBD)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0

				EPA UWWTP Tool Version				
89	Isodrin	E	ESTIMATE	5.0	0.0	0.0	0.0	0.0
				EPA UWWTP Tool Version				
67	Isoproturon	E	ESTIMATE	5.0	0.072	0.073	0.0	0.001
23	Lead and compounds (as Pb)	M	CRM	ICPMS	1.639	1.647	0.0	0.008
				EPA UWWTP Tool Version				
45	Lindane	E	ESTIMATE	5.0	0.004	0.004	0.0	0.0
21	Mercury and compounds (as Hg)	M	CRM	ICPMS	0.6	0.603	0.0	0.003
				EPA UWWTP Tool Version				
46	Mirex	E	ESTIMATE	5.0	0.0	0.0	0.0	0.0
				EPA UWWTP Tool Version				
68	Naphthalene	E	ESTIMATE	5.0	0.039	0.046	0.0	0.007
22	Nickel and compounds (as Ni)	M	CRM	ICPMS	46.675	46.897	0.0	0.222
				EPA UWWTP Tool Version				
64	Nonylphenol and Nonylphenol ethoxylates (NP/NPEs)	E	ESTIMATE	5.0	0.8	0.85	0.0	0.05
				EPA UWWTP Tool Version				
87	Octylphenols and Octylphenol ethoxylates	E	ESTIMATE	5.0	0.0	0.0	0.0	0.0
				EPA UWWTP Tool Version				
69	Organotin compounds (as total Sn)	E	ESTIMATE	5.0	0.0	0.0	0.0	0.0
				EPA UWWTP Tool Version				
48	Pentachlorobenzene	E	ESTIMATE	5.0	0.0	0.0	0.0	0.0
				EPA UWWTP Tool Version				
49	Pentachlorophenol (PCP)	E	ESTIMATE	5.0	0.0	0.0	0.0	0.0
				EPA UWWTP Tool Version				
71	Phenols (as total C)	E	ESTIMATE	5.0	8.773	12.474	0.0	3.701
				EPA UWWTP Tool Version				
50	Polychlorinated biphenyls (PCBs)	E	ESTIMATE	5.0	0.0	0.0	0.0	0.0
				EPA UWWTP Tool Version				
72	Polycyclic aromatic hydrocarbons (PAHs)	E	ESTIMATE	5.0	0.12	0.13	0.0	0.01
				EPA UWWTP Tool Version				
51	Simazine	E	ESTIMATE	5.0	0.136	0.137	0.0	0.001
				EPA UWWTP Tool Version				
52	Tetrachloroethylene (PER)	E	ESTIMATE	5.0	0.57	0.57	0.0	0.0
				EPA UWWTP Tool Version				
53	Tetrachloromethane (TCM)	E	ESTIMATE	5.0	0.0	0.0	0.0	0.0
				EPA UWWTP Tool Version				
73	Toluene	E	ESTIMATE	5.0	4.756	5.393	0.0	0.637
12	Total nitrogen	M	OTH	Calculation	257882.684	259106.623	0.0	1223.939
				EPA UWWTP Tool Version				
76	Total organic carbon (TOC) (as total C or COD/3)	E	ESTIMATE	5.0	88902.922	89502.535	0.0	599.613
13	Total phosphorus	M	CRM	Dig/Colorimetry	3191.713	3206.861	0.0	15.148
				EPA UWWTP Tool Version				
59	Toxaphene	E	ESTIMATE	5.0	0.0	0.0	0.0	0.0
				EPA UWWTP Tool Version				
74	Tributyltin and compounds	E	ESTIMATE	5.0	0.0	0.0	0.0	0.0
				EPA UWWTP Tool Version				
54	Trichlorobenzenes (TCBs)(all isomers)	E	ESTIMATE	5.0	0.0	0.0	0.0	0.0
				EPA UWWTP Tool Version				
57	Trichloroethylene	E	ESTIMATE	5.0	0.0	0.0	0.0	0.0
				EPA UWWTP Tool Version				
77	Trifluralin	E	ESTIMATE	5.0	0.0	0.0	0.0	0.0
				EPA UWWTP Tool Version				
75	Triphenyltin and compounds	E	ESTIMATE	5.0	0.0	0.0	0.0	0.0
				EPA UWWTP Tool Version				
60	Vinyl chloride	E	ESTIMATE	5.0	0.0	0.0	0.0	0.0
				EPA UWWTP Tool Version				
78	Xylenes	E	ESTIMATE	5.0	1.118	1.191	0.0	0.073
24	Zinc and compounds (as Zn)	M	CRM	ICPMS	376.111	377.896	0.0	1.785

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION C : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					

Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
370	Selenium	E	ESTIMATE	EPA UWWTP Tool Version 5.0	4.219	4.219	0.0	0.0
205	Antimony (as Sb)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	1.49	1.512	0.0	0.022
368	Molybdenum	E	ESTIMATE	EPA UWWTP Tool Version 5.0	14.625	14.689	0.0	0.064
358	Tin	E	ESTIMATE	EPA UWWTP Tool Version 5.0	29.169	29.169	0.0	0.0
373	Barium	E	ESTIMATE	EPA UWWTP Tool Version 5.0	178.469	180.119	0.0	1.65
374	Boron	E	ESTIMATE	EPA UWWTP Tool Version 5.0	606.281	610.354	0.0	4.073
356	Cobalt	E	ESTIMATE	EPA UWWTP Tool Version 5.0	1.695	1.71	0.0	0.015
386	Vanadium	E	ESTIMATE	EPA UWWTP Tool Version 5.0	26.298	26.536	0.0	0.238
388	Dichlobenil	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.041	0.041	0.0	0.0
383	Linuron	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
385	Mecoprop Total	E	ESTIMATE	EPA UWWTP Tool Version 5.0	1.032	1.037	0.0	0.005
380	2,4 Dichlorophenol (2,4 D)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.492	0.494	0.0	0.002
384	MCPA	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.855	0.855	0.0	0.0
382	Glyphosate	E	ESTIMATE	EPA UWWTP Tool Version 5.0	14.78	14.798	0.0	0.018
389	Benzo[a]pyrene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.019	0.019	0.0	0.0
390	Benzo[b]fluoranthene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.019	0.019	0.0	0.0
391	Benzo[k]fluoranthene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.019	0.019	0.0	0.0
392	Indeno[1,2,3-c,d]pyrene	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.021	0.021	0.0	0.0
393	Carbon tetrachloride	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
394	2,6-Dichlorobenzamide	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.776	0.779	0.0	0.003
395	Dicofol	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
396	Hexabromocyclodecane (HBCD)	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.0	0.0	0.0	0.0
397	PFOS	E	ESTIMATE	EPA UWWTP Tool Version 5.0	0.005	0.005	0.0	0.0
238	Ammonia (as N)	M	CRM	Colorimetry	11200.8	11253.96	0.0	53.16
303	BOD	M	CRM	Electrometry	16065.0	16141.246	0.0	76.246
306	COD	M	CRM	Colorimetry	251365.997	252559.007	0.0	1193.01
362	Kjeldahl Nitrogen	M	CRM	Dig/Distii/Titrimet	16623.906	16702.805	0.0	78.899
327	Nitrate (as N)	M	CRM	Colorimetry	252413.573	253611.555	0.0	1197.982
372	Nitrite (as N)	M	CRM	Colorimetry	5464.743	5490.679	0.0	25.936
332	Ortho-phosphate (as PO4)	M	CRM	Colorimetry	1952.518	1961.785	0.0	9.267
240	Suspended Solids	M	CRM	Gravimetry	49361.122	49595.395	0.0	234.273

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE | PRTR# : D0004 | Facility Name : Leixlip Waste Water Treatment Plant | Filename : D0004_2013.xls | Return Year : 2013 | 24/02/2014 15:56

Please enter all quantities on this sheet in Tonnes 6

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer	Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
						M/C/E	Method Used					
Within the Country	19 08 01	No	140.1	screenings	D1	M	Weighed	Offsite in Ireland	Oxigen Commercial,W0152-03	Merrywell Industrial Estate,Ballymount Road Lower,Dublin 22,.,Ireland		
Within the Country	**19 08 05**	**No**	6793.78	sludges from treatment of urban waste water	R10	M	Weighed	Offsite in Ireland	Sede Ireland,Awaiting permit approval	Carran,Dunbell,Co Kilkenny,IRE,Ireland		
Within the Country	20 03 01	No	20.95	mixed municipal waste	D1	M	Weighed	Offsite in Ireland	Oxigen Commercial,W0152-03	Merrywell Industrial Estate,Ballymount Road Lower,Dublin 22,.,Ireland		

* Select a row by double-clicking the Description of Waste then click the delete button

Link to previous years waste data
Link to previous years waste summary data & percentage change
Link to Waste Guidance

Section 3. Operational Reports Summary

3.1 Treatment Efficiency Report

Table 5 – Treatment Efficiency Report

	BOD (kg/yr)	COD (kg/yr)	SS (kg/yr)	TP (kg/yr)	TN (kg/yr)
Main Plant Loading	555408	1430131	655388	18128	194849
Intel Plant Loading	826725	2068546	1087883	26250	246953
Combined Plant Loading	1382133	3498677	1743271	44378	441802
Final Effluent	16065	251366	49361	3192	257883
Removed	99	93	97	93	42

Table 5 depicts the removal efficiencies for the combined plant and with the exception of total nitrogen the plant performed excellently. There was 42% removal of total nitrogen and this was not due to poor performance of the plant but the physical absence of nitrogen removal facilities in the Main Plant. Removal efficiencies for nitrogen will remain low until the plant is upgraded.

3.2 Treatment Capacity Report

Table 6 – Current Plant Load & Available Plant Load

Hydraulic Capacity – Design / As Constructed (m3/day)	33,745
Hydraulic Capacity – Current loading (m3/day)	24,950
Hydraulic Capacity – Remaining (m3/day)	8,795
Organic Capacity – Design / As Constructed (PE)	80,000
Organic Capacity – Current loading (PE)	61,510
Organic Capacity – Remaining (PE)	18,490
Will the capacity be exceeded in the next three years?	Yes

The capacity of the 80,000 pe WWTP will be exceeded in the next three years. However, the pending developments are included in the design capacity of the 150,000 pe WWTP. The construction contract is required to be completed on a sectional completion basis in order to facilitate acceptance and treatment of the additional non-domestic wastewater loads before full completion of all works.

3.3 Extent of Agglomeration Summary Report

Table 7 – Extent of Agglomeration Summary Report

	% of total load generated in the agglomeration
Load generated in the agglomeration that is collected in the sewer network	Data not available

Load collected in the agglomeration that enters treatment plant	Data not available
Load generated in the agglomeration going to individual and appropriate treatment systems	Data not available
Load generated in the agglomeration that is not collected and not individually treated	Data not available

3.4 Complaints Summary

Table 8 – Complaints Summary

Number	Date & Time	Nature of Complaint	Cause of Complaint	Action taken to resolve issue	Closed (Y/N)
None					

3.5 Reported Incidents Summary

Table 9 – Summary of Incidents

Incident Type	Incident Description	Cause	No. of Incidents	Corrective Action	Authorities Contacted	Reported to EPA	Closed
Emission	Nitrate non compliance	No nitrogen removal in Main Plant	38	Future upgrade	Fingal Co Co & Fisheries Ireland	Yes	No
Emission	Nitrite non compliance	No nitrogen removal in Main Plant	7	Future upgrade	Fingal Co Co & Fisheries Ireland	Yes	No
Emission	Ammonia non compliance	No nitrogen removal in Main Plant	4	Future upgrade	Fingal Co Co & Fisheries Ireland	Yes	No

Table 10 – Incident Reporting Summary

Number of incidents in 2013	52
Number of incidents reported to the EPA in 2013	49
Explanation of any discrepancies	Access to WWDL on Eden blocked by Irish Water

3.6 Sludge / Other inputs to the WWTP

Table 11 – Other inputs table

Input type	m3/yr	PE/year	% of load (hydraulic)
Domestic / Septic Tank Sludge	5,299	Not available (na)	0.05
Industrial / Commercial Sludge	748	na	0.00
Landfill Leachate (delivered by tanker)	27,176	na	0.28
Landfill Leachate (delivered by sewer network)	0	0	0
WTP sludge	2,255	na	0.02
KCC inputs by tanker (sludge from small WWTP's & sump clean outs)	7,352	na	0.07

Section 4. Infrastructural Assessments and Programme of Improvements

4.1 Storm water overflow identification and inspection report

Table 12A – SWO Identification and Inspection Summary Report

WWDL Name/Code for SWO	Irish Grid Reference	Included in Schedule A4 of the WWDL	Compliance with DoEHLG Criteria	No of times activated in 2013	Estimated / Measured Data	Total volume discharged in 2013 (m^3)	Estimated / Measured data
SW2	301546E 235839N	Yes	Not Compliant	13	Measured	45,765	Measured
SW3	289638E 239169N	Yes	Compliant	0	Measured	0	Estimated
SW4	294412E 238713N	Yes	Compliant	10	Measured	Unknown	Estimated
SW5	297173E 233844N	Yes	Compliant	0	Estimated	0	Estimated
SW6	298219E 233796N	Yes	Compliant	4	Measured	Unknown	Estimated
SW7	297585E 233309N	Yes	Compliant	0	Estimated	0	Estimated
SW8	297584E 233306N	Yes	Compliant	0	Estimated	0	Estimated
SW9	297379E 232911N	Yes	Compliant	1	Measured	Unknown	Estimated
SW10	298650E 233375N	Yes	Compliant	17	Measured	Unknown	Estimated
SW11	298649E 233370N	Yes	Compliant	0	Estimated	0	Estimated
SW12	296936E	Yes	Compliant	0	Estimated	0	Estimated

	232433N						
SW13	301155E 235871N	Yes	Not Compliant	9	Estimated	Unknown	Estimated
SW14	292834E 229614N	Yes	Compliant	0	Measured	0	Estimated
SW15	235863E 300413N	Technical amendment requiring its inclusion was submitted to the EPA in February 2012	Not yet assesses	0	Estimated	0	Estimated

Table 12B – SWO Identification and Inspection Summary Report

How much sewage was discharged via SWO's in the agglomeration in the year (m3/yr)?	Unknown
How much sewage was discharged via SWO's in the agglomeration in the year (p.e.)?	Unknown
What % of the total volume of sewage generated in the agglomeration was discharged via SWO's in the agglomeration in 2013?	Unknown
Is each SWO identified as non-compliant with DoEHLG Guidance included in the Programme of Improvements?	No
The SWO assessment includes the requirements of Schedule A3 & C3	No
Have the EPA been advised of any additional SWO's / changes to Schedule C3 and A4 under Condition 1.7?	Yes – by letter dated February 21st, 2012

4.2 Report on progress made and proposals being developed to meet the improvement programme requirements

Table 13 – Schedule A3 and C Improvement Programme Summary Report

Specified Improvement Programmes	Licence Schedule	Licence Completion Date	Date Expired?	Status of Works	Comment	Licensee Timeframe for Completing the Work
Waste water treatment plant upgrade	C.1	31st January 2012	Yes	Work ongoing on-site	Upgrade commenced Sept 2013	Q4 2015 – Q1 2016
Waste water sewer network infiltration / capacity improvement works	C.1	31st January 2012	Yes	Completed		
Upgrading of sewer network to ensure all SWO's comply with the DoEHLG criteria	C.3	31st January 2012	Yes	Work ongoing on-site	Upgrade commenced Sept 2013	Q3 2014 for two SWO's and no timeframe for the remaining one SWO

Table 14 – Improvement Programme (WWTP) Summary

Improvement Identifier	Improvement Description	Improvement Source	Progress (% complete)	Expected Completed Date
		*WWTP assessment (Condition 5.2)	100	
		Sewer Integrity Tool (Condition 5.2)	0	31/12/14
		Secondary discharges assessment (Condition 5.2)	Not required	
		*SWO assessment (Condition 4 & 5.2)	100	
		Drinking Water Abstraction Risk Assessment (Condition 4)	Not required	
		Shellfish Impact Risk Assessment (Condition 5)	Not required	
		Pearl Mussel Impact Assessment (condition 4)	Not required	

		Improved Operational Control	Not required	
		Incident Reduction	Not required	
		Elimination/Reduction of Priority Substances	Not required	

*Reports required in 2013 AER – no change in situation so not appropriate to repeat exercise in 2013, 2010 reports included in appendices.

Table 14A - Sewer Integrity Risk Assessment Tool Improvement Programme (Works) Summary

Assessment not carried out – planned to be carried out in 2014

4.3 Statement of Measures

Table 15 Statement of Measures

Risk I.D.	Risk Score	Mitigation measure to be taken	Outcome	Action	Date for completion	Owner/Contact Person
15	10	Upgrade to SW2 & SW13	Compliance with DoEHLG criteria	WWTP upgrade underway	Q3 2014	Gerry Conlan, Senior Engineer
16	4	Plant upgrade	Full ELV compliance & increased capacity	WWTP upgrade underway	Q4 2015	Gerry Conlan, Senior Engineer
Statement						
I confirm the above are the measures which will be taken by the Local Authority in 2013						
Signed:						
Name		Date				
	The appropriate Officer should sign the Programme of Measures					

Section 5. Licence Specific Report

Table 16 – Licence Specific Reports Summary

Licence Specific Report	Required in 2013 AER or outstanding from previous AER	Included in 2013 AER	Location in 2013 AER
Priority Substances Assessment	No	No	NA
Drinking Water Abstraction Point Risk Assessment	No	No	NA
Habitats Impact Assessment	No	No	NA
Shellfish Impact Assessment	No	No	NA
Toxicity / Leachate Management	No	No	NA
Toxicity of Final Effluent Report	Yes	Yes	Summary of findings on page 20. Full report in Appendix 1
Dangerous Substances and Priority Substances Investigation	Yes	Yes	Summary of findings on page 20. Full report in Appendix 2

6.1 Toxicity of Final Effluent Report

Table 17 – Toxicity Assessment of Final Effluent

Is a Toxicity report required?	Yes
Has the study been carried out against 4 species in 3 trophic levels?	No*
Does the report identify that the discharge is toxic to any of the species in the study?	No
List species impacted	None
Are measures to reduce the toxicity of the final effluent being implemented by the WSA?	No
Provide details	Not applicable

*study initially carried out, 2010, against 4 species in subsequent years the study is only required on the 2 most sensitive species

6.2 Dangerous Substances and Priority Substances Investigation

The required report on mercury in biota in the River Liffey is included in Appendix 2. In summary the report found 4.9ug/kg of mercury in biota at aSW1d – this is below the maximum allowed 20ug/kg.

Section 6. Certification and Sign Off

Pursuant to the provisions of the Waste Water Discharge (Authorisation) Regulations, 2007, I herby submit the 2013 Annual Environmental Report (AER) for the LLVRSS Agglomeration (Licence Register Number: D0004-01).

Does the AER include an executive summary?	**Yes**
Does the AER include an assessment of the performance of the Waste Water Works?	**Yes**
Is there a need to advise the EPA for consideration of a technical amendment / review of the licence?	**No**
Reason	**N/A**
Is there a need to request / advise the EPA of any modifications to the existing WWDL?	**No**
Reason	**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**
List outstanding reports	**N/A**

I certify that the information given in this AER is truthful, accurate and complete.

Signed by: _____ A/SE
(On behalf of the organisation)

Print signature name: COLM FLYNN

Position in organisation: ACTING SENIOR ENGINEER.

Date: 28/2/14

Appendix 1

Toxicity of Final Effluent Report


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CONFIDENTIAL REPORT
SHANNON AQUATIC TOXICITY LABORATORY

Front Cover Report Sheet

Dept. Toxicity
Sheet no. 1 of 3 sheets

Tox F020 Ver. 2.2

Customer
Kildare County Council
Aras Chill Dara
Devoy Park
Naas
Co. Kildare

Title
Toxicological analysis of an effluent sample

Attn: Mr. Tom Sexton

Report reference: 13T020

Order no.: 400 330 701

Report by: Robert Hernan

Date received: 09.04.13

Approved by: Kathleen O' Rourke
Toxicologist

Copies to: R.6. Files

Date of issue: 17.04.13

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Test report relates only to the sample(s) tested

TOXICOLOGICAL ANALYSIS REPORT

Form No.: ToxF035-1 Ver 2.3

TEST RESULTS

Customer: Kildare County Council

Customer sample description: Final effluent, 09.04.13

Tox. Ref. No.: 13T020

Test Date: 09.04.13 – *Daphnia magna*
10.04.13 – *Vibrio fischeri*

Test Parameter	Test Results		95% Confidence Limits % vol./vol.	Method of Calculation
	Concentration % vol./vol.	Toxic Units		
48 h EC_{50} to *Daphnia magna*	>100	<1	n/a	n/a
30 min EC_{50} to *Vibrio fischeri*	>45	<2.2	n/a	n/a

Comments:

48 h EC_{50} to *Daphnia magna*
No *Daphnia* were immobilized at 100% vol./vol.

30 min EC_{50} to *Vibrio fischeri*
Less than 8% light inhibition occurred at 45% vol./vol.
- compared to the control.

Test Method(s): (see Appendix on back of page 3)
Method 1: Freshwater crustacean, *Daphnia magna*
Method 2: Marine bacterium, *Vibrio fischeri*

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TOXICOLOGICAL ANALYSIS REPORT

Form No.: ToxF035-2 Ver 2.4

SAMPLE INFORMATION

	SATL	Customer	Other
Sampled by:	☐	☑	☐
Collected by:	☑	☐	☐

Tox Ref. No.	13T020
Sampling procedure	n/a
Date of analysis	09.04.13
Storage conditions (°C)	3±3
Temperature (°C)	12.8
pH (at 12.4°C)	7.1
Dissolved oxygen (mg/l)	6.6
Dissolved oxygen (% saturation)	63
Conductivity (µS/cm at 25°C)	1193
Salinity (ppt at 20°C)	<1

Appendix

Toxicity Test Methods and Procedures

1. Freshwater Crustacean
Method 6.1 based on ISO 6341:1996/Cor.1:1998: 'Water quality – Determination of the inhibition of the mobility of *Daphnia magna* Straus (Cladocera, Crustacea) – Acute toxicity test'

2. Marine Bacterium
Method 6.2 based on ISO 11348-3:2007: 'Water quality - Determination of the inhibitory effect of water samples on the light emission of *Vibrio fischeri* (Luminescent bacteria test) – Part 3: Method using freeze-dried bacteria'

3. Marine Copepod
Method 6.3 based on ISO 14669:1999: 'Water quality – Determination of acute lethal toxicity to marine copepods (*Copepoda, Crustacea*)'

4. Marine Algae
Method 6.4 based on ISO 10253:2006: 'Water quality - Marine algal growth inhibition test with *Skeletonema costatum* and *Phaeodactylum tricornutum'*

5. Freshwater Algae
Method 6.5 based on ISO 8692:2004 : 'Water quality – Freshwater algal growth inhibition test with unicellular green algae'

6. Freshwater Plant
Method 6.6 based on ISO 20079:2005: 'Water quality – Determination of the toxic effect of water constituents and waste water to duckweed (*Lemna minor*) – Duckweed growth inhibition test'

7. Marine Fish
Method 6.7 based on OECD 1992: Guideline 203: - 'Fish, acute toxicity test'

8. Freshwater Fish
Method 6.8 based on OECD 1992: Guideline 203: - 'Fish, acute toxicity test'

9. Estuarine Crustacean
Method 6.9 based on MAFF SOP No. BEG/030:1996: 'Brown Shrimp (*Crangon crangon*) 96 h acute toxicity for liquid effluents and wastes'

10. Sampling
Method based on ISO 5667-16:1998: 'Water quality – Sampling - Part 16: Guidance on biotesting of samples'

11. Eluate Generation
Procedure 4.7.8. "Eluate Generation" based on DIN 38 414 part 4, 1984: – 'Sludge and Sediments (Group S) – Determination of leachability by water (S4)'

Appendix 2

Ecological Monitoring Survey 2013 (mercury in biota report)

Leixlip Waste Water Treatment Plant: Ecological Monitoring Survey 2013

Report for:
Water Services Section,
Kildare County Council,
Áras Chill Dara,
Devoy Park,
Naas,
Co. Kildare.

August 2013

John Brophy B.A. (Mod.), M.Sc., MCIEEM

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Email: info@botanicalenvironmental.com

Table of contents

1 Introduction

BEC Consultants Ltd was appointed by the Water Services Section of Kildare County Council to carry out the monitoring of aquatic macroinvertebrate communities and the concentration of mercury in the biota in the River Liffey in relation to a waste water discharge license for the waste water treatment plant (WWTP) servicing the Lower Liffey Valley Regional Sewerage Scheme agglomeration.

In accordance with Article 3 of the Priority Substances Directive (2008/105/EC) an additional condition in relation to a receiving water limit for mercury levels in biota has been applied. Condition 4.20.1 of the licence sets a maximum target level for mercury and its compounds in biota (prey tissue – wet weight) of 20 µg/kg at the edge of the mixing zone of the primary discharge, choosing the most appropriate indicator from amongst fish, molluscs, crustaceans and other biota.

Some aquatic organisms are known to accumulate contaminants from the surrounding water. These contaminants accumulate up the food web in a process known as biomagnification. Therefore the tissue of organisms of higher trophic levels (higher in the food web), such as carnivorous fish, can accumulate higher concentrations of contaminants compared to those of lower trophic levels.

In this study the amphipod *Gammarus duebeni* Liljeborg, 1852 (Crustacea: Malacostraca) was selected for the mercury in biota assessment. *Gammarus duebeni* is an omnivore, feeding on a wide variety of plant and animal material (Gledhill *et al.*, 1993) and it is in turn consumed by fish. Additionally, the water quality at each of the study sites in the vicinity of the WWTP was assessed. This was based on the macroinvertebrate communities present which allow for Q-values to be determined i.e. giving an indication of the amount of organic pollution present if any (Toner *et al*., 2005).

2 Methods

2.1 Study area

A field survey was carried out on the 2nd July 2013 at each of three sites on the River Liffey; two upstream (U2 and U1) and one downstream (D1) of the discharge point of Leixlip WWTP (Table 1). Site U2 was located directly upstream of the bridge in Celbridge (Appendix I, Plate 1). Site U1 was located directly upstream of the bridge in Leixlip (Appendix II, Plate 2). Site D1 was located directly downstream of the Lucan weir located off the N4 motorway between Leixlip and Lucan (Appendix I, Plate 3).

Table 1. Details of the survey sites.

Site code	Irish Grid (10m accuracy)	Description
U2	N 9736 3291	Upstream of bridge in Celbridge
U1	O 0080 3583	Upstream of bridge in Leixlip
D1	O 0223 3528	Downstream of Lucan weir

2.2 Physico-chemical parameters

A range of physico-chemical parameters were measured *in situ* at each sampling site using Oxyguard Handy meters, including:

- Dissolved oxygen (concentration and saturation)
- Temperature
- pH
- Conductivity

2.3 Mercury in biota

The mercury concentration in the biota was analysed for each site. For this purpose, samples of macroinvertebrates were collected by means of kick samples obtained in 0-0.5 m of water depth using a standard Freshwater Biological Association (FBA) pond net with a 1 mm mesh. Samples were transferred to a white tray and *Gammarus duebeni* specimens were picked out until approximately 5 g of material had been collected for analysis from each site. The samples were placed in the appropriate sample container, labelled and sent to a UKAS-accredited laboratory (Environmental Agency – National Laboratory Service, Leeds) using a next-day delivery courier service. Levels of mercury in dry tissue were determined by cold vapour atomic fluorescence spectroscopy after microwave HNO_3/H_2O_2 digestion, and acidic $SnCl_2$ reduction.

Results were converted into wet weight using the following formula (provided by Environmental Agency – National Laboratory Service):

Wet Weight Hg = (Dry Weight Hg Result x % dry weight)/100

2.4 Biological water quality (Q-values)

Standard two-minute kick samples with stone-washing were taken for macroinvertebrates at each site. Samples were inspected *in situ* in order to identify any species of conservation concern that may be present in order to record them and return them to the river alive.

Samples were preserved in 70% Industrial Methylated Spirits (IMS) and returned to the BEC Consultants laboratory for processing. Samples were washed through 1 mm sieve. All macroinvertebrates were extracted from the samples, identified to the lowest possible taxonomical level and enumerated.

Q-values were calculated for each site following the EPA methodology (Toner *et al.*, 2005). Relative abundances were calculated as follows: 1 or 2 individuals = Present, <1% = Scarce/Few, <5% = Small numbers, 5-10% = Fair numbers, 10-20% = Common, 25-50% = Numerous, 50-75% = Dominant, >75% = Excessive. The EPA faunal indicator groups of sensitivity to pollution are A (sensitive), B (less sensitive), C (tolerant), D (very tolerant) and E (most tolerant). For accurate

calculation of a Q-value kick sampling should be carried out according to the specifications of Toner *et al*. (2005), as was done in this survey.

3 Results

3.1 Mercury and physico-chemical results

The results for the mercury in biota analysis from the *Gammarus duebeni* tissue samples are presented in Table 2 while the results of *in situ* physico-chemical water analysis are presented in Table 3.

Table 2. Mercury concentration in *Gammarus duebeni* tissue samples. Conversion factors for each sample supplied by the National Laboratory Service were used to obtain results in wet weight.

Site code	Dry weight (µg/kg)	% Dry weight	Wet weight (µg/kg)
U2	46	13.6	6.3
U1	55	14.3	7.9
D1	34	14.3	4.9

Table 3. Physico-chemical parameters in the River Liffey on 02/07/2013.

Site code	pH	Temperature (°C)	Dissolved oxygen		Conductivity mS/cm
			Concentration (mg/l)	Saturation (%)	
U2	8.2	15	9.2	93	0.2
U1	8.24	15.2	9.5	97	0.3
D1	8.15	19	8.8	93	0.3

3.2 Biological water quality (Q-values)

Kick samples taken at site U2 (Appendix I, Plate 1) contained 393 individuals, representing 21 different species or higher taxa. Group C taxa were present in Excessive numbers (83%) with the freshwater shrimp *Gammarus duebeni* most abundant (22%). Other Group C taxa included the freshwater limpet *Ancylus fluviatilis* and the snail *Theodoxus fluviatilis*, larvae of the water beetles *Elmis aenea* and *Limnius volckmari*, true fly larvae *Dicranota* spp. and of the families Chironomidae and Simuliidae, the mayflies *Baetis rhodani* and *Serratella ignita*, and the uncased caddis *Hydropsyche siltalai*, *Cheumatopsyche lepida* and *Rhyacophila dorsalis*. Group A taxa were present in Fair numbers and represented by the mayflies *Ephemera danica*, *Rhithrogena semicolorata*, *Ecdyonurus torrentis* and *Heptagenia sulphurea*. Group B taxa were present in Small numbers represented by the stonefly *Leuctra inermis* and the cased caddis *Glossosoma boltoni*. Group D taxa were Scarce, represented by the leech *Erpobdella octoculata*. Group E taxa were Absent. The relative proportions of the species groups result in a value of Q4 being assigned to this site indicating unpolluted, Class A water.

Kick samples taken at site U1 (Appendix I, Plate 2) contained 262 individuals, representing 22 different taxa. Group C taxa were present in Excessive numbers (77%) with the mayfly *Serratella*

ignita most abundant (23%). Other Group C taxa included the snail *Theodoxus fluviatilis*, the freshwater shrimp *Gammarus duebeni*, larvae of the water beetle *Elmis aenea*, true flies of the families Chironomidae and Simuliidae, the mayflies *Caenis rivulorum*, *Baetis rhodani* and *Baetis muticus* and the uncased caddis *Hydropsyche siltalai*, *Cheumatopsyche lepida*, *Rhyacophila dorsalis* and *Polycentropus flavomaculatus*. Group B taxa were Common and were represented by the stonefly *Leuctra inermis* and the cased caddis *Athripsodes albifrons* and *Lepidostoma hirtum*. Group A was present in Fair numbers and was represented by the mayflies *Ecdyonurus torrentis* and *Heptagenia sulphurea*. Group D taxa were present in Small numbers and were represented by the leech *Erpobdella octoculata,* the bivalve *Sphaerium* spp. and the water slater *Asellus aquaticus*. Group E taxa were absent. The relative proportions of the species groups result in a value of Q3-4 being assigned to this site, indicating slightly polluted waters, Class B water.

Kick samples taken at site D1 (Appendix I, Plate 3) contained 383 individuals, representing 22 different taxa. Group C taxa were present in Excessive numbers (92%) with the uncased caddis *Hydropsyche siltalai* most common at 43%. Other Group C taxa included the snails *Bithynia tentaculata* and *Theodoxus fluviatilis*, the freshwater shrimp *Gammarus duebeni*, adults and larvae of the riffle beetle *Elmis aenea* and larvae of the beetle *Limnius volckmari*, true flies of the families Chironomidae and Simuliidae, the mayflies *Serratella ignita* and *Baetis rhodani* and the uncased caddis *Cheumatopsyche lepida*, *Rhyacophila dorsalis*, *Polycentropus flavomaculatus* and *Psychomyia pusilla*. Group A taxa were present in Small numbers and were represented by the mayflies *Ecdyonurus torrentis* and *Heptagenia sulphurea*. Group B taxa were present in Small numbers and represented by the stonefly *Leuctra inermis* and the cased caddis *Athripsodes albifrons* and *Lepidostoma hirtum*. Group D taxa were present in Small numbers and were represented by the leech *Glossiphonia complanata* and the bivalve *Sphaerium* spp. Group E taxa were Absent. The relative proportions of the species groups result in a value of Q3-4 being assigned to this site, indicating slightly polluted waters, Class B water.

A full list of macroinvertebrates taxa and their respective abundance found at each of the site is presented in Appendix II, Table A1.

3.3 Other notable observations

White-clawed crayfish *Austropotamobius pallipes* and lamprey were recorded at sites D1 and U2. These species are listed under Annex II of the European Union's Habitats Directive (92/43/EEC). A kingfisher was recorded at Site D1 and is listed under Annex I of the European Union's Birds Directive (2009/147/EC).

4 Discussion

4.1 Biological water quality (Q-values)

Biological water quality, as indicated by Q-values, was Q4 at the uppermost site (U2), indicating unpolluted, Class A water and was Q3-4 at U1 and D1, indicating slightly polluted, Class B water.

These results indicate an improvement in water quality at all three sample sites as compared to the 2012 monitoring results, when all three sites returned a Q3 (BEC, 2012). The results from the 2013 monitoring are comparable to nearby EPA sampling stations last surveyed in 2010: Bridge at Celbridge, Leixlip Bridge and Lucan Bridge (Table 4), although the Q3-4 recorded at Leixlip Bridge is an improvement on the 2010 result from the EPA (Q3).

Table 4. Results of 2010 EPA monitoring (EPA, 2013)

Monitoring station	Q-value
Bridge in Celbridge	Q4
Leixlip Bridge (RHS)	Q3
Lucan Bridge	Q3-4

The fact that the water quality appears to have improved at all three sample sites suggests the improvement is linked to a wider catchment effect. This may be due to the lower levels of rainfall occurring in spring and summer 2013 as compared to 2012.

4.2 Mercury in biota

The mercury level in the wet tissue of *Gammarus duebeni* below the discharge point of Leixlip WWTP was 4.9 µg/kg (Table 2 and Appendix III), which is below the limit of 20 µg/kg stipulated by the EPA discharge licence.

Mercury levels in *G. duebeni* recorded at the three sampling stations in 2013 are highest at the middle station (U1) and lowest at the downstream station (D1). When compared with the results from 2010 and 2012 (Table 5), this variation in the levels does not allow any inferences to be drawn as to the source of any mercury input to the River Liffey, either natural or anthropogenic.

Table 5. Mercury concentrations (wet weight µg/kg) in samples of *Gammarus duebeni*

Site	2010	2011	2012	2013
U2	6.8	4.7	6.0	6.3
U1	5	4.8	4.8	7.9
D1	2.2	4.7	6.3	4.9

In 2012, mercury levels were highest at the downstream site (D1), with a value of 6.3 µg/kg, and lowest at the middle site (U1) with a value of 4.8 µg/kg; the upper site (U2) returned a value of 6.0 µg/kg.

In 2011, mercury levels showed a consistency between the sampling points with the samples from U2 and D1 returning a level 4.7 µg/kg and the sample from U1 returning 4.8 µg/kg, while in 2010, a decreasing trend of mercury from U2 (6.8 µg/kg), to U1 (5.0 µg/kg) to D1 (2.2 µg/kg) was recorded.

The variation in the mercury levels recorded across the three sample locations across the four survey years may be due to the natural variation of levels or changes to the River Liffey upstream of, or within, the study area. The River Liffey drains a relatively densely populated area and there are many possible influxes of contaminants upstream of the examined discharge. No obvious trend has emerged for mercury levels in *Gammarus deubeni* in the River Liffey from the monitoring that has been carried out this far, with each sampling station returning the lowest reading for at least one of the monitoring years.

In conclusion, the level of mercury in biota downstream of the Leixlip WWTP is well below the 20 µg/kg limit stipulated by the EPA Waste Water Discharge Licence, and lower than the level recorded at the upper two sampling stations (U1 and U2) suggesting the discharge is not leading to any increase in the mercury levels of the River Liffey.

5 References

BEC (2012) Leixlip Waste Water Treatment Plant: Ecological Monitoring Survey 2012. Report prepared by BEC Consultants Ltd, Dublin 2 for the Water Services Section, Kildare County Council, Naas, Co. Kildare.

EPA (2013) EPA ENVision website accessed at www.epa.ie on 11/07/2013. Environmental Protection Agency, Johnstown Castle, Co. Wexford.

Gledhill, T., Sutcliffe, D.W. and Williams, W.D. (1993) *British freshwater Crustacea Malacostraca: a key with ecological notes*. Scientific Publication No. 52. Freshwater Biological Association, Ambleside.

Toner, P., Bowman, J., Clabby, K., Lucey, J., McGarrigle, M., Concannon, C., Clenaghan, C., Cunningham, P., Delaney, J., O'Boyle, S., MacCarthaigh, M., Craig M. and Quinn, R. (2005) *Water Quality in Ireland 2001–2003*. Environmental Protection Agency, Johnstown Castle, Wexford.

Appendix I - Plates

Plate 1. Site U2 at Celbridge Bridge.

Plate 2. Site U1 at Leixlip Bridge.

Plate 3. Site D1 downstream of the Lucan weir.

Appendix II - Macroinvertebrate species list

Table A1. Results of the macroinvertebrate sampling on the River Liffey on 02/07/2013

EPA sensitivity group	Taxa	U2	U1	D1
	ANNELIDA			
-	*Stylodrilus heringianus*	21	-	1
-	*Eiseniella tetraedra*	-	3	-
D	*Glossiphonia complanata*	-	-	1
D	*Erpobdella octoculata*	3	1	-
	MOLLUSCA			
C	*Ancylus fluviatilis*	3	-	-
C	*Bithynia tentaculata*	-	-	1
C	*Theodoxus fluviatilis*	9	1	1
D	*Sphaerium* spp.	-	5	6
	CRUSTACEA			
C	*Gammarus duebeni*	86	25	28
D	*Asellus aquaticus*	-	1	-
	INSECTA			
	Coleoptera			
C	*Elmis aenea (*larva)	1	-	10
C	*Elmis aenea* (adult)	-	-	4
C	*Limnius volckmari* (larva)	12	2	2
	Diptera			
C	Chironomidae	11	27	17
C	*Dicranota* spp.	2	-	-
C	Simuliidae	6	5	2
	Ephemeroptera			
A	*Ephemera danica*	1	-	-
A	*Rhithrogena semicolorata*	2	-	-
A	*Ecdyonurus torrentis*	12	9	5
A	*Heptagenia sulphurea*	19	9	8
C	*Caenis rivulorum*	-	2	-
C	*Baetis rhodani*	81	1	6
C	*Baetis muticus*	-	1	-
C	*Serratella ignita*	79	61	25
	Plecoptera			
B	*Leuctra inermis*	7	26	3
	Trichoptera			
B	*Athripsodes albifrons*	-	4	2
B	*Lepidostoma hirtum*	-	1	5
B	*Glossosoma boltoni*	1	-	-
C	*Hydropsyche siltalai*	8	22	162
C	*Cheumatopsyche lepida*	19	41	71
C	*Rhyacophila dorsalis*	10	12	20
C	*Polycentropus flavomaculatus*	-	3	1
C	*Psychomyia pusilla*	-	-	2
	Total abundance	**393**	**262**	**383**
	Total number of taxa			
	Q value	**Q4**	**Q3-4**	**Q3-4**

Appendix III - Mercury analysis results

National Laboratory Service

Analytical Report

Final Report

Report ID - 20054444 - 1

Batch description: PRJ69 - Lexilip Mercury 2013

Reported on: 29-Jul-2013

Client: Botanical Environmental Ltd

Folder No: 002390460

Comments: U2 Upstream 2

Quote No: 10102

Project: Mercury in Biota

Sample Point Name: CC Botanical Environmental

Sampled on: 3-Jul-13 @ 14:30

Matrix: Biota - Fauna

Analyte	Result	Units	Flag	MRV	Accred	Lab ID	Testcode
Mercury : Dry Wt	0.0460	mg/kg		0.001	UKAS	SC	345

NLS Leeds
Olympia House
Gelderd Lane
Gelderd Road
Leeds LS12 6DD

NLS Nottingham
Meadow Lane
Nottingham
NG2 3HN

NLS Starcross
Staplake Mount
Starcross
Exeter
EX6 8FD

Environment Agency

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National Laboratory Service

Analytical Report

Final Report

Report ID - 20054444 - 1

Batch description: PRJ69 - Lexilip Mercury 2013

Reported on: 29-Jul-2013

Client: Botanical Environmental Ltd

Folder No: 002390459

Comments: U1 Upstream 1

Quote No: 10102

Project: Mercury in Biota

Sample Point Name: CC Botanical Environmental

Sampled on: 3-Jul-13 @ 12:00

Matrix: Biota - Fauna

Analyte	Result	Units	Flag	MRV	Accred	Lab ID	Testcode
Mercury : Dry Wt	0.0550	mg/kg		0.001	UKAS	SC	345

NLS Leeds
Olympia House
Gelderd Lane
Gelderd Road
Leeds LS12 6DD

NLS Nottingham
Meadow Lane
Nottingham
NG2 3HN

NLS Starcross
Staplake Mount
Starcross
Exeter
EX6 8FD

Environment Agency

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National Laboratory Service

Analytical Report

Final Report

Report ID - 20054444 - 1

Batch description: PRJ69 - Lexilip Mercury 2013

Reported on: 29-Jul-2013

Client:	Botanical Environmental Ltd	Project:	Mercury in Biota
		Sample Point Name:	CC Botanical Environmental
Folder No:	002390458	Sampled on:	3-Jul-13 @ 10:30
Comments:	D1 Downstream 1		
Quote No:	10102	Matrix:	Biota - Fauna

Analyte	Result	Units	Flag	MRV	Accred	Lab ID, Testcode
Mercury : Dry Wt	0.0340	mg/kg		0.001	UKAS	SC 345

NLS Leeds
Olympia House
Gelderd Lane
Gelderd Road
Leeds LS12 6DD

NLS Nottingham
Meadow Lane
Nottingham
NG2 3HN

NLS Starcross
Staplake Mount
Starcross
Exeter
EX6 8FD

Environment Agency

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Appendix 3

Flow & Load Survey 2013

KILDARE COUNTY COUNCIL

Comhairle Chontae Cill Dara

LOWER LIFFEY VALLEY REGIONAL SEWERAGE SCHEME

Flow & Load Survey

2013

WWDA Licence No. D0004-01

May 2013

Water Services Section
Aras Cill Dara
Devoy Park
Naas
Co. Kildare

Tel: (045) 980362
Fax: (045) 980359

Table of Contents

1. Introduction

The Lower Liffey Valley Regional Sewerage Scheme was granted a Waste Water Discharge Licence, WWDL, on May 6th 2009. Condition 1.7 of this WWDL requires Kildare County Council to assess the available organic and hydraulic treatment capacities at the agglomerations waste water treatment plant.

1.7.1 The licensee shall, on an annual basis, undertake an assessment of the remaining organic and hydraulic treatment capacities within the waste water works (capacity of plant, less flow-load calculation for representative period).

In order to satisfy this condition Kildare County Council undertook a seven day flow and load study at the waste water treatment plant in Leixlip between May 23rd and May 29th.

2. Flow & Load Monitoring

The flow and sampling locations for the Flow and Load Survey utilised the existing Main Plant and Intel Plant influent sampling locations. Both these sampling sites are post preliminary treatment, include process water returned to the head of the works, and include imported sludge and landfill leachate.

2.1 Sampling Equipment

The existing Isco 4700 refrigerated samplers were used to provide a composite sample for the Main and Intel Plants. Samples were collected each morning at approximately 8am.

2.2 Flow Monitoring

Flow monitoring was provided by the existing Bailey Fisher Mag and Parti Meters. The daily flows were recorded each morning at 8am.

2.3 Rainfall Monitoring

Rainfall levels were provided by the Met Eireann station at the Ardrass House Celbridge.

3. Results

Table 3.1 – Flow and Load Survey Results for the Main Plant

Date	Daily Flow (m3)	BOD Load (kg/day)	Population Equivalent	Total Ammonia Load (kg/day)	Suspended Solids Load (kg/day)
23/5/2013	7766	994	16567	396	901
24/5/2013	8158	2317	38617	547	2341
25/5/2013	7468	1225	20417	403	993
26/5/2013	7712	1542	25700	409	1581
27/5/2013	8196	1680	28000	295	1705
28/5/2013	9499	2128	35467	332	2242
29/5/2013	8749	1032	17200	735	2712

Table 3.2 – Flow and Load Survey Results for the Intel Plant

Date	Daily Flow (m3)	BOD Load (kg/day)	Population Equivalent	Total Ammonia Load (kg/day)	Suspended Solids Load (kg/day)
23/5/2013	15862	2411	40183	397	2855
24/5/2013	16319	1403	23383	473	1012
25/5/2013	15724	959	15983	330	959
26/5/2013	15521	1211	20183	357	1506
27/5/2013	16433	2218	36967	394	2054
28/5/2013	19128	2946	49100	363	2946
29/5/2013	18113	3768	62800	398	1811

Table 3.3 – Flow and Load Survey Results for Both Plants Combined

Date	Daily Flow (m3)	BOD Load (kg/day)	Population Equivalent	Total Ammonia Load (kg/day)	Suspended Solids Load (kg/day)
23/5/2013	23628	3405	56750	793	3756
24/5/2013	24477	3720	62000	1020	3353
25/5/2013	23192	2184	36400	733	1952
26/5/2013	23233	2753	45883	766	3087
27/5/2013	24629	3898	64967	689	3759
28/5/2013	28627	5074	84567	695	5188
29/5/2013	26862	4800	80000	1133	4523

Table 3.4 – Rainfall at the WWTP during the Flow and Load Survey

Date	Rainfall (mm)
16/5/13	0.0
17/5/13	0.0
18/5/13	1.6
19/5/13	0.0
20/5/13	0.0
21/5/13	0.0
22/5/13	0.0
23/5/13	0.0
24/5/13	0.0
25/5/13	2.7
26/5/13	12.7
27/5/13	2.8
28/5/13	6.0
29/5/13	0.0

4. Discussion

Table 4.1 summaries the findings from the Flow and Load Survey. The current organic load on the WWTP was found to be a population equivalent, pe, of 61,510 while the hydraulic load was found to be 24,950m^3/day.

Table 4.1 – Current Plant Load & Available Plant Load

Hydraulic Capacity – Design / As Constructed (m3/day)	33,745
Hydraulic Capacity – Current loading (m3/day)	24,950
Hydraulic Capacity – Remaining (m3/day)	8,795
Organic Capacity – Design / As Constructed (PE)	80,000
Organic Capacity – Current loading (PE)	61,510
Organic Capacity – Remaining (PE)	18,490

Appendix 4

Condition 5 Programme of Improvement Report

Kildare County Council
Comhairle Chontae Cill Dara

LOWER LIFFEY VALLEY REGIONAL SEWERAGE SCHEME
LEIXLIP WASTEWATER TREATMENT PLANT

PROGRAMME OF IMPROVEMENTS REPORT

February 2011

Nicholas O'Dwyer
CONSULTING ENGINEERS

LOWER LIFFEY VALLEY REGIONAL SEWERAGE SCHEME
LEIXLIP WATEWATER TREATMENT WORKS

PROGRAMME OF IMPROVEMENTS REPORT

Nicholas O'Dwyer Ltd.,
Consulting Engineers,
Nutgrove Office Park,
Nutgrove Avenue,
Dublin 14.

February 2011

PROJECT NO. 20458					
Revision	**Reason for Revision**	**Prepared by**	**Reviewed by**	**Approved by**	**Issue Date**
-	Draft	F. Lane	N. Delaney	N. Delaney	08/12/2010
A	Updated following review of Leixlip WWTW scheme	F. Lane	N. Delaney	N. Delaney	18/02/2010
B	Minor changes	F. Lane	N. Delaney	N. Delaney	21/02/2010
C					
D					

CONTENTS

1 Introduction

1.1 Background

Kildare County Council submitted an application to the Environmental Protection Agency (EPA) for a wastewater discharge licence for the Lower Liffey Valley Sewerage Scheme agglomeration in accordance with the requirements of the of the Waste Water Discharge (Authorisation) Regulations 2007. The Lower Liffey Valley Sewerage Scheme agglomeration was issued with a Wastewater Discharge Licence by the EPA on the 9th May 2009.

1.2 Scope of Report

The purpose of this report is to provide details of the Programme of Improvements in accordance with the requirements of Condition 5 of the wastewater discharge licence relating the wastewater treatment plant (WWTP). The requirements of Condition 5 of the licence are summarised as follows:

- Assess existing wastewater treatment plant and level of treatment
- Assess receiving waters designation and use
- Provide programme and details of any proposed improvement works

The complete requirements of Condition 5 are included in Appendix No. 1 of this report. A separate report is being prepared on behalf of Kildare County Council to review the requirements for the sewerage network.

1.3 Overview of Leixlip WWTP and Network

The existing wastewater treatment plant was designed as two separate streams referred to as the 'Main Stream' and the 'Intel Stream'. The total capacity of these two streams is 80,000 PE. The main stream of the existing Leixlip wastewater treatment plant was completed in 1990/1991. The wastewater treatment plant was upgraded and expanded in the late 1990's. During this expansion a new separate stream was constructed for the load from the new Intel facility in Leixlip. Kildare County Council appointed Nicholas O'Dwyer Limited in association with PJ Tobin in 2004 to advance the works proposed in the Preliminary Report for the Lower Liffey Valley Sewerage Scheme to planning, contract document and construction phases. The main purpose of the Lower Liffey Valley Sewerage Scheme is to upgrade and expand the existing collection network and wastewater treatment plant.

The contract for the sewerage network element of the Lower Liffey Valley Sewerage Scheme is currently under construction. This contract includes for on-line stormwater storage, separation of surface water flows where feasible and upgrading, repair and extension of pipelines as identified in the Preliminary Report. The network contract will reduce the flows per population equivalent within the catchment being received at the wastewater treatment plant and provide balancing of flows within the network.

An Environmental Impact Statement for the expanded wastewater treatment plant was approved by An Bord Pleanála in 2006. Contract documents for the proposed Design-Build Works to expand the existing wastewater treatment plant to 150,000 PE were submitted to Kildare County Council in 2009. The expansion of the wastewater treatment plant is included on the Water Services Investment Programme 2010 – 2012 (WSIP).

2 Assessment of the Existing Wastewater Treatment Plant

2.1 Introduction

An assessment of the existing wastewater treatment plant under Condition 5.2a is detailed in Section 2.2 to Section 2.7 below. This includes an assessment of the following as required by Condition 5.2a:-

i. *the waste water treatment plant, having regard to the effectiveness of the treatment provided by reference to the following:*
ii. *the existing level of treatment, capacity of treatment plant and associated equipment;*
iii. *the emission limit values specified in Schedule A: Discharges, of this licence;*
iv. *designations of the receiving water body;*
v. *downstream abstractions and uses of water;*
vi. *water quality objective for the receiving water body;*
vii. *the standards and volumetric limitations applied to any industrial waste water that is licensed to discharge to the waste water works.*

2.2 Existing Level of Treatment and Existing Capacity

The existing wastewater treatment plant was designed as two separate streams referred to as the 'Main Stream' and the 'Intel Stream'. The total capacity of these two streams is 80,000 PE. The influent load parameters to the existing wastewater treatment plant based on the design capacity of 80,000 PE are summarised in Table 2.1 below.

Table 2.1 – Design Capacity

Parameter	Intel Load	Municipal Load	Total Design Load
Population Equivalent	22,500	57,500	80,000
Daily Dry Weather Flow (m^3/day)	20,000	10,350	30,350
Peak Flow to Full Treatment(l/s)	270	360	630
BOD (kg/day)	1,350	3,450	4,800
Suspended solids (kg/day)	1,620	4,140	5,760
Ammonia (kg.N/day)	459	506	938
Total Nitrogen (kg.N/day)	540	633	1,173
Total Phosphorus (kg.P/day)	68	144	211

The current loads to the plant are summarised in **Section 3.2** below. The current average daily flows over each monthly period normally exceed the total flow of 30,350m^3/day. The provision of stormwater tanks within the sewer network will provide a reduction in the overall peak flows reaching the wastewater treatment plant. The treatment plant is suitable for accepting peak flows as detailed above

for limited periods.

2.2.1 Wastewater Treatment Plant Effluent Standards

There are two sets of design effluent standards for the existing wastewater treatment plant. The Intel stream provides for nitrogen removal from the effluent. The main stream is not designed for nitrogen removal. These effluent standards are summarised in Table 2.2 below.

Table 2.2 –Final Effluent Discharge Limit Standards – Existing Design

Parameter	Maximum Concentration[1] mg/l
Main Treatment Stream	
BOD_5	8
COD	100
Total Suspended Solids	15
Total Phosphorus	1.0
Intel Stream	
BOD_5	8
COD	100
Total Suspended Solids	15
Total Phosphorus	0.6
Total Nitrogen	9

The wastewater treatment plant is currently compliant with all the parameters in the design effluent treatment standards. Details of compliance with the Emission Limit Values (ELV's) of the Wastewater Discharge are included in Section 2.3.

2.3 Emission Limit Values in Wastewater Discharge Licence

Kildare County Council applied to the EPA for a Wastewater Discharge Licence (WWDL) in December 2007 under S.I. No. 684 of 2007, Waste Water Discharge (Authorisation) Regulations 2007. A licence was issued by the EPA in May 2009. The required effluent standards from the WWDL are summarised in **Table 2.3** below. Compliance with the effluent standards in the WWDL are required from the date of the licence, unless otherwise stated, and supersede the limits in the Environmental Impact Statement.

Table 2.3 – WWDL Primary Discharge Emission Limit Values

Parameter	Emission Limit Value	
pH	6-9	
Temperature (°C)	25	
Oils, fats and grease (mg/l)	15	
BOD_5 (mg/l)	8	
COD (mg/l)	100	
Suspended Solids (mg/l)	20[1]	15[2]
Total Phosphorus (mg/l P)	1.0[1]	0.5[2]
Orthophosphate (mg/l P)	0.39[2]	
Nitrite (mg/l N)	1	
Nitrate (mg/l N)	14.9	
Total Oxidised nitrogen (mg/l N)	15.9	
Ammonia (mg/l N)	2.75[2]	

The wastewater discharge licence includes limits for ammonia and oxidised nitrogen. The oxidised nitrogen limits apply from the date of issue of the licence. It is required to comply with the ammonia limits by 31st January 2012. The main stream of the treatment works is not currently designed to provide nitrogen removal, i.e. it is not designed for either nitrification or denitrification. The limits of the WWDL for oxidised nitrogen and the ammonia limits required by 31st January 2012 are not currently being achieved. A more stringent phosphorus standard is also required by 31st January 2012 which is not currently being achieved.

The performance of the wastewater treatment plant in relation to the current and future Emission Limit Values is detailed in **Table 2.4** below.

[1] Limit applies up to 30th January 2012

[2] Limit applies from 31st January 2012.

Table 2.4 – Compliance with Emission Limit Values (Current and Future)[3]

Parameter	Discharge Limit	Number of Samples	Number of Samples > ELV	Compliant (Yes/No)
pH	6-9	65	0	Yes
BOD_5 (mg/l)	8	58	1	Yes
COD (mg/l)	100	52	1	Yes
Suspended Solids (mg/l)	20	63	1	No
Suspended Solids (mg/l) [4]	*15*	*63*	*10*	*No*
Total Phosphorus (mg/l P)	1.0	56	1	Yes
Total Phosphorus (mg/l P) [4]	*0.5*	*56*	*16*	*No*
Orthophosphate (mg/l P)	*0.39*	*56*	*11*	*No*
Nitrite (mg/l N)	1	54	4	No
Nitrate (mg/l N)	14.9	57	47	No
Ammonia (mg/l N) [4]	*2.75*	*57*	*42*	*No*
Oils, fats and grease (mg/l)	15	8	1	Yes
Fluoride (kg/day)	180	50	0	Yes

Notes
- The number of allowable exceedances of the ELV for pH, flow, BOD, COD & Suspended Solids for 41 to 53 samples = 5 and for: 54 – 67 = 6.
- No exceedance of > 100% above ELV for BOD and COD, or >150% above ELV for SS
- One exceedance of BOD and COD as detailed above is in compliance with the wastewater discharge licence requirements as the exceedances were less than 100% above ELV.
- Eight out of ten consecutive composite results for all other parameters shall not exceed the emission limit value; No exceedance over 20% above ELV

The pH, BOD, COD, fluoride and total phosphorus in the Primary Discharge, over the 12 months from October 2009 to September 2010, were in compliance with the current Emission Limit Values of the Wastewater Discharge Licence. There was one exceedance of the required suspended solids level at 82mg/l.

The wastewater discharge licence has an ELV in the Primary Discharge for Total Phosphorus concentration of 1.0mg/l up to 30th January 2012 and 0.5mg/l after January 2012, as detailed in **Table 2.3**. The WWDL also includes an ELV in the Primary Discharge for orthophosphate (as P) of 0.39mg/l from the 31st January 2012. The current final effluent phosphorus is compliant with the existing ELV. The future Total Phosphorus and Orthophosphate Limits were exceeded for 29% and 20% respectively of the total samples taken over the last 12 months.

87% of the nitrate samples and 7% of the nitrite samples exceed the current Emission Limit Values in the Wastewater Discharge Licence. 74% of the ammonia samples exceed the Emission Limit Value for ammonia required by 31st January 2012.

[3] Data on final effluent standards was taken from the Leixlip Wastewater Treatment Plant monthly PMS reports from October 2009 to September 2010.
[4] The limits from 31st January 2012 for suspended solids, total phosphorus and orthophosphate and ammonia included in italics in Table 2.4 for information

The nitrate levels in the Primary Discharge are consistently in excess of the ELV. This could be reduced by restricting the level of nitrification in the Intel stream to comply with the current wastewater discharge licence. However, this would increase the effluent ammonia levels and thereby increase ammonia levels in the River Liffey. This is not recommended as an appropriate course of action as ammonia will have a detrimental effect on fish life and has a more serious pollutant impact than nitrate.

2.4 Designations of Receiving Water Body

The receiving water body for the Leixlip Wastewater Treatment Plant Primary Discharge (SW1) is the River Liffey. The River Liffey has no Natura 2000[5] designation at the Primary Discharge location. However, the River Liffey Discharges to the South Dublin Bay and River Tolka Special Protection Area approximately 23km downstream of the primary discharge point. There are a total of fourteen stormwater overflows from the Lower Liffey Valley Sewerage Scheme. Two of these storm water overflows discharge to the Rye Water, with one, SWO No. 4 discharging directly to the Rye Water Valley/Carton SAC.

The River Liffey is designated as sensitive under the Urban Wastewater Treatment Regulations (S.I. No. 254 of 2001) downstream of Osberstown wastewater treatment plant to Leixlip reservoir, Co. Kildare and the Liffey estuary is also designated as sensitive from the Islandbridge weir to Poolbeg Lighthouse, including the River Tolka basin and South Bull Lagoon, i.e. the Liffey is designated as sensitive upstream and downstream of the wastewater treatment plant outfall.

An appropriate assessment was prepared by Nicholas O'Dwyer Limited in 2010 under the requirements of the wastewater discharge licence issued for the Lower Liffey Valley Catchment. This assessment considered the impacts of the Lower Liffey Valley Sewerage Scheme on the the Rye Water Valley/Carton Special Area of Conservation and the South Dublin Bay and River Tolka Special Protection Area.

The appropriate assessment concluded that the existing and proposed[6] mitigation measures for the Leixlip WWTP remove the potential for the majority of activities associated with the Leixlip WWTP to have a significant effect alone (or in-

[5] The habitats listed in Annex I and species listed in Annex II of the Habitats Directive, and birds listed on Annex 1 of the Birds Directive are protected by a network of areas known as Natura 2000 and the sites are referred to as 'European Sites'.
[6] The proposed mitigation measures are included in the conditions of the wastewater discharge licence for the Lower Liffey Valley Sewerage Scheme, D0004-01, Environmental Protection Agency

combination) on the River Tolka and Dublin Bay SPA and Rye Water/Carton SAC. There remains an extremely small possibility of extreme/unforeseen events causing significant effects. However, by employing the specified mitigation measures, enforcing the effluent standards required by the WWDL and maintaining existing practices on site, it is considered that the risk of such events occurring has been reduced to the lowest possible level (negligible risk) and thus it can be fully concluded that the integrity of either designated site will not be adversely affected by discharges of wastewater from the Leixlip WWTP.

Further details on the impact of the Lower Liffey Valley Sewerage Scheme on the designated sites are included in the Appropriate Assessment. The proposed mitigation measures are ongoing as further detailed within this report.

2.5 Downstream Abstractions and Uses of Water

There are no drinking water abstractions downstream of the Leixlip Wastewater Treatment Plant.

There are no designated bathing waters in the River Liffey downstream of Leixlip Wastewater Treatment Plant. There are designated bathing waters in the Dublin Bay area. Due to the distance and high level of dilution and dispersion of discharges from the Leixlip Wastewater Treatment Plant, prior to potentially reaching any bathing water, any impact is negligible.

The OPW in conjunction with the local authorities in Kildare, Fingal, South Dublin and Dublin City prepared a Stragegy Report for the Liffey Valley Park. This report reviews the recreational, access, ecological, and built heritage resources along the River Liffey from Ballymore Eustace to Islandbridge. The report identifies canoeing and rowing as the main uses of the River Liffey downstream of the Leixlip Wastewater Treatment Plant.

2.6 Water Quality Objectives for the Receiving Water Body

The River Liffey is one of the most important rivers in Ireland and is a major water source for the Greater Dublin Area. The River Liffey has been a controlled river for more than 50 years. It is dammed at Pollaphuca and Leixlip and there are also three hydro-electric power stations along its course. Due to this artificially controlled hydraulic regime, the River Liffey is defined as a "Heavily Modified Water Body"[7] under the Water Framework Directive[8].

[7] Final Characterisation Report, Hydrometric Area Number 09
[8] Directive 2000/60/EC

The water quality Q-rating in the River Liffey varies along its length between 5 (close to source) and 2-3 in the lower reaches (close to sea). The Eastern River Basin Management Plan categorises the River Liffey as of "moderate" quality throughout the majority of its course[9]. The River is designated in parts under the Urban Waste Water Treatment Regulations 2001, as a "sensitive" river (downstream of the Osberstown sewage treatment works to Leixlip Reservoir, County Kildare).

The Eastern River Basin District River Basin Management Plan 2009 – 2015 (ERBD Plan) prepared in compliance with the Water Framework Directive sets out objectives for the River. Heavily modified water bodies, including the River Liffey, are expected to achieve good ecological potential and this requires that measures addressing water quality are still implemented. Good potential has not yet been defined by the EPA, but an interim potential was provided in the ERBD Plan and the current potential of the River Liffey was described as "Good". In the ERBD measures have been defined to address these issues, but they may require adjustment after the first cycle when good potential for each water body has been defined.

Full details of water quality objectives are available in ERBD Plan. The current ecological potential of the River Liffey as "Good" achieves the current objectives of the ERBD Plan.

2.7 Licensed Industrial Wastewater Discharges

There are two IPPC licensed discharges to the Leixlip Wastewater Treatment Plant from Intel Ireland Limited (Intel) and Hewlett Packard Manufacturing Limited (Hewlett Packard). Details of these discharges are included in Section 2.7.1 and 2.7.2 below. There are an additional fifty-four licences that have been issued by Kildare County Council for industrial and commercial discharges to the Leixlip Wastewater Treatment Plant catchment. Ten of these licences are not currently active. The total commercial and industrial load excluding Intel and Hewlett Packard is less than 10% of the total load to the wastewater treatment plant[10] and as such these discharges have not been examined individually in this section.

2.7.1 Intel Emission Limits

Intel have a current IPPC licence (licence reg. no. 746) to discharge to the Leixlip

[9] Eastern River Basin District – Programme of Measures, 2009 - 2015

[10] Reference: Lower Liffey Valley Sewerage Scheme Preliminary Report

Wastewater Treatment Plant. The current licence includes for emissions to the sewer as detailed in **Table 2.5**.

Table 2.5 –Intel IPPC Licence Emissions to Sewer

Parameter	**Emission Limit Value**		
Flow	200 l/s	720m^3/hr	16,500m^3/day
pH	6 – 9.5		
Temperature	30°C		
Parameter	**Daily Mean Concentration mg/l**	**Daily mean loading kg/day**	
BOD_5	n/a	1,350	
COD	n/a	2,700	
Inorganic Suspended Solids	n/a	2,700	
Total Suspended Solids	n/a	4,125	
Total Dissolved Solids	n/a	60,570	
Total Nitrogen (as N)	n/a	540	
Total Phosphorus (as P)	n/a	67.5	
Fluoride	n/a	160	
Cyanide	0.1	1.35	
Arsenic	0.1	1.35	
Copper	0.3	4.05	
Chromium	0.1	1.35	
Nickel	0.2	2.70	
Tin	0.4	5.40	
Lead	0.4	1.6	
Total heavy metals	n/a	13.50	

The current flow and loads discharged to sewer from Intel is substantially less than the allowable flows and loads in the IPPC licence. The flow discharge is approximately 60 to 70% of the licensed flow. The BOD load discharged is approximately 25% of the licensed load.

2.7.2 Hewlett Packard Emission Limits

Hewlett Packard have a current IPPC licence (licence reg. no. 463) to discharge to the Leixlip Wastewater Treatment Plant. The current licence includes for emissions to the sewer as detailed in **Table 2.6**.

Table 2.6 –Hewlett Packard IPPC Licence Emissions to Sewer

Parameter	**Emission Limit Value**		
Flow	$56m^3$/hr	$1,337m^3$/day	
pH	6 – 9		
Temperature	42°C		
Parameter	**Grab Sample mg/l**	**Daily Mean Concentration mg/l**	**Daily mean loading kg/day**
BOD_5	80	53	70.9
Total Ammonia	45	30	-
Total Dissolved Solids	10,000	8,000	640
Organic Solvents	1	1	-
Suspended solids	96	64	85.6
Nitrates (as N)	30	20	-
Total Phosphorus (as P)	105	70	-
Nickel (as Ni)	0.5	0.5	-
Gold (as Au)	0.5	0.5	-
Palladium (as Pd)	0.5	0.5-	
Arsenic (as As total)	0.5	0.5	-
Chromium (Cr^{3+})	0.75	0.5	-
Cyanide (as CN total)	0.2	0.2	-
Rhodium (as Rd)	0.5	0.5	-

3 Assessment of the Integrity of the Wastewater Treatment Plant

3.1 Introduction

An assessment of the integrity of the wastewater treatment plant under Condition 5.2b is detailed in Section 3.2 and Section 3.3 below. This includes an assessment of the following as required by Condition 5.2b:-

(i) capacity of the waste water works;
(ii) leaks from the waste water works;

3.2 Capacity of the Wastewater Treatment Plant

3.2.1 Capacity of the Existing Wastewater Treatment Plant

The inlet flows to the existing wastewater treatment plant from the Lower Liffey Valley catchment are conveyed to the plant in a 750mm diameter gravity sewer. The Intel flows gravitate to the works in an 800mm diameter sewer. The Intel sewer includes some small local flows from the Leixlip area. The existing inlet sewers to the wastewater treatment plant are surcharged. This is currently causing operational challenges at the works due to surcharging the inlet screens. There is also a potential for overflow from these sewers upstream of the wastewater treatment plant.

The design capacity of the existing wastewater treatment plant as detailed in Section 2.2 is approximately 80,000 PE. The peak hydraulic capacity of the Main Stream in the WWTP is approximately 360 l/s. The Intel stream was designed for a maximum hydraulic capacity of 270 l/sec. Due to the dilute nature of the Intel load and the potential for a disproportionally high influent nitrogen levels, it is necessary to blend some of the Main Stream flows with the Intel stream flows to ensure full treatment.

The existing tertiary sand filters on the Intel stream are designed for a throughput of 270 l/s, i.e. the maximum flows from the Intel stream. The tertiary filters on the main stream are not currently operational. Some upgrade works are required to provide tertiary filtration of the full design hydraulic load to the wastewater treatment plant. However, it should be noted that the effluent standards for BOD and suspended solids are currently in compliance with the Wastewater Discharge Licence Emission Limit Values.

3.2.2 Proposed Works

The works proposed for the expansion of the Lower Liffey Valley Regional

Sewerage Scheme – Leixlip WWTW includes for expansion to a design population equivalent of 149,200 PE. The programme for these works is included in Section 4.

The design of the process tanks at the Leixlip wastewater treatment plant is suitable for an organic (BOD) and hydraulic load for a population equivalent of 80,000 with 22,500PE going to the Intel Stream and 57,500 going to the Main Stream. However, the aeration capacity of the surface aerators in the Main Plant (Aeration Tanks A1 and A2 as shown on Drawing No. 20309-102 in Appendix 2) is insufficient to provide nitrification. In order to comply with the Wastewater Discharge Licence it is necessary to provide additional aeration capacity in the Main Stream (to provide nitrification) in addition to the anoxic and anaerobic zones proposed (as detailed further in Section 4.3).

It is proposed that the Works due to be carried out under the Water Services Investment Programme are phased to initially upgrade the wastewater treatment plant to provide for compliance with the Wastewater Discharge Licence with no additional capacity. The expansion of the works, under the same scheme, to cater for 149,200 PE will then be completed. The upgraded works will be capable of treating the final effluent to comply with the Emission Limit Values required by the Wastewater Discharge Licence.

A summary of the design loads for 80,000 PE is included in **Table 2.1**. The anticipated loads up to 2017 are examined in **Section 3.2.3**.

3.2.3 Current and Future Flows and Loads at Wastewater Treatment Plant

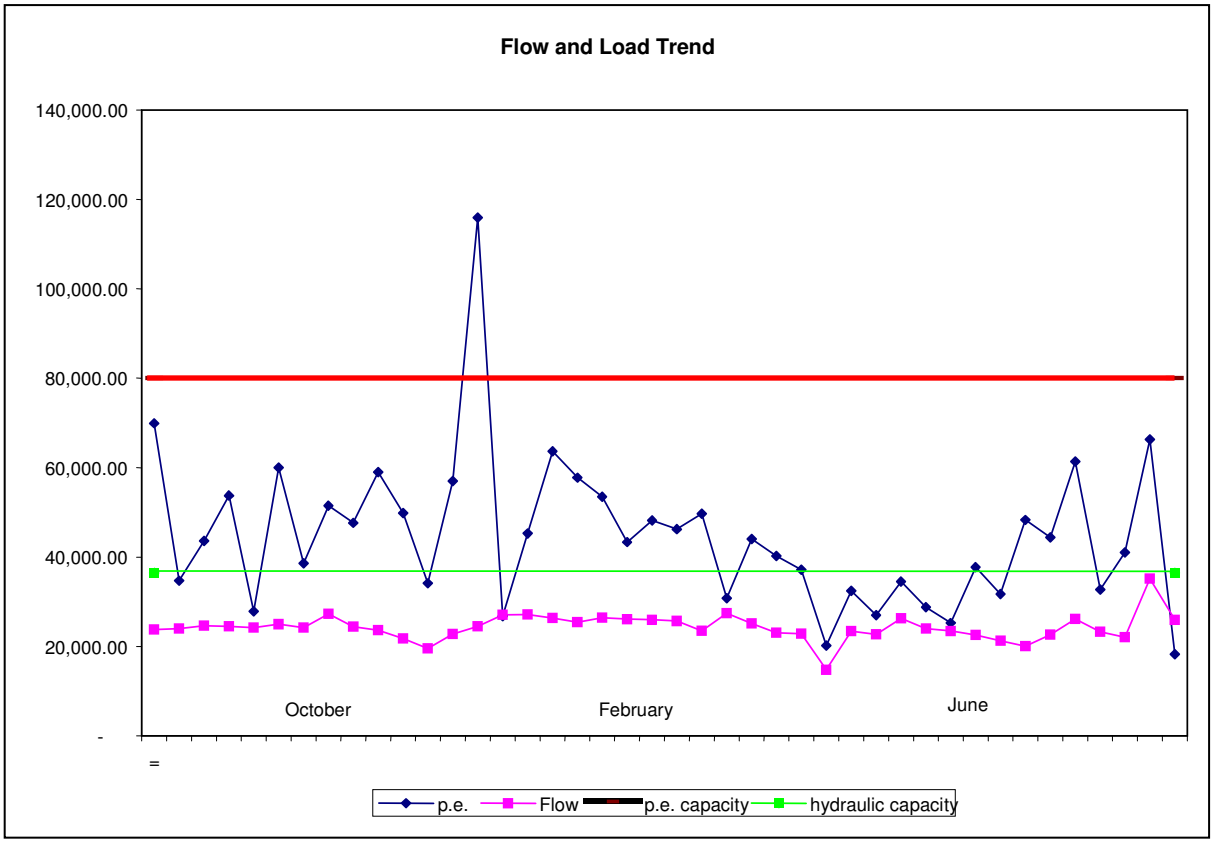
Current Flows and Loads

Flow and load surveys were carried out at the wastewater treatment plant in 2007 and 2008 to assess the accurate flows and loads to the Leixlip WWTP over three 7-day periods. The average population equivalent of 45,000 PE calculated for the period of the flow and load surveys includes a period of lower flows and loads in June where the load from the university in Maynooth and other loads from schools and colleges in the catchment is reduced. The average daily flow during the flow and load survey was 24,278m^3/day. The variation in the load over the period of the survey is indicative of the flat nature of the catchment, i.e. there is a spike in loads associated with the "first flush" following rainfall events. The 95-percentile daily load to the plant at the time of the survey was 66,000 PE.

Assuming a 3% per annum increase in load since 2008, it is estimated that the current daily load is approximately 48,000 PE. The average daily BOD load from Intel in 2008 and 2009 was 282 kg/day, i.e. less than 25% of the IPPC limit. The remaining load from the catchment is estimated as 43,200 PE. It should be noted that the flow measured in one of the surveys in 2008 did not correspond to the flows measured at the wastewater treatment plant site. It is proposed to carry out further 7-day flow and load surveys in 2011 to establish the current flows and loads over a full 7-day period.

A graphical summary of the flows and loads during these surveys is included on Figure 3.1 below:

Table 3.1 - Plot of Flows and Loads during Survey Period



Future Flows and Loads

Population projections from the County Kildare Development Plan 2011-2017 and the Regional Planning Guidelines for the Greater Dublin Area 2010-2022 indicate the domestic population in the catchment of the Leixlip Wastewater Treatment Plant may reach 76,000 by 2017. The total anticipated non-domestic load is 46,000. The total predicted load by 2017 is therefore 121,000. It is

likely that the housing targets in the Regional Planning Guidelines and Development Plan will not be reached. However, as the capacity of the plant is likely to be exceeded over the next 5-10 years, the proposed expansion is due to proceed in accordance with the Water Services Investment Programme.

3.3 Assessment of Leaks from the Wastewater Treatment Plant

An inspection of the existing wastewater treatment plant was carried out in December 2008 as part of the preparation of the Contract Documents for the wastewater treatment plant expansion. The structural integrity of existing process tanks and chambers was inspected at this time. As the tanks and chambers are in use at all times a detailed structural condition survey could not be carried out. However, there is no indication of leaks from the wastewater treatment plant and an improvement in water quality in the receiving waters (River Liffey) supports this assessment. However, structures being upgraded will be inspected during the proposed works and any defects will be remedied.

4 Plan for Implementation of Programme of Works

4.1 Introduction

A plan for implementation of the works required to provide the improvements identified under Condition 5.2 is provided in this section. This includes an assessment of the following as required by Condition 5.3a:-

(i) clearly identify and describe the improvement and the timeframe for implementation;
(ii) specify the parametric emission(s) that will be affected by the implementation of the improvement;
(iii) estimate the costs and sources of funding required to implement the improvement including, where appropriate, details of submissions made to the Department of the Environment, Heritage and Local Government and sanctions received;
(iv) identify the anticipated improvements in the quality of the receiving waters as a result of the implementation of the improvement.

4.2 Review of Existing Wastewater Treatment Plant

The existing wastewater treatment plant was examined prior to the submission of the contract documents in December 2008 to assist in identifying any requirements for upgrading of the works. Following this review which included site visits and discussions with the plant manager additional site upgrade requirements were identified. A further site visit was carried out in August 2010 to identify any additional works that are necessary prior to the full expansion of the wastewater treatment plant.

In general the plant is working effectively. However, there are some hydraulic issues with older settlement tanks (A1, A2 and A3 as shown on Drawing No. 20309-102 in Appendix 2) due to the low side wall height of these tanks. Careful operation of these tanks is required to ensure there is no overflow of the sludge blanket into the Primary Discharge.

4.3 Upgrade Works Proposed

4.3.1 Balancing Tank and Inlet Works

It was recommended in the Environmental Impact Statement for the expansion of the wastewater treatment plant that the two existing streams be blended and balanced to optimise the use of the existing infrastructure and thus reduce the environmental impacts of the proposed expansion. This will provide a more consistent feed to both streams.

In order to facilitate this, the 4,000m^3 balancing tank proposed as part of the scheme should be provided. It will be necessary to provide a cover, mixing and a cleaning facility in this tank to prevent settlement and odours. The provision of a balancing tank will also reduce the sludge age required to achieve nitrification in the aeration basin. Therefore, no additional aeration tanks are required at this stage to provide sufficient sludge age for nitrification

It is also recommended that an inlet filter screen is provided on the Intel line. Settlement of fine inorganic solids in the aeration tanks on the Intel stream has caused excessive maintenance requirements in these tanks due to a build-up of inorganic silt in the tanks.

Once the flows are blended, all flows will go to the existing inlet works. The inlet works is designed for a maximum flow of 700 l/s and is therefore suitable for the proposed flows.

4.3.2 Flow Dividing Chamber and Pipework Modifications

Flows from the inlet works are transferred to the primary settlement tanks. The primary settlement tanks are suitable for the proposed combined flow. It will be necessary to provide a new flow dividing chamber and connection to the existing pipework to the aeration basins due to the new process flow arrangement.

4.3.3 Aeration Tank Modifications

The aerations tanks (A1 and A2) on the main stream are not designed for nitrogen removal. In order to provide for nitrogen removal an anoxic tank is required. This can be provided within the existing tanks by provision of baffle walls within the aeration tank. In light of the works required in each tank, it is recommended that an anaerobic, anoxic and aerobic zone is provided in each tank. The anaerobic zone will provide biological phosphorus removal and the anoxic zone will provide denitrification.

The oxygen requirements to provide nitrification in the aerobic zone will increase from the current oxygen requirements. Some of this oxygen is recovered in the denitrification process. However, there will still be an overall increase in the oxygen required. In order to achieve this it is recommended that the current surface aerators are replaced with a fine bubble diffused air aeration system. Sludge recirculation from the aerobic zone to the anoxic zone is also required to provide a carbon source for denitrification.

4.3.4 Settlement Tank Modifications

The hydraulic problems within the settlement tanks (A1, A2 and A3) can be readily resolved by the provision of baffles within the tanks. This would require the draining down of the tanks to facilitate installation and will have to be carried out when the proposed balancing tank is commissioned.

4.3.5 Modifications to Phosphorus Removal

There is an existing chemical dosing system for phosphorus removal. In addition biological phosphorus removal will be provided in the modified aeration tanks. However, some additional works to provide for additional dosing, control and flexibility in dosing points will be required to guarantee compliance with the required limits.

4.3.6 Modifications to Tertiary Filters

There are existing tertiary filters on the main stream of the wastewater treatment plant. These tertiary filters are not currently operational and require upgrading to provide tertiary filtration of the full design hydraulic load, of 80,000PE, to the wastewater treatment plant. It should be noted that the effluent BOD and suspended solids are currently in compliance with the Wastewater Discharge Licence Emission Limit Values.

4.3.7 Associated Works

Modifications to the existing control system, sludge draw-off and site pipework will be required to accommodate the proposed works detailed above.

4.4 Works Proposed for Plant Expansion

4.4.1 Design Flows and Loads

The proposed upgrade to the wastewater treatment plant under the Water Services Investment Programme, 2010-2012 (WSIP) includes for expansion of the capacity of the existing wastewater treatment works in addition to the upgrade works detailed above.

The design influent load parameters to the wastewater treatment plant following the plant expansion are summarised in **Table 4.1** below.

Table 4.1 - Influent Load

	Design Load	Municipal Load	Intel Load
Population Equivalent	149,200	126,700	22,500
Daily Dry Weather Flow (m^3/day)	38,500	18,500	20,000
Dry Weather flow (1/sec)	446	214	231
Peak Flow to Full Treatment(l/sec) [11]	683	428	255
BOD (kg/day)	8,952	7,602	1,350
COD	33,108	30,408	2,700
Suspended solids (kg/day)	10,742	9,122	1,620
Ammonia (kg.N/day)	1,547	1,115	432
Total Nitrogen (kg.N/day)	1,934	1,394	540
Total Phosphorus (kg.P/day)	384	317	68

4.4.2 Additional Works for Plant Expansion

Following completion of the upgrade works detailed in Section 4.3, the additional works proposed as part of the full upgrade and expansion in accordance with the Preliminary Report and Contract Documents for the scheme are summarised as follows:

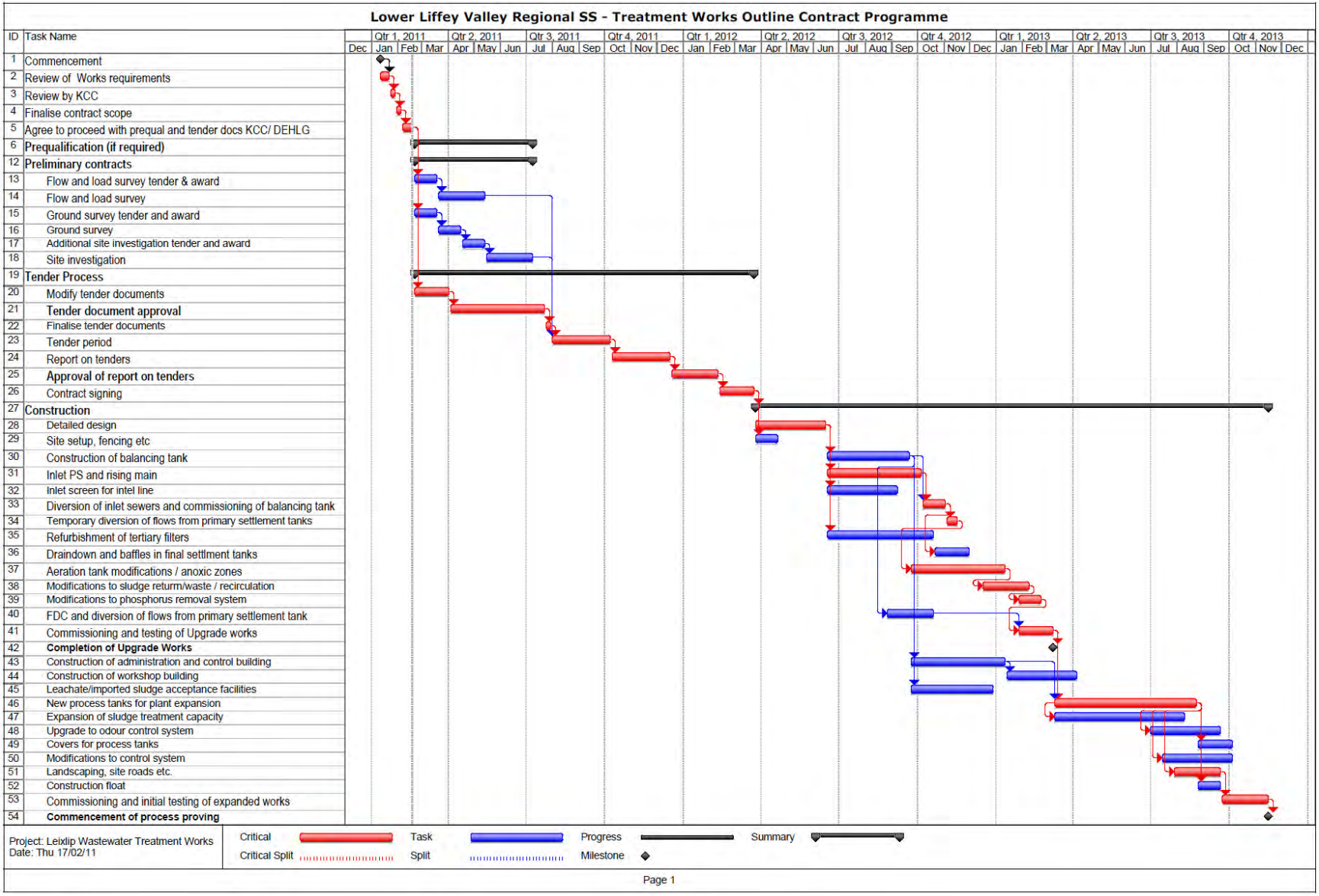
- Two additional aeration tanks adjacent to aeration tanks B1 and B2
- One final settlement tank adjacent to final settlement tank A3
- Modifications to phosphorus removal plant to provide additional capacity
- Additional tertiary filter
- Covers for existing and proposed tanks to contain odour
- Provision of three-stage odour control system or similar to meet odour requirements of the certified Environmental Impact Statement
- Upgrading of sludge thickening dewatering facility
- Disinfection of final effluent
- Provision of new workshop and administration building
- Provision of new imported sludge and leachate facilities
- Pipework, landscaping and siteworks associated with the above
- Electrical installation
- Instrumentation
- Modifications to the control system

[11] It is proposed to limit the flows to full treatment to 1.5 times average dry weather flows. The provision of a balancing tank and the balancing of the Intel flows at the Intel site reduces the peak flows to the WWTW.

4.5 Timeframe for Implementation

A summary programme of works recommended in Section 4.3 and 4.4above is included overleaf. The completion date of full upgrade and expansion of the wastewater treatment plant is November 2013. The initial upgrade works are due to be complete by March 2013. The existing wastewater treatment plant will not be able to comply with the oxidised nitrogen or ammonia Emission Limit Values until the upgrade Works are completed.

Figure 4.1 Preliminary Programme for Upgrade and Expansion Works



4.6 Parametric Emissions Affected by Works

The main parametric emissions which will be affected by the proposed works as detailed above are:

- Ammonia
- Nitrate
- Nitrate

The provision of the balancing tank and the upgrade to aeration tanks A1 and A2 will provide a substantial reduction in the ammonia and total nitrogen in the Primary Discharge.

In addition the following parameters will be affected by the proposed improvements to provide a more reliable level of treatment.

- BOD
- COD
- Suspended Solids
- Phosphorus
- Ortho-phosphate

The BOD, COD, suspended solids and phosphorus will continue to comply with the Emission Limit Values in the Wastewater Discharge Licence. The provision of the balancing tank will provide consistency in flows and loads to the process and thus flexibility in operation and maintenance reducing the overall potential for exceeding the Emission Limit Values.

4.7 Cost Estimates and Funding

A summary of the items identified for inclusion in an advance works contract and a cost estimate for these items is as follows:

Upgrade Works	**Cost, €**
Inlet filter screen	330,000
Balancing tank	480,000
Pumping to existing inlet works	240,000
Flow dividing chamber downstream of primary settlement	120,000
Baffles in final settlement tanks (A1, A2 and A3)	180,000
Pipework modifications from FDC to aeration	80,000
Refurbish or replace backwash filters on main treatment stream	400,000
Control system, electrics and Instrumentation for above Works	320,000
Fencing of additional site area	28,000
Siteworks, Landscaping, Pipework, etc.	180,000

Modifications to existing aeration tanks/blowers	1,200,000
Sludge recirculation on upgraded A1 and A2	180,000
Modifications to phosphorus removal plant	200,000
Sludge Draw-Off, transfer and storage	160,000
Control system, electrics and Instrumentation for above Works	280,000
Siteworks, Landscaping, Pipework, etc.	320,000
Expansion Works	
Additional aeration basin / biological treatment expansion	1,800,000
Additional final settlement tank	800,000
Additional tertiary filter	280,000
Sludge Draw-Off, transfer and storage	220,000
Sludge recirculation	120,000
Modifications to phosphorus removal plant	60,000
Sludge Draw-Off, transfer and storage	240,000
Modifications to sludge dewatering plant	320,000
Tanks covers, odour control system	2,000,000
Administration and control building / workshop	850,000
Leachate and sludge acceptance works	550,000
Disinfection of final effluent	260,000
Control system, electrics and Instrumentation for above Works	850,000
Siteworks, Roads, Landscaping, Pipework, etc.	1,500,000
Total excluding VAT	**14,548,000**
VAT @ 13½%	1,963,980
Total Cost	**€16,511,980**

The Water Services Investment Programme, 2010-2012 includes €17,500,000 as the total capital cost for the Lower Liffey Valley Wastewater Treatment Plant Upgrade. This cost is for the full upgrade to 149,200 PE.

4.8 Anticipated Improvements in Water Quality

The current status of the River Liffey has achieved the current objectives of the ERBD Plan as detailed in Section 2.6. The 95 percentile flow in the River Liffey at the Primary Discharge Point is 2.09m^3/s. The proposed average dry weather flow to the wastewater treatment plant is 428 l/s. The dilution in the River Liffey of the effluent loads is therefore a minimum of 4.9, i.e. the 95 percentile flow in the River Liffey is six times the flow from the Primary Discharge. The average flow in the River Liffey at the Primary Discharge point is 13.32m^3/s, i.e. 31 times the average flow from the wastewater treatment plant Primary Discharge (of 428 l/s).

It is not proposed to provide any further reduction in the BOD and COD loads discharged to the River Liffey from the wastewater treatment plant as the existing plant is operating in compliance with the wastewater discharge licence. However, it is proposed to reduce the nutrients being discharged from the plant, including ammonia, oxidised nitrogen, total phosphorus and orthophosphate. These

improvements will be achieved on completion of the works detailed in Section 4.3 above.

It should be noted that the improvements to the effluent standards at the Leixlip wastewater treatment plants and improvements to sewer network in the Lower Liffey Valley catchments have provided an improvement to the overall water quality of the River Liffey. Further improvements to the ammonia, nitrate and phosphorus levels will be realized on completion of the proposed works which will assist in maintaining and improving the current "Good" status of the River Liffey. The improvements to the ammonia and nitrate levels will be only be perceptible during low flows in the River Liffey due to the high level of dilution at average flows. The improvements to the phosphorus are only minor as there is existing phosphorus removal in the wastewater treatment plant and the current effluent phosphorus levels to the Primary Discharge are low.

5 Schedule C: Specified Improvement Programme

The capacity of the existing wastewater treatment plant as detailed in Section 3.2 above is sufficient for the current loads. However, the capacity of the plant will increase when the works proposed in Section 4 are carried out. The requirements of Condition 5.3b are as follows:-

*(i) identify, evaluate and describe the infrastructural works necessary to implement those works listed under **Schedule C: Specified Improvement Programme** of this licence;*

(ii) clearly identify and describe the improvement and the timeframe for its implementation;

(iii) estimate the costs and sources of funding required to implement the improvement including, where appropriate, details of submissions made to the Department of the Environment, Heritage and Local Government and sanctions received.

The requirements of (ii) and (iii) above are examined in Section 4 above. The requirements of (i) above are reviewed below with full details of the works proposed also provided in Section 4.

The improvements specified in Schedule C of the wastewater discharge licence relating to the wastewater treatment plant are as follows:

Specified Improvement	**Completion Date**
Waste water treatment plant upgrade and ancillary works	31st January 2012

The proposed upgrade to the wastewater treatment plant under the Water Services Investment Programme, 2010-2012, as detailed in the Wastewater Discharge Licence application, is proposed to commence in 2012. The works proposed, as detailed in Section 4.3, will be staged to provide full compliance with the Wastewater Discharge Licence Emission Limit Values prior to completion of the full expansion. These works are due to be complete in March 2013. A detailed programme is included in Section 4.

6 Summary of Programme of Improvements

The programme of improvements as detailed in Condition 5.1 of the Wastewater Discharge Licence and the Works proposed to achieve these improvements are detailed below:-

(a) achieve improvements in the quality of all discharges from the works;

The proposed works for upgrading the existing wastewater treatment plant will provide an overall improvement in the quality of discharges from the works.

The works proposed for the upgrading of the existing wastewater treatment plant are summarised as follows:-

- Inlet filter screen, balancing tanks and pumping to existing inlet works
- Flow dividing chamber downstream of primary settlement tanks
- Baffles in final settlement tanks A1, A2 and A3
- Refurbish backwash filters on main treatment stream
- Refurbish aeration tank A1 and A2 to provide nitrogen removal
- Modifications to existing phosphorus removal system
- Control system, electrics and Instrumentation for above Works
- Siteworks, Landscaping, Pipework, etc.

These are the items required to achieve the Emission Limit Values. These works form part of the proposed Works included in the Water Services Investment Programme scheme, for the expansion of the wastewater treatment plant. The works included in the full upgrade and expansion also include items as follows:-

- Additional aeration tanks, final settlement tank and tertiary filter
- Modifications to phosphorus removal plant to provide additional capacity
- Covers for existing and proposed tanks to contain odour
- Provision of three-stage odour control system or similar to meet odour requirements of the certified Environmental Impact Statement
- Upgrading of sludge thickening dewatering facility
- Disinfection of final effluent
- Provision of new workshop and administration building
- Provision of new imported sludge and leachate facilities
- Pipework, landscaping and siteworks associated with the above
- Modifications to the control system, instrumentation and electrical installation

*(b) meet the emission limit values specified in **Schedule A: Discharges,** of this licence;*

The works proposed will provide for full compliance with the Emission Limit Values specified in Schedule A of the wastewater discharge licence.

(c) give effect to Regulation 2 of the Waste Water Discharge (Authorisation) Regulations 2007 (S.I. No. 684 of 2007);

The works proposed under the Programme of Improvements will provide a further reduction in the loads being discharged to the River Liffey thus reducing the pollution of waters by waste water discharges in compliance with the requirement of Regulation 2 of the Waste Water Discharge (Authorisation) Regulations 2007 (S.I. No. 684 of 2007).

(d) reduce phosphorus loadings in the discharge to the maximum practicable extent;

It is anticipated that the phosphorus levels set in the wastewater discharge licence will be achieved when the proposed works are carried out. The limits set after 31st January 2012 are considered to be the maximum practicable reduction in loadings achievable with chemical dosing and biological phosphorus removal.

(e) reduce ammonia loadings in the discharge to the maximum practicable extent;

It is anticipated that the ammonia level set in the wastewater discharge licence will be achieved when the proposed works are carried out. The limit set after 31st January 2012 is considered to be the maximum practicable reduction in loadings achievable.

(f) meet the obligations of Condition 1.7.

The current and future flows and loads to the wastewater treatment plant are summarised in Section 3.2. The capacity of the wastewater treatment plant following the proposed works of 80,000 PE is estimated be sufficient for the next 10 years. The current average population equivalent is 48,000 PE with a 95 percentile load of 66,000 PE. There are daily peaks in the load to the plant following rainfall events due to a "first flush" from the catchment.

However, it should be noted that the industrial discharge from Intel is currently substantially lower than the licensed amount. If Intel discharge the full allowable load the total average PE would increase to 65,700 PE. The spare capacity of the

plant would therefore be reduced to 14,300 PE. This would still leave a substantial allowance for growth within the catchment. The level of spare capacity should be reviewed annually to monitor changes to both the industrial and municipal loads.

Appendix No. 1

Condition 5 of WWDL

Condition 5. Programmes of Improvements

5.1 *The licensee shall, as a part of the second AER (required under Condition 6.10), prepare and submit to the Agency a programme of infrastructural improvements to maximise the effectiveness and efficiency of the waste water works in order to:*

(a) achieve improvements in the quality of all discharges from the works;
(b) meet the emission limit values specified in ***Schedule A: Discharges,*** *of this licence;*
(c) give effect to Regulation 2 of the Waste Water Discharge (Authorisation) Regulations 2007 (S.I. No. 684 of 2007);
(d) reduce phosphorus loadings in the discharge to the maximum practicable extent;
(e) reduce ammonia loadings in the discharge to the maximum practicable extent;
(f) meet the obligations of Condition 1.7.

5.2 *The programme of infrastructural improvements referred to in Condition 5.1 shall include an assessment of:*
a) the waste water treatment plant, having regard to the effectiveness of the treatment provided by reference to the following:
(i) the existing level of treatment, capacity of treatment plant and associated equipment;
(ii) the emission limit values specified in Schedule A: Discharges, of this licence;
(iii) designations of the receiving water body;
(iv) downstream abstractions and uses of water;
(v) water quality objective for the receiving water body;
(vi) the standards and volumetric limitations applied to any industrial waste water that is licensed to discharge to the waste water works.

b) the integrity of the waste water works having regard to:
(i) capacity of the waste water works;
(ii) leaks from the waste water works;

5.3 *The programme of infrastructural improvements shall include a plan for implementation for each individual improvement identified. The plan for implementation shall:*
a) *in the case of the assessment carried out under Conditions 5.2(a) (waste water treatment plant), and 5.2(c) (storm water overflows):*
(i) clearly identify and describe the improvement and the timeframe for implementation;
(ii) specify the parametric emission(s) that will be affected by the implementation of the improvement;
(iii) estimate the costs and sources of funding required to implement the improvement including, where appropriate, details of submissions made to the Department of the Environment, Heritage and Local Government and

sanctions received;

(iv) identify the anticipated improvements in the quality of the receiving waters as a result of the implementation of the improvement.

b) *in the case of the assessment carried out under Condition 5.2(b) (waste water works):*

(i) identify, evaluate and describe the infrastructural works necessary to implement those works listed under ***Schedule C: Specified Improvement Programme*** *of this licence;*

(ii) clearly identify and describe the improvement and the timeframe for its implementation;

(iii) estimate the costs and sources of funding required to implement the improvement including, where appropriate, details of submissions made to the Department of the Environment, Heritage and Local Government and sanctions received.

Appendix No. 2

Layout of Wastewater Treatment Plant

NOTES

LEGEND

- SITE BOUNDARY
- PROPOSED EXTENTION TO EXISTING TREATMENT WORKS SITE BOUNDARY AS PER LAND ACQUISITION DRAWING
- EXISTING TREATMENT PLANT
- PROPOSED STRUCTURE
- PROPOSED GRASS AREA
- PROPOSED NEW ACCESS ROAD
- PROPOSED PLANTING
- PROPOSED PROCESS PIPEWORK

LIST OF PUMPING STATIONS

P.S.1, RELOCATE PRELIMINARY UNITS PUMPS TO BALANCING TANK
P.S.2, SURPLUS ACTIVATED SLUDGE PUMPING STATION (UP GRADE PUMPS)
P.S.3, STORMWATER TANK IN&T PUMPING STATION
P.S.4, THICKENED/STABILISED SLUDGE PUMPING STATION
P.S.5, MODIFIED TO AGT AS NEW SLUDGE RETURN PUMPING STATION
P.S.6, PRIMARY SLUDGE PUMPING STATION
P.S.7, STORMWATER RETURN PUMPING STATION
P.S.8, SLUDGE RETURN PUMPING STATION (ABANDONED)
P.S.9, INTEL PLANT PUMPING STATION WEING MAIN TO FDC2
P.S.10, ACTIVATED SLUDGE RETURN PUMPS
P.S.11, FILTERED WASHWATER PUMPS & FINAL EFFLUENT SERVICE WATER PUMPS
P.S.12, WASHWATER RETURN TO PRELIMINARY UNITS PUMPS
P.S.13, SLUDGE DIGESTORS RECIRCULATION PUMPS & SLUDGE HOLDING TANKS FORWARD FEED PUMP
P.S.14, DIGESTOR FEED PUMPS
P.S.15, NEW FIRST STAGE SLUDGE RETURN PUMPS

FLOW SPLITTING CHAMBERS

F.D.C. 4, RE BUILD NEW FLOW SPLITTING CH. AT FIRST STAGE SETTLING TANKS A1&A2
F.D.C. 5, FLOW SPLITTING CH. AT FINAL SETTLING TANKS A3, B1 & B2.
F.D.C. 6, FLOW SPLITTING CH. FOR AERATION TANKS A1 & A2. (ABANDONED)
F.D.C. 7, FLOW SPLITTING CH. FOR FINAL SETTLING TANKS A1, A2, & A3, (ABANDONED)
F.D.C. 8, NEW SELECTOR TANK RO08

REV	DATE	DESCRIPTION	D	C	A

FOR APPROVAL

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PROJECT
LOWER LIFFEY VALLEY
REGIONAL SEWERAGE SCHEME
LEIXLIP WWTW

TITLE
LAYOUT PLAN OF PROPOSED
WASTE WATER TREATMENT PLANT

SCALES	DRAWN	CHECKED	APPROVED
1:500 @A1	D.Rimdzius	F.Lane	N.Delaney
	DATE 03-02-2009	DATE 03-02-2009	DATE 03-02-2009

DRAWING No. 20309-TW-102 REV -

Appendix 5

SWO Assessment

Comhairle Chondae Chill Dara

Kildare County Council

Lower Liffey Valley Regional Sewerage Scheme

Storm Water Overflow Assessment

December 2010

TOBIN CONSULTING ENGINEERS

TOBIN
Patrick J. Tobin & Co. Ltd.

REPORT

PROJECT: **Lower Liffey Valley Regional Sewerage Scheme**

CLIENT: **Kildare County Council**

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Devoy Park,

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Template rep 003

DCO 0084

DOCUMENT AMENDMENT RECORD

Client:	**Kildare County Council**
Project:	**Lower Liffey Valley Regional Sewerage Scheme**
Title:	**Storm Water Overflow Assessment**

PROJECT NUMBER: 2135				**DOCUMENT REF: 2135 SWO Assessment-Rev B**			
B	Issue For Client	GW	20.12.10	DC	20.12.10	COK	20.12.10
Revision	**Description & Rationale**	**Originated**	**Date**	**Checked**	**Date**	**Authorised**	**Date**
TOBIN Consulting Engineers							

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Drawing no. 8 SWO 10 and 11– general location

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1 INTRODUCTION

Kildare County Council have commissioned TOBIN Consulting Engineers to carry out investigation for identification and assessment of storm water overflows in Lower Liffey Valley sewerage network, in accordance with the requirements as set out in Urban Waste Water Treatment Directive (91/271/EEC) – Procedures and Criteria in relation to Storm Water Overflows (Department of Environment, Heritage and Local Government - DOEHLG; 1995).

The surface water overflows are located on combined sewer network serving Lower Liffey Valley Sewerage Scheme agglomeration (Leixlip, Celbridge, Maynooth, Kilcock and Straffan, Co. Kildare).

2 EXECUTIVE SUMMARY

14 of the existing Storm Water Overflow (SWO) structures and working conditions have been assessed based on the existing available hydraulic data and on-site visual inspection. 7 of the assessed overflows (SWO number 4, 6, 9, 10, 11, 12, 14) have meet DOEHLG requirements. Minor upgrade works have been recommended for three overflow structures from this group (SWO number 9, 10 and 11).

7 remaining overflows (SWO number 2, 3, 5, 7, 8, 13, 15) have not meet the requirements and require upgrade or other preventive actions to protect the receiving waters from excessive and unnecessary sewage discharges. Three overflow structures from this group (SWO number 5, 7 and 8) have recently became unnecessary and could be sealed off. SWO number 3 will be shortly replaced by a new structure, built to DOEHLG requirements. It is recommended that detailed analysis using rainfall model data will be undertaken in cases where DOEHLG conditions have not been met, to determine the exact target parameters and define the best improvement solutions before any works commence on site.

3 STORM WATER OVERFLOW NO. 2 (SWO 2)

3.1 LOCATION – STORM WATER OVERFLOW NO. 2

The assessed storm water overflow number 2 (SWO 2) is located at Leixlip Waste Water Treatment Plant (WWTP), southeast of Leixlip town, in Saint Catherine's Park. The general location of the overflow point is shown on Drawing no. 1.

3.2 CHARACTERISTICS OF OVERFLOW – SWO 2

The general characteristics of SWO 2 are compiled in the Table below.

SWO number (as per Waste Water Discharge Licence application)	2
Location	Leixlip WWTP
Grid reference of overflow point (6E, 6N) – as surveyed on site	301542, 235824

Technical description	High level overflow pipe from storm water holding tank. 700mm diameter underground concrete pipe to precast concrete outfall chamber. Outfall from chamber located under water.
Description of operation	Overflow operates when storm water holding tank at WWTP is full. The overflow discharges to the river.
Name of receiving waters	River Liffey
River basin district	Eastern RBD
Designation of receiving waters	Non sensitive
Dry weather flow rate in receiving waters	$2.0m^3 \times sec^{-1}$
Maximum volume emitted (up to 5 year storm)	$1,142m^3$ (theoretical volume, calculated for critical storm using 20-year time series rainfall data) $56,298m^3$ (actual monthly volume, measured by flow meter in November 2009)
SWO Control Type	High level overflow pipe from storm water holding tank
Type of Flow Meter at SWO	Ultrasonic, linked with SCADA system at WWTP
SWO event notification	Not available

SWO 2 overflows from storm water holding tank to River Liffey. The capacity of the tank is 1,200m³. In the event that storm water holding tank is exhausted, settled storm water can overflow via 700mm diameter high level pipe, through outfall manhole chamber located on River Liffey bank. Overflow to the river is located below water level and is not visible from the river bank. The overflow does not operate in dry weather flow conditions, as observed during site visit on 9th of December 2010.

There is an ultrasonic flow meter located on overflow pipe. The readings from flow meter are recorded on monthly basis. The recorded data show that there were 13 storm water spillage events through SWO 2 in the last 22 months, with spillage volumes ranging from $56,298m^3$ to $1,229m^3$ per month.

3.3 STRUCTURAL DESCRIPTION – SWO 2

The storm water holding tank is a reinforced concrete enclosed overground structure. Overflow from the tank is a high level pipe. The overflow to the river is an underground concrete pipe 700mm diameter and concrete precast chamber. All visible elements of assessed SWO are in good structural conditions, with no noticeable structural defects. The outfall is however located under water and it is not possible to assess its structural condition without underwater examination. No flow problems resulting in backflow, outflow restrictions or any other issues have been reported by WWTP staff.

3.4 VISUAL OR AESTHETIC IMPACT – SWO 2

The assessed overflow is located in the area outside of public access. The outfall point of SWO is hidden under water and is not visible from the river banks. The SWO does not cause visual or aesthetic impact on surrounding environment. The elements of SWO 2 are shown in Figures 1 and 2.

Fig. 1 SWO 2: outfall chamber visible from river bank

Fig. 2 SWO 2: storm water holding tank

3.5 CONCLUSIONS AND RECOMMENDATIONS – SWO 2

Records indicate that there have been significant overflow events at SWO 2 in the past and that SWO 2 does not meet DOEHLG requirements in terms of discharge frequency. The majority of the recent overflow events occurred in 2009, which has been recorded as an extremely wet period. It is clear that the overflow events are as a result of storm water in the foul sewerage network. This has been recognized in the past and efforts are underway to reduce the volume of storm water entering the system.

As part of the Lower Liffey Valley Sewerage Scheme, a network rehabilitation contract was completed in 2010. The works involved the rehabilitation of a significant amount of the network. It is envisaged that this will reduce the frequency of overflow events at SWO 2. Coupled with this, further investigative works are also planned to identify sources of storm water in other areas of the network, with following rehabilitation works, if necessary.

In addition to the above, as part of the upgrading of the Leixlip WWTP, it is intended to provide a large balancing tank, with the capacity of 4,170m^3. All flows entering the Leixlip WWTP will be discharged to the balancing tank. The tank will balance peak rates from diurnal flow variations and also provide additional storm water storage for the rainfall events. These measures will allow SWO 2 to meet the DOEHLG criteria, based on theoretical flow rate calculation results.

4 STORM WATER OVERFLOW NO. 3 (SWO 3)

4.1 LOCATION – STORM WATER OVERFLOW NO. 3

The assessed storm water overflow number 3 (SWO 3) is located at Rye River Walk in Kilcock. The overflow is associated with existing pumping station. The existing pumping station and overflow will be shortly decommissioned and replaced with new pumping station and overflow. The general locations of existing and future pumping stations and overflow points are shown on Drawing no. 2.

4.2 CHARACTERISTICS OF OVERFLOW – SWO 3

The general characteristics of SWO 3 are compiled in the Table below.

SWO number (as per Waste Water Discharge Licence application)	3
Location	Kilcock pumping station (Rye River Walk)
Grid reference of overflow point (6E, 6N) – as surveyed on site	288871, 239578
Technical description	High level overflow pipe from pump sump linked with storm water holding tank. 375mm diameter underground concrete pipe with flap valve at outfall.

Description of operation	Overflow operates when pump sump and storm water storage tank at Pumping Station are full. The overflow discharges to the river.
Name of receiving waters	Rye Water
River basin district	Eastern RBD
Designation of receiving waters	Non sensitive
Dry weather flow rate in receiving waters	$0.05m^3 \times sec^{-1}$
Maximum volume emitted (up to 5 year storm)	$149.2m^3$ (theoretical volume, calculated for critical 5 year return period storm with 1 hour duration) $256.9m^3$ (theoretical volume, calculated for critical 5 year return period storm with 6 hour duration)
SWO Control Type	High level overflow pipe from pump sump (linked with storm water holding tank)
Type of Flow Meter at SWO	Not available
SWO event notification	Not available

SWO 3 overflows to Rye Water from pump sump linked with storm water holding tank. In the event that storm water holding tank and pump sump is exhausted, water can overflow via 375mm diameter high level pipe. The outfall point is located on Rye Water river bank, above water level. There is a flap valve on the overflow pipe, at outfall to the river. The overflow does not operate in dry weather flow conditions, as observed during site visit on 8th of December 2010.

Theoretical analysis was carried out of the existing storm water storage capacity at Kilcock pumping station. The results show that spillage would occur for every 2 and 5 year storm return period of durations ranging from 30 minutes to 12 hours. The overflow for 5 year storm return period of 1 hour duration (design rainfall event used to determine the size of storm water holding tank, as required by DOEHLG), has been calculated as $149.2m^3$. The highest overflow volume has been calculated for 5 year storm return period of 6 hours duration ($256.9m^3$). The calculation results show that the existing volume of storm water holding tank is inadequate, and the spillage events are very frequent.

The existing Kilcock Pumping Station pumps the wastewater from Kilcock onwards to Maynooth by means of two pumps discharging through a 250mm diameter rising main of 3,450m length. Since the existing pumps were installed wear and tear has significantly reduced their discharge capacity. The current pumping capacity and storage capacity is inadequate to deal with both the flow rates and volumes of combined foul and storm water flows.

4.3 STRUCTURAL DESCRIPTION – SWO 3

The pump sump and storm water holding tank are reinforced concrete enclosed underground structures. Overflow from the pump sump is a high level pipe. The overflow to the river is an underground concrete pipe 375mm diameter. All visible elements of assessed SWO are in good structural conditions, with no noticeable structural defects.

4.4 VISUAL OR AESTHETIC IMPACT – SWO 3

The outfall point of SWO is located on the river bank and is visible from the adjacent land across Rye Water river. The adjacent area is however outside of frequent public access, and overflow events do not cause significant visual or aesthetic impact on surrounding environment. The SWO 3 is shown in Figures 3 and 4.

Fig. 3 SWO 3 – outfall with flap valve, located on Rye Water river bank

Fig. 4 SWO 4 and old pumping station, visible from opposite river bank

4.5 NEW PUMPING STATION FOR KILCOCK TOWN

The existing pumping station will be soon abandoned and replaced with newly constructed facility, with increased pumping and storm water holding capacity. The new pumping station will be fitted with stand-by power generator to make the station fully operational during power outage incidents, and telemetry system to remotely notify the maintenance personnel about any recorded failures of the pumping equipment. The station has been constructed in the western outskirts of the town. It is expected to decommission the old station and begin the operations at new facility in early 2011.

New pumping station and outfall are shown in Figures 5 and 6.

Fig. 5 New Kilcock Pumping Station

Fig. 6 Storm water overflow to Rye Water at new Kilcock Pumping Station

4.6 CONCLUSIONS AND RECOMMENDATIONS – SWO 3

The existing SWO 3 operates very frequently and its activation level is below DOEHLG requirements. The whole old station will be decommissioned and abandoned in the following months, therefore any improvements of the existing storm water overflow characteristics would not be economically justified.

The new pumping station has been constructed with 450m^3 storm water holding tank, which will prevent overflows to the Rye Water river from rainfall events with a frequency of up to 1 in 5 years. The SWO parameters at the new station meet DOEHLG requirements.

5 STORM WATER OVERFLOW NO. 4 (SWO 4)

5.1 LOCATION – STORM WATER OVERFLOW NO. 4

The assessed storm water overflow number 4 (SWO 4) is from Maynooth Pumping Station, located northeast of Maynooth town, on Old Dunboyne Road. SWO 4 discharges to Rye Water river, at Maynooth Fisheries grounds. The general location of the overflow point is shown on Drawing no. 3.

5.2 CHARACTERISTICS OF OVERFLOW – SWO 4

The general characteristics of SWO 4 are compiled in the Table below.

SWO number (as per Waste Water Discharge Licence application)	4
Location	Fisheries grounds, Old Dunboyne Road
Grid reference of overflow point (6E, 6N) – as surveyed on site	294466, 238712

Technical description	High level overflow pipe from storm water holding tank. 450mm diameter underground concrete pipe. Reinforced concrete headwall at outfall to the river.
Description of operation	Overflow operates when storm water holding tank at Pumping Station is full. The overflow discharges to the river.
Name of receiving waters	Rye Water
River basin district	Eastern RBD
Designation of receiving waters	SAC 001398
Dry weather flow rate in receiving waters	$0.05m^3 \times sec^{-1}$
Maximum volume emitted (up to 5 year storm)	No overflow for critical storm events with up to 1 in 5 years frequency (modelling results)
SWO Control Type	High level pipe overflow from storm water holding tank
Type of Flow Meter at SWO	Not available
SWO event notification	Not available

SWO 4 overflows to Rye Water from storm water holding tank. In the event that storm water holding tank is exhausted, water can overflow via 450mm diameter high level pipe. The outfall point is located at Maynooth Fisheries grounds, on Rye Water river bank, above water level. The overflow is located downstream of water extraction point for fish ponds. There is a grating on the overflow pipe, at outfall to the river. The overflow does not operate in dry weather flow conditions, as observed during site visit on 8th of December 2010.

The minimum overflow setting is determined by 'Formula A', which takes into account the dry weather flow, the population and the industrial effluent. 'Formula A' for the overflow at the Main Maynooth Pumping Station is calculated at 16,262m³/d or 0.188m³/s. 'Formula A' therefore sets the minimum flow which must be either discharged by the pumps at Maynooth onwards to Leixlip or to be stored within the system before overflows take place. Until recently the pumping and storage capacity at Maynooth Pumping Station was only approximately 50% of that required by the 'Formula A' calculation. The pumps and overflow settings were inadequate to meet the DOEHLG criteria. That resulted in frequent storm water overflow incidents.

The Maynooth Pumping Station has been recently significantly upgraded, with construction works commissioned in October 2010. The construction of a new pumping facility and emergency storm water holding tank resulted in sufficient protection to the adjoining watercourses from storm water overflows. The station has been also equipped with stand-by power generator and telemetry system.

The storm water holding capacity has been determined by rainfall event analysis. The largest volume projected to be overflowed has been calculated as 2,599m³, during Time Series Rainfall Event No. 22. This has been additionally increased by safety factor of 10%. The capacity of the existing new storm water holding tank is 2,850m³.

5.3 STRUCTURAL DESCRIPTION – SWO 4

The storm water holding tank is an underground reinforced concrete enclosed structure. Overflow from the tank is a high level concrete pipe. The overflow to the river is an underground concrete pipe 450mm diameter, with reinforced concrete headwall structure at outfall point. All visible elements of assessed SWO are in good structural conditions, with no noticeable structural defects.

5.4 VISUAL OR AESTHETIC IMPACT – SWO 4

The outfall point of SWO is located on the river bank and is visible from close distance. The adjacent area is however outside of frequent public access, and overflow events do not cause significant visual or aesthetic impact on surrounding environment.

The SWO 4 is shown in Figures 7 and 8.

Fig. 7 SWO 4 – grating at outfall to the river

Fig. 8 SWO 4 – headwall structure at outfall to the river

5.5 CONCLUSIONS AND RECOMMENDATIONS – SWO 4

The existing SWO 4 meets DOEHLG requirements. The new pumping station has been constructed with 2,850m^3 storm water holding tank, which will prevent overflows to the Rye Water river from rainfall events with a frequency of up to 1 in 5 years.

6 STORM WATER OVERFLOW NO. 5 (SWO 5)

6.1 LOCATION – STORM WATER OVERFLOW NO. 5

The assessed storm water overflow number 5 (SWO 5) is located at Maynooth Castle grounds, in Maynooth town centre. The general location of the overflow point is shown on Drawing no. 4.

6.2 CHARACTERISTICS OF OVERFLOW – SWO 5

The general characteristics of SWO 5 are compiled in the Table below.

SWO number (as per Waste Water Discharge Licence application)	5
Location	Maynooth Castle, Maynooth
Grid reference of overflow point (6E, 6N) – as surveyed on site	293643, 237676
Technical description	225mm ductile iron overflow pipe from foul sewer manhole chamber. Outfall to the stream, above water level.
Description of operation	Overflow operates when inflow to the chamber exceeds maximum capacity of the downstream pipeline. The overflow

	discharges to the stream.
Name of receiving waters	Lyreen Stream, tributary to Rye Water
River basin district	Eastern RBD
Designation of receiving waters	Non sensitive
Dry weather flow rate in receiving waters	0.05m^3 x sec^{-1} (Rye Water)
Maximum volume emitted (up to 5 year storm)	Not available
SWO Control Type	High level overflow pipe from open channel in manhole chamber.
Type of Flow Meter at SWO	Not available
SWO event notification	Not available

SWO 5 overflows to Lyreen Stream from foul sewer manhole chamber. In the event that the capacity of downstream part of network is exhausted, water can overflow via 225mm diameter pipe. This overflow is in fact an emergency outfall to the stream. There is no storm water storage capacity at overflow chamber. The chamber with overflow is located at Maynooth Castle grounds. The outfall point is located behind Castle's wall, at the stream bank, above water level. The overflow does not operate in dry weather flow conditions, as observed during site visit on 8th of December 2010.

Until recently the spillage incidents through SWO 5 were very frequent. The results of theoretical analysis determined spillage for every 2 year storm return period of durations ranging from 30 minutes to 12 hours. The overflow volume varied from 104m^3 to 229 m^3. The capacity of downstream section of the network was by far inadequate and the DOEHLG criterion ('Formula A') was not meet.

The situation has changed when the new trunk line on Parson Street and Leinster Street was built. Most of the flow from Castle Grounds pipeline has been diverted to the new trunk line. The flow rate in the Castle Grounds has been greatly reduced, and no overflow incidents through SWO 5 have been reported since then.

6.3 STRUCTURAL DESCRIPTION – SWO 5

The overflow is a high level ductile iron pipe from concrete chamber. The section at Castle grounds is underground. The final section is an overground pipe, with concrete block outfall point. All visible elements of assessed SWO are in good structural conditions, with no noticeable structural defects.

6.4 VISUAL OR AESTHETIC IMPACT – SWO 5

The outfall point of SWO is located on the stream bank and is highly visible. The overflow incidents cause significant aesthetic impact on surrounding environment. The outfall is located in the town center,

with nearby college entrance and town amenities. When it operates, raw sewage is visible from the bridge and adjacent properties located across the stream.

The SWO 5 is shown in Figure 9.

Fig. 9. SWO 5 – outfall to Lyreen Stream (open pipe at the bottom)

6.5 CONCLUSIONS AND RECOMMENDATIONS – SWO 5

Until recently the existing SWO 5 has been operating on frequent basis and DOEHLG 'Formula A' criterion has not been met. Any overflow incidents through SWO 5 cause significant aesthetic impact on surrounding environment. As the majority of flow from Castle Grounds pipeline has been recently diverted to the new trunk line, the overflow structure could be probably abandoned and sealed off. In case that Local Authority would wish to maintain the overflow at current location, it is recommended to reconstruct it and locate the outflow pipe under water level, to hide it from public view. In the event that overflow function will be retained, the existing overflow chamber should be examined, to determine if any improvement measures are necessary. Any action should be confirmed by detailed analysis using rainfall model data, to define the best solution.

7 STORM WATER OVERFLOW NO. 6 (SWO 6)

7.1 LOCATION – STORM WATER OVERFLOW NO. 6

The assessed storm water overflow number 6 (SWO 6) is located at Celbridge Main Pumping station, at Castletown, east of Celbridge town. The general location of the overflow point is shown on Drawing no. 5.

7.2 CHARACTERISTICS OF OVERFLOW – SWO 6

The general characteristics of SWO 6 are compiled in the Table below.

SWO number (as per Waste Water Discharge Licence application)	6
Location	Celbridge Main Pumping Station, Castletown, Celbridge
Grid reference of overflow point (6E, 6N) – as surveyed on site	297989, 233620
Technical description	High level overflow pipe from storm water holding tank. 300mm diameter underground ductile iron pipe. Steel grating at outfall to the river.
Description of operation	Overflow operates when storm water holding tank at Pumping Station is full. The overflow discharges to the river.
Name of receiving waters	River Liffey
River basin district	Eastern RBD
Designation of receiving waters	Sensitive
Dry weather flow rate in receiving waters	$2.4m^3 \times sec^{-1}$
Maximum volume emitted (up to 5 year storm)	No overflow for critical storm events with up to 1 in 5 years frequency (modelling results)
SWO Control Type	High level pipe overflow from storm water holding tank
Type of Flow Meter at SWO	Not available
SWO event notification	Not available

SWO 6 overflows to River Liffey from storm water holding tank. In the event that storm water holding tank is exhausted, water can overflow via 300mm diameter high level pipe. The outfall point is located on River Liffey bank, above water level. There is a grating on the overflow pipe, at outfall to the river.

There were numerous incidents of uncontrolled discharge through SWO 6 in the past, due to pumping equipment failures. This has been however resolved following the recent pumping station upgrade, to meet DOEHLG criteria. The increase of sewage pumping and storm water holding capacity provided appropriate protection to the adjoining watercourses from storm water overflows. The capacity of two newly constructed storm water holding tanks has been determined by rainfall event analysis. The new

storm water holding structures will prevent overflows to the receiving waters from rainfall events with a frequency of up to 1 in 5 years.

The existing available storage capacity, including two new storage tanks, wet well and inlet channel, is 471m^3. The overall storage capacity will be shortly additionally increased to 732m^3, by adoption of dry and wet wells, making previously part of the old pumping station.

The pumping station is equipped with stand-by power generator and telemetry system.

The SWO 6 does not operate in dry weather flow conditions, as observed during site visit on 8th of December 2010.

7.3 STRUCTURAL DESCRIPTION – SWO 6

The overflow is a high level ductile iron pipe from storm water holding tank. The outfall point is located on the river bank and covered by boulders. There is a steel grating at the outfall point. All visible elements of assessed SWO are in good structural conditions, with no noticeable structural defects.

7.4 VISUAL OR AESTHETIC IMPACT – SWO 6

The outfall point of SWO is located on the river bank and is visible from close distance. The overflow does not cause significant aesthetic impact on surrounding environment, however when it operates, storm water could be visible from the adjacent river walk.

The SWO 6 is shown in Figures 10 and 11.

Fig. 10 SWO 6 – outfall from open pipe to River Liffey

Fig. 11 SWO 6 – grating at outfall

7.5 CONCLUSIONS AND RECOMMENDATIONS – SWO 6

The existing SWO 6 meets DOEHLG requirements. The pumping capacity and storm water holding tank have been recently upgraded, to meet 'Formula A' criterion. Storm water holding tank capacity has been increased to 471m^3. The implemented measures will prevent overflows to River Liffey from rainfall events with a frequency of up to 1 in 5 years. The storage capacity will be shortly additionally increased by 261m^3, to total capacity of 732m^3, which will provide supplementary safety factor and further protect the receiving waters from sewage discharges. Although overflow incidents could be visible from the adjacent river walk, they will be rare enough to not to cause significant visual impact on surrounding environment.

8 STORM WATER OVERFLOWS NO. 7 (SWO 7) AND 8 (SWO 8)

8.1 LOCATION – STORM WATER OVERFLOWS NO. 7 AND 8

The assessed storm water overflows number 7 (SWO 7) and 8 (SWO 8) are located on Castle Slip Road, at Castletown, in eastern part of Celbridge town. The general location of the overflow points is shown on Drawing no. 6.

8.2 CHARACTERISTICS OF OVERFLOW – SWO 7

The general characteristics of SWO 7 are compiled in the Table below.

SWO number (as per Waste Water Discharge Licence application)	7
Location	Castletown Gate Slip, Castletown, Celbridge
Grid reference of overflow point (6E, 6N)	297585, 233309
Technical description	300mm concrete overflow pipe from foul sewer manhole chamber. Outfall to the river. .
Description of operation	Overflow operates when inflow to the sewer backs up (surcharge of downstream section). The overflow discharges to the river.
Name of receiving waters	River Liffey
River basin district	Eastern RBD
Designation of receiving waters	Sensitive
Dry weather flow rate in receiving waters	$2.4m^3 \times sec^{-1}$
Maximum volume emitted (up to 5 year storm)	Not available
SWO Control Type	High level overflow from manhole chamber
Type of Flow Meter at SWO	Not available
SWO event notification	Not available

The general characteristics of SWO 8 are compiled in the Table below.

SWO number (as per Waste Water Discharge Licence application)	8
Location	Castletown Gate Slip, Castletown, Celbridge
Grid reference of overflow point (6E, 6N)	297584, 233306
Technical description	450mm concrete overflow pipe from foul sewer manhole chamber. Outfall to the river. .

	chamber. Outfall to the river. .
Description of operation	Overflow operates when inflow to the sewer backs up (surcharge of downstream section). The overflow discharges to the river.
Name of receiving waters	River Liffey
River basin district	Eastern RBD
Designation of receiving waters	Sensitive
Dry weather flow rate in receiving waters	$2.4m^3 \times sec^{-1}$
Maximum volume emitted (up to 5 year storm)	Not available
SWO Control Type	High level overflow from manhole chamber
Type of Flow Meter at SWO	Not available
SWO event notification	Not available

SWO 7 and SWO 8 at Castletown Gate Slip overflow to River Liffey from sewer manhole chambers. In the event that the capacity of downstream part of network is exhausted, water can overflow via 300mm diameter (SWO 7) or 450mm diameter (SWO 8) high level pipes. These overflows are in fact emergency outfalls to the river. The overflows do not operate in dry weather flow conditions, as observed during site visit on 8th of December 2010.

Until recently the spillage incidents through SWO 7 and SWO 8 were very frequent. This was most likely related to network surcharge caused by insufficient pumping and storage capacity at Main Celbridge Pumping Station (Castletown), located approximately 500m downstream of SWO 7 and 8 locations.

Another reported incidents at Castletown Gate Slip have been related to uncontrolled overflows through manhole lid of chamber number 5304, located at the bottom of the road. The character of these incidents suggests that they were caused by surcharge of downstream section of the network and insufficient pumping and holding capacity at Castletown Pumping Station.

The risk of surcharge and back up from downstream pipelines has been reduced, thanks to the upgrade works completed recently at Castletown Pumping Station. The increase of sewage pumping and storm water holding capacity provided adequate protection to the adjoining watercourses from uncontrolled storm water and emergency overflows. The new characteristics of the Pumping Station will prevent overflows to the receiving waters from rainfall events with a frequency of up to 1 in 5 years.

No surcharge incidents through SWO 7 and SWO 8 have been observed since upgrade works have been commissioned at the Pumping Station.

8.3 STRUCTURAL DESCRIPTION – SWO 7 AND SWO 8

The overflows are high level underground concrete pipes from sewer chambers. All visible elements of assessed storm water overflows are in good structural conditions, with no noticeable structural defects.

8.4 VISUAL OR AESTHETIC IMPACT – SWO 7 AND SWO 8

The outfall points of SW Overflows are located on the river bank and are hidden from public view. Overflow incidents through SWO outfalls do not cause aesthetic impact on surrounding environment.

The manhole 5304 is located on public road, and any overflow incident through its lid causes significant visual and aesthetic impact, with raw sewage overflowing to the road surface.

The SWO 7 and SWO 8 points are shown in Figure 12. Manhole 5304 is shown in Figure 13.

Fig. 12. SWO 7 and SWO 8 – location of outfall points to River Liffey

Fig. 13. Manhole 5304

8.5 CONCLUSIONS AND RECOMMENDATIONS – SWO 7 AND SWO 8

Until recently the existing SWO 7 and 8 have been operating on frequent basis and DOEHLG 'Formula A' criterion has not been met.

The recent upgrade works at the downstream Castletown Pumping Station most likely reduced the risk of surcharge and overflow incidents in the discussed area. It is possible that the existing emergency overflows SWO 7 and SWO 8 would not be needed any longer, and could be abandoned and sealed off. Detailed analysis using rainfall model data should be undertaken to determine the possible improvement solutions.

Overflow incidents through manhole 5304 cause significant aesthetic impact on surrounding environment, by uncontrolled discharge of raw sewage to the public road. To prevent uncontrolled discharge incidents at this location, the standard ductile iron lid should be replaced with sealed and lockable lid.

9 STORM WATER OVERFLOW NO. 9 (SWO 9)

9.1 LOCATION – STORM WATER OVERFLOW NO. 9

The assessed storm water overflow number 9 (SWO 9) is from Primrose Hill Pumping Station. SWO 9 is located on Newtown Road, in Celbridge town center, and discharges to River Liffey. The general location of the overflow point is shown on Drawing no. 7.

9.2 CHARACTERISTICS OF OVERFLOW – SWO 9

The general characteristics of SWO 9 are compiled in the Table below.

SWO number (as per Waste Water Discharge Licence application)	9
Location	Newtown Road, Celbridge
Grid reference of overflow point (6E, 6N) – as surveyed on site	297379, 232913
Technical description	High level overflow pipe from foul sewer manhole chamber. 300mm diameter underground concrete pipe. Outfall from the pipe at the retaining wall.
Description of operation	Overflow operates when sewer backs up, as a result of insufficient pumping or storm water holding capacity at Primrose Hill Pumping Station. The overflow discharges to the river.
Name of receiving waters	River Liffey
River basin district	Eastern RBD
Designation of receiving waters	Sensitive
Dry weather flow rate in receiving waters	$2.4m^3 \times sec^{-1}$
Maximum volume emitted (up to 5 year storm)	No overflow for critical storm events with up to 1 in 5 years frequency (modelling results)
SWO Control Type	High level pipe overflow from foul sewer manhole chamber
Type of Flow Meter at SWO	Not available
SWO event notification	Not available

SWO 9 overflows to River Liffey from foul sewer line, as a result of surcharge and back up from Primrose Hill Pumping Station, located approximately 80m downstream of SWO point. In the event that storm water holding capacity or pumping capacity at the station is exhausted, water can overflow via 300mm diameter high level pipe from the main trunk line. The outfall point is located in the retaining wall, on River Liffey bank, above water level. The overflow does not operate in dry weather flow conditions, as observed during site visit on 8th of December 2010.

In view of the sensitivity of the River Liffey (the location of the pumping station is upstream of the water intake works at Leixlip), the Primrose Hill Pumping Station has been recently upgraded. A new storm

water holding tank has been constructed. The existing storm water holding capacity is 289m³ (79m³ in old tank and 210m³ in new tank), and provides 8 hours emergency storage. The tanks are underground concrete enclosed structures, with high level overflows. The station has been also equipped with stand-by power generator and telemetry system.

9.3 STRUCTURAL DESCRIPTION – SWO 9

The overflow is a high level concrete iron pipe from foul sewer line. The outfall point is located in the retaining wall. The end of the pipe is open and there is no grating or flap valve at the outfall point. The visible part of assessed SWO is in good structural condition, with no noticeable structural defects.

9.4 VISUAL OR AESTHETIC IMPACT – SWO 9

The outfall point of SWO is located above water level. It is visible from the adjacent foot bridge. The overflow incidents cause significant visual and aesthetic impact on surrounding environment, as raw sewage discharge from the pipe at high level is visible from the public space.

The SWO 9 is shown in Figure 14.

Fig. 14 SWO 9 – outfall to River Liffey

9.5 CONCLUSIONS AND RECOMMENDATIONS – SWO 9

The SWO 9 activation level meets DOEHLG requirements ('Formula A'), however any overflow incident causes significant visual and aesthetic impact on the surrounding environment. The outfall from the overflow pipe is located 1 to 2m above water level, and is clearly visible from the adjacent footbridge.

There is no flap valve on the overflow pipe, which could also cause odour problems. It is recommended to upgrade the SWO discharge point and hide the outfall from public view, possibly under water.

10 STORM WATER OVERFLOWS NO. 10 AND 11 (SWO 10, 11)

10.1 LOCATION – STORM WATER OVERFLOWS NO. 10 AND 11

The assessed storm water overflows number 10 (SWO 10) and 11 (SWO 11) are located at Ballyoulster Pumping Station, on Dublin Road, east of Celbridge town. The general location of the overflow points is shown on Drawing no. 8.

10.2 CHARACTERISTICS OF OVERFLOW – SWO 10 AND 11

The general characteristics of SWO 10 are compiled in the Table below.

SWO number (as per Waste Water Discharge Licence application)	10
Location	Ballyoulster Pumping Station, Celbridge
Grid reference of overflow point (6E, 6N) – as surveyed on site	298651, 233374
Technical description	High level overflow pipe from pump sump. 225mm diameter underground PVC pipe with open outfall to the stream.
Description of operation	Overflow operates when pump sump is full. The overflow discharges to the stream.
Name of receiving waters	Shinkeen Stream (tributary to River Liffey)
River basin district	Eastern RBD
Designation of receiving waters	Sensitive
Dry weather flow rate in receiving waters	$2.4m^3 \times sec^{-1}$ (River Liffey)
Maximum volume emitted (up to 5 year storm)	Not available
SWO Control Type	High level overflow pipe from pump sump
Type of Flow Meter at SWO	Not available
SWO event notification	Not available

The general characteristics of SWO 11 are compiled in the Table below.

SWO number (as per Waste Water Discharge Licence application)	11
Location	Ballyoulster Pumping Station, Celbridge
Grid reference of overflow point (6E, 6N) – as surveyed on site	298650, 233378
Technical description	High level overflow pipe from manhole chamber. 150mm diameter underground PVC pipe with open outfall to the stream.
Description of operation	Overflow operates when there is a blockage at the inflow to pump sump and the network is surcharged. The overflow discharges to the stream.
Name of receiving waters	Shinkeen Stream (tributary to River Liffey)
River basin district	Eastern RBD
Designation of receiving waters	Sensitive
Dry weather flow rate in receiving waters	$2.4m^3 \times sec^{-1}$ (River Liffey)
Maximum volume emitted (up to 5 year storm)	Not available
SWO Control Type	High level overflow pipe from manhole chamber
Type of Flow Meter at SWO	Not available
SWO event notification	Not available

SWO 10 overflows to Shinkeen Stream from the pump sump at the pumping station. In the event that sump capacity is exhausted, water can overflow via 225mm diameter high level pipe. This can be caused by excessive inflow to the pumping station or pumps failure. Outfall point is located on the stream bank, in gabion retaining wall, approximately 1m above water level. There is no grating and no flap valve on the overflow pipe at outfall to the stream. The overflow does not operate in dry weather flow conditions, as observed during site visit on 8th of December 2010.

SWO 11 overflows to Shinkeen Stream from the manhole chamber located at the pumping station site, immediately upstream of pump sump. In the event of blockage or surcharge at the inlet to the pump sump, sewage can overflow via 150mm diameter high level pipe. Outfall point is located on the stream bank, in gabion retaining wall, approximately 2m above water level. Outfall of SWO 11 is approximately

1m higher than outfall of SWO 10. This means overflow events through SWO 11 are not resulted by pump sump overload. There is no grating and no flap valve on the overflow pipe, at outfall to the stream. The overflow does not operate in dry weather flow conditions, as observed during site visit on 8th of December 2010.

The Ballyoulster Pumping Station is located on a small site adjacent to the Shinkeen Stream and serves the Ballyoulster Housing Estate and the Industrial factory on Dublin Road. The available storm water storage at the pumping station is limited to pump sump only. There is no information on how frequently the overflow operates or associated spill volumes. There is also no emergency storage on site. DOEHLG 'Formula A' at Ballyoulster Pumping Station is estimated at 0.008m³/s. Pumping capacity is 0.01m³/s, and exceeds 'Formula A' value.

Because of the site restrictions it is not possible to construct inflow storage facilities to provide any emergency retention capacity. The station however has been recently upgraded with telemetry system and stand-by power generator on site, to come into play when there is a power outage. The upgrade works have considerably reduced risk of uncontrolled overflow incidents through SWO 10.

10.3 STRUCTURAL DESCRIPTION – SWO 10 AND 11

The overflows are high level PVC open pipes, with outfalls in gabion retaining wall, at the stream bank. All visible elements of assessed overflows are in good structural condition, with no noticeable structural defects.

10.4 VISUAL OR AESTHETIC IMPACT – SWO 10 AND 11

The outfall points of SWO 10 and 11 are located above water level, and could be visible by pedestrians from the Dublin Road bridge and from the property located across the stream from the pumping station. Because of relative remoteness of the discussed area, the overflows do not cause significant aesthetic impact on surrounding environment.

The SWO 10 and 11 are shown in Figure 15.

Fig. 15 SWO 11 (150mm pipe, foreground) and SWO 10 (225mm pipe, background)

10.5 CONCLUSIONS AND RECOMMENDATIONS – SWO 10 AND 11

The existing SWO 10 and 11 meet DOEHLG requirements in terms of 'Formula A' criterion. Pumping capacity is over 10 times higher than 6 DWF inflow rate. Recent installation of telemetry system and stand-by power generator on site significantly reduced the risk of unnecessary spillages. Large reserve of pumping capacity means that pumps are adequate to handle most of rainfall events.

There is no emergency storage available at pumping station site. It is not possible to build the storage within pumping station boundaries, because of very limited available area. In the future the storage tank could be possibly built upstream of the pumping station. The most convenient place for underground structure seems to be a green area at the entrance to Ballyoulster housing estate.

It is possible that SWO 11 could be abandoned and sealed off. As an overflow from foul sewer manhole chamber, it increases the risk of pollution in the receiving waters, by likely uncontrolled discharge of raw sewage. The discharge function of SWO 11 is in principle doubled by the function of SWO 10 – overflow from the pump sump. Overflow from SWO 10 has also lesser impact on the quality of receiving waters, as the water would be partly settled in the pump sump, before discharge to the stream. It is recommended to carry out hydraulic calculations to confirm the proposed solution.

In any case it is recommended to install flap valves on the outflow pipes to the stream. This will greatly reduce any possible odour emissions from the pipes.

11 STORM WATER OVERFLOW NO. 12 (SWO 12)

11.1 LOCATION – STORM WATER OVERFLOW NO. 12

The assessed storm water overflow number 12 (SWO 12) is located at Temple Mills Pumping Station, Abbey Farm, in southern part of Celbridge town. The general location of the overflow point is shown on Drawing no. 9.

11.2 CHARACTERISTICS OF OVERFLOW – SWO 12

The general characteristics of SWO 12 are compiled in the Table below.

SWO number (as per Waste Water Discharge Licence application)	12
Location	Temple Mills Pumping Station, Abbey Farm, Celbridge
Grid reference of overflow point (6E, 6N) – as surveyed on site	296933, 232428
Technical description	High level overflow pipe from pump sump. 300mm diameter underground ductile iron pipe. Flap valve at outfall to the river.
Description of operation	Overflow operates when capacity of pump sump at the pumping station is exhausted. The overflow discharges to the river.
Name of receiving waters	River Liffey
River basin district	Eastern RBD
Designation of receiving waters	Sensitive
Dry weather flow rate in receiving waters	$2.4m^3 \times sec^{-1}$
Maximum volume emitted (up to 5 year storm)	Not available
SWO Control Type	High level pipe overflow from pump sump
Type of Flow Meter at SWO	Not available
SWO event notification	Not available

SWO 12 overflows to River Liffey from the pump sump at the pumping station. In the event that sump capacity is exhausted, water can overflow via 300mm diameter high level pipe. This can be caused by excessive inflow to the pumping station or pumps failure. Outfall point is located on the river bank,

above water level. There is a flap valve on the overflow pipe at outfall point. The overflow does not operate in dry weather flow conditions, as observed during site visit on 9th of December 2010.

The Temple Mills Pumping Station is located on a small site on the banks of River Liffey, south of Clane Road in Celbridge. The available storm water storage at the pumping station is limited to pump sump only. There is no information on how frequently the overflow operates or associated spill volumes. DOEHLG 'Formula A' at Temple Mills Pumping Station is estimated at 0.019m³/s. Pumping capacity is 0.03m³/s, and exceeds 'Formula A' value.

Because of the site restrictions it is not possible to construct sufficient emergency storage facilities to store excessive inflow and flows during times of power outage. The station however has been recently upgraded with telemetry system and stand-by power generator to come into play when there is a power outage. These elements have considerably reduced risk of uncontrolled overflow incidents through SWO 12.

11.3 STRUCTURAL DESCRIPTION – SWO 12

The overflow is a high level ductile iron pipe from pump sump. There is a flap valve at the outfall point. All visible elements of assessed SWO are in good structural conditions, with no noticeable structural defects.

11.4 VISUAL OR AESTHETIC IMPACT – SWO 12

The outfall point of SWO is located on the river bank and covered by greenery, in the area generally inaccessible to public. The overflow does not cause aesthetic impact on surrounding environment.

The SWO 12 is shown in Figures 16 and 17.

Fig. 16 SWO 12 – flap valve at outfall pipe

Fig. 17 SWO 6 – outfall at pumping station site

11.5 CONCLUSIONS AND RECOMMENDATIONS – SWO 12

The existing SWO 12 meets DOEHLG requirements in terms of 'Formula A' condition. Pumping capacity is over 50% higher than 6 DWF inflow rate. There is no emergency or storm water holding storage available at pumping station site. It is not possible to build the storage within pumping station boundaries, because of limited available area. Recent installation of stand-by power generator on site eliminated the risk of unnecessary spillages in the event of power cut.

12 STORM WATER OVERFLOW NO. 13 (SWO 13)

12.1 LOCATION – STORM WATER OVERFLOW NO. 13

The assessed storm water overflow number 13 (SWO 13) is located at Mill Lane, in southeastern part of Leixlip town. The general location of the overflow point is shown on Drawing no. 10.

12.2 CHARACTERISTICS OF OVERFLOW – SWO 13

The general characteristics of SWO 13 are compiled in the Table below.

SWO number (as per Waste Water Discharge Licence application)	13
Location	Mill Lane, Leixlip

Grid reference of overflow point (6E, 6N)	301148, 235876
Technical description	High level overflow pipe from foul sewer manhole chamber. 225mm diameter underground concrete pipe. Outfall from chamber located above water level. Flap valve at outfall
Description of operation	Overflow operates when sewer backs up, as a result of insufficient capacity of downstream section of the network. The overflow discharges to the stream.
Name of receiving waters	Silleachain Stream (tributary to River Liffey)
River basin district	Eastern RBD
Designation of receiving waters	Non sensitive
Dry weather flow rate in receiving waters	$2.0m^3 \times sec^{-1}$ (River Liffey)
Maximum volume emitted (up to 5 year storm)	Not available
SWO Control Type	High level overflow pipe from foul sewer manhole chamber
Type of Flow Meter at SWO	Not available
SWO event notification	Not available

SWO 13 overflows from foul sewer manhole chamber located on 375mm pipeline, to Silleachain Stream. In the event that the capacity of downstream part of network is exhausted, water can overflow via 225mm diameter pipe. This overflow is in fact an emergency outfall to the stream. The chamber with overflow is located on private property. Overflow to the stream is located in the public space, above water level and is visible from the adjacent road and footpath. The overflow does not operate in dry weather flow conditions, as observed during site visit on 9th of December 2010.

There is no information on how frequently the overflow operates or associated spill volumes. DOEHLG 'Formula A' of downstream section of 375mm diameter Mill Lane sewer is estimated at $0.06m^3/s$. The maximum capacity of the downstream section of sewer is $0.072m^3/s$. The downstream sewer capacity is greater than the 'Formula A' requirement. However the downstream capacity is influenced by the inflow to the Leixlip WWTP as outlined below.

The 375mm diameter sewer from Mill Lane enters the Inlet of the Leixlip Wastewater Treatment Plant at the same invert as the 750mm diameter main inlet sewer. The 375mm diameter sewer has a fall of 0.652m over a length of 366m, which means that if the 750mm diameter sewer is flowing close to full bore then the 366m length of 375mm diameter sewer would be surcharged. The surcharging of the

375mm diameter sewer causes near stagnant flows, which results in deposition of silt at the low velocities, as well as upstream overflows through SWO 13 on Mill Lane.

12.3 STRUCTURAL DESCRIPTION – SWO 13

Overflow from the manhole chamber is a high level 225mm diameter concrete pipe. The overflow to the stream is located in a stone wall, at the stream bank, above water level. There is a flap valve at outflow point. All visible elements of assessed SWO are in good structural conditions, with no noticeable structural defects.

12.4 VISUAL OR AESTHETIC IMPACT – SWO 13

The outfall point of SWO 13 is located above water level and is visible from the adjacent footpath and Mill Lane road. The overflow incidents cause significant visual and aesthetic impact on surrounding environment, as raw sewage discharge is visible from the public space.

The SWO 13 is shown in Figures 18 and 19.

Fig. 18 SWO 13: flap valve at the outfall point.

Fig. 19 Silleachain Stream at Mill Lane. SWO 13 visible behind 750mm diameter crossing sewer, at the right.

12.5 CONCLUSIONS AND RECOMMENDATIONS – SWO 13

The existing SWO 13 does not meet DOEHLG requirements. While theoretical activation level meets DOEHLG criterion and downstream sewer capacity is greater than the 'Formula A' requirement, other influences result in overflows occurring below the 'Formula A' setting. The overflow incidents through SWO 13 are caused mainly by insufficient velocity and surcharge of inlet to the downstream section of 375mm diameter pipeline, between Mill Street and Leixlip Waste Water Treatment Plant, located approximately 380m downstream of SWO 13.

In order to prevent near stagnant flows in this sewer and overflows through SWO 13, the inlet to the Leixlip Wastewater Treatment Plant should be reconstructed to allow a free discharge from the inlet pipes. This work could form part of the contract for the Upgrading of the Leixlip Treatment Plat when a new inlet balancing tank and pumping station would be constructed as per the recommendations of other preliminary report studies. Detailed design and calculations must be carried out, to determine the exact solutions and target parameters.

13 STORM WATER OVERFLOW NO. 14 (SWO 14)

13.1 LOCATION – STORM WATER OVERFLOW NO. 14

The assessed storm water overflow number 14 (SWO 14) is located at Straffan Pumping Station, east of Straffan village. The general location of the overflow point is shown on Drawing no. 11.

13.2 CHARACTERISTICS OF OVERFLOW – SWO 14

The general characteristics of SWO 14 are compiled in the Table below.

SWO number (as per Waste Water Discharge Licence application)	14
Location	Straffan Pumping Station, Lodgepark, Straffan
Grid reference of overflow point (6E, 6N) – as surveyed on site	292824, 229606
Technical description	High level overflow pipe from storm water holding tank. 300mm diameter underground ductile iron pipe. Flap valve at outfall to the stream.
Description of operation	Overflow operates when capacity of storm water holding tank at the pumping station is exhausted. The overflow discharges to the stream.
Name of receiving waters	Liffey Water stream (tributary to River Liffey)
River basin district	Eastern RBD
Designation of receiving waters	Sensitive
Dry weather flow rate in receiving waters	$2.4m^3 \times sec^{-1}$ (River Liffey)
Maximum volume emitted (up to 5 year storm)	Not available
SWO Control Type	High level pipe overflow from storm water holding tank
Type of Flow Meter at SWO	Not available
SWO event notification	Not available

SWO 14 overflows to Liffey Water stream from storm water holding tank at the pumping station. In the event that storm tank capacity is exhausted, water can overflow via 300mm diameter high level pipe. Outfall point is located on the stream bank, above water level. There is a flap valve on the overflow pipe, at outfall to the stream. The overflow does not operate in dry weather flow conditions, as observed during site visit on 9th of December 2010.

The storm water holding tank at pumping station has a storage capacity of $100m^3$. The storage system provides protection to the water quality in the River Liffey in the event of high flows caused by heavy rainfall, infiltration through sewer connection pipelines located in private property or temporary pump failure at the pumping station. The provision of storage at Straffan also allows for temporary cessation

of pumping onwards to Celbridge, if there is a problem at the main pumping station at Castletown in Celbridge, and there is a need to keep the available storage there for incoming flows from Celbridge itself, so as to prevent unnecessary overflows to the River Liffey.

In order to check the adequacy of the existing storage capacity with respect to high flows caused by heavy rainfall a series of rainfall events were used. A twenty year Time Series Rainfall was generated for Straffan, based on daily rainfall records for the period 1979 to 1999 supplied by Met Eireann. The model of the proposed Straffan Main Drainage System and Pumping Station was analysed under seven selected critical storms from the Time Series data. The analysis shows that there would be no overflow from the storage system during seven critical time series events. As a result, SWO frequency level meets the DOEHLG criteria: no overflow incidents to the receiving waters from rainfall events with a frequency of up to 1 in 5 years.

Because of the importance of water quality in the River Liffey for water abstraction at Leixlip, a telemetry system and stand-by power generator have been provided at Straffan Pumping Station. In the event of a prolonged power outage there is a facility to maintain the pumping station operational and protect the river quality.

13.3 STRUCTURAL DESCRIPTION – SWO 14

The overflow is a high level ductile iron pipe from storm water holding tank. The outfall point is located on the stream bank, in a concrete brick headwall. There is a flap valve at the outfall point. All visible elements of assessed SWO are in good structural conditions, with no noticeable structural defects.

13.4 VISUAL OR AESTHETIC IMPACT – SWO 14

The outfall point of SWO is located on the stream bank and is partly covered by greenery. It is located in the area generally inaccessible to public. The overflow incidents do not cause aesthetic impact on surrounding environment, however water flow in the stream during dry weather is almost stagnant, as observed during site visit. Any overflow incidents in dry weather can cause odour and local ground pollution problems, as the overflow may not be sufficiently diluted with stream flow.

The SWO 14 is shown in Figures 20 and 21.

Fig. 20 SWO 14 – flap valve at outfall pipe

Fig. 21 SWO 14 – outfall and pumping station site

13.5 CONCLUSIONS AND RECOMMENDATIONS – SWO 14

The existing SWO 14 meet DOEHLG requirements in terms of activation frequency, and does not cause visual and aesthetic impact on surrounding environment. There is very low flow velocity in the Liffey Water stream, which could cause problems with dry weather discharges (no proper dilution with

stream waters). The station is however equipped with stand by power generator and telemetry system, therefore risk of uncontrolled spillages is minimized.

14 STORM WATER OVERFLOW NO. 15 (SWO 15)

14.1 LOCATION – STORM WATER OVERFLOW NO. 15

The assessed storm water overflow number 15 (SWO 15) is located on Pound Street, in Leixlip town centre. The general location of the overflow points is shown on Drawing no. 12. This overflow has not been included in the original Waste Water Discharge License application from December 2007.

14.2 CHARACTERISTICS OF OVERFLOW – SWO 15

The general characteristics of SWO 15 are compiled in the Table below.

SWO number	15
Location	Pound Street, Leixlip
Grid reference of overflow point (6E, 6N)	300413, 235863
Technical description	High level overflow pipe from foul sewer manhole to storm culvert. Outfall located above water level, at river bank.
Description of operation	Overflow operates when sewer backs up, as a result of insufficient capacity of downstream section of the network. The overflow discharges to the river.
Name of receiving waters	Rye Water
River basin district	Eastern RBD
Designation of receiving waters	Non sensitive
Dry weather flow rate in receiving waters	$0.05m^3 \times sec^{-1}$ (Rye Water, approximate) $2.0m^3 \times sec^{-1}$ (River Liffey)
Maximum volume emitted (up to 5 year storm)	Not available
SWO Control Type	High level overflow pipe from foul sewer manhole chamber
Type of Flow Meter at SWO	Not available
SWO event notification	Not available

SWO 15 overflows from foul sewer manhole chamber no. 4801, to the storm culvert and then to Rye Water river. This overflow is in fact an emergency outfall to the river. It has been constructed after

numerous flooding incidents in the downstream part of the network, of which the most serious happened in January 2009. After several days of snowfall followed by heavy rains, the manhole located at the entrance to Leixlip Castle, immediately upstream of Rye Bridge, surcharged and flooded the entrance to the Castle. Inspection chambers in the adjacent garden also surcharged causing extensive flooding in the vicinity of the house. The flooding was mainly caused due to insufficient capacity of pipe traversing the Rye Water river at Rye Bridge and inadequate capacity of the network downstream of Pound Street.

The discussed overflow has been designed such that it only comes into operation during significant storm events whereby the overspill will be significantly diluted with surface waters.

The outfall to the river is located in the public space, above water level and is visible from the footpath along Rye Water. The overflow does not operate in dry weather flow conditions, as observed during site visit on 9th of December 2010. There is no information on how frequently the overflow operates or associated spill volumes.

14.3 STRUCTURAL DESCRIPTION – SWO 15

Overflow from the manhole chamber is a high level pipe, to the storm stone culvert. The overflow to the river is located in a stone wall, at the river bank, above water level. There is no flap valve at outflow point and no grating. All visible elements of assessed SWO are in good structural conditions, with no noticeable structural defects.

14.4 VISUAL OR AESTHETIC IMPACT – SWO 15

The outfall point of SWO 15 is located above water level and is visible from the adjacent footpath, along Rye Water river. The overflow incidents can cause some visual and aesthetic impact on surrounding environment, however this overflow will come into operation only during heavy rainfall events, where foul sewage spill will be significantly diluted with storm water.

The SWO 15 is shown in Figures 22 and 23.

Fig. 22 SWO 15: surface water culvert combined with foul sewer overflow

Fig. 23 SWO 15 to Rye Water, visible from the above footpath

14.5 CONCLUSIONS AND RECOMMENDATIONS – SWO 15

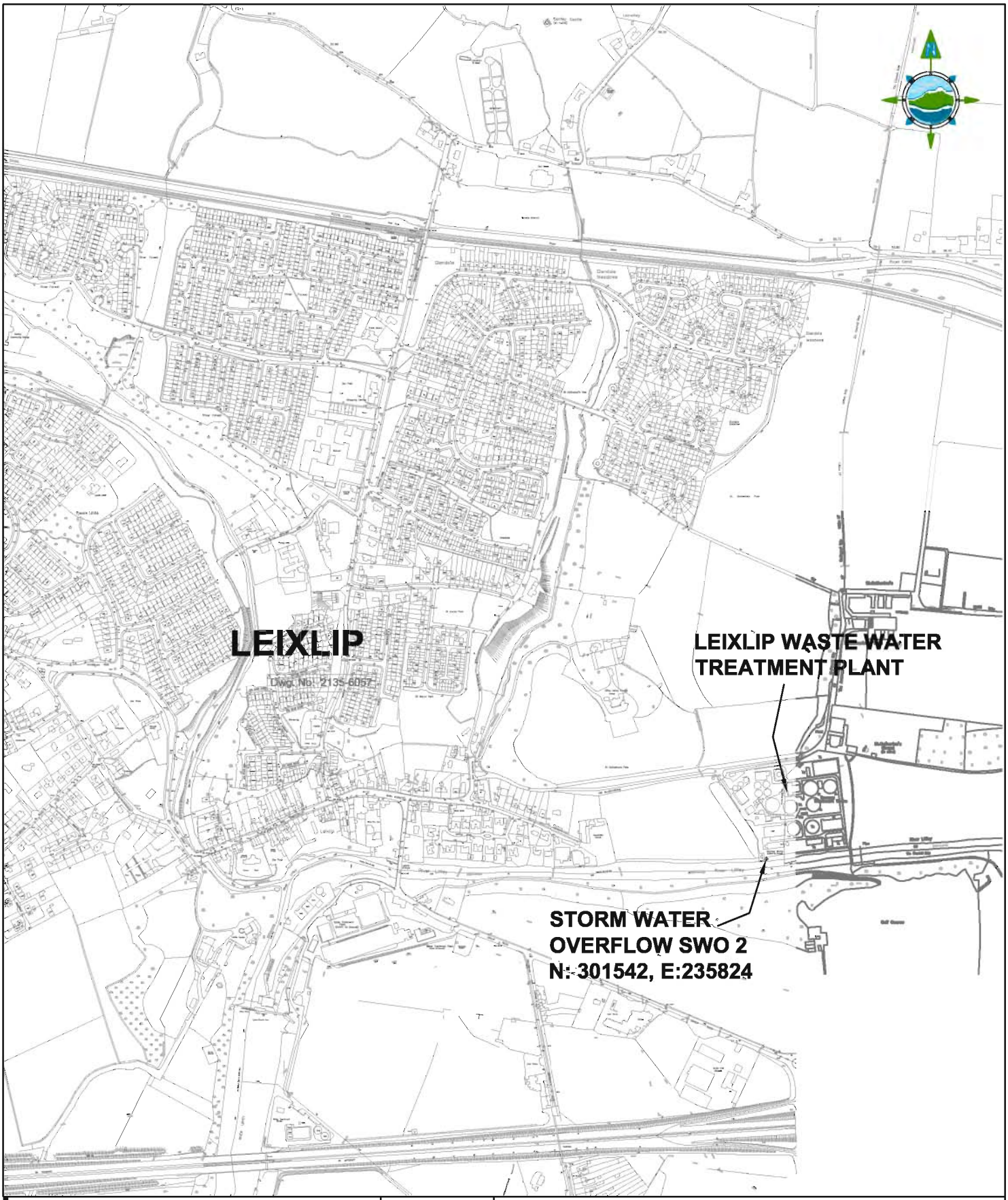
The SWO 15 does not meet the DOEHLG requirements in terms of 'Formula A' and activation level. This overflow is however considered as a short-term interim solution, until upgrade of foul sewer pipe at Rye Bridge, downstream of SWO 15.

It is recommended to carry out flow monitoring of the foul sewer network on Pound Street, to enable calibration of a hydraulic model to ascertain the required size of sewer to transverse the Rye Water river at Rye Bridge.

The long Term strategy should however be to endeavour to eliminate extensive surface water ingress into the foul network. This would have the beneficial impact of increasing the capacity of the foul network for sewerage loads in Pound Street and Main Street area. This will also indirectly improve the efficiency and cost effectiveness of Leixlip Waste Water Treatment Plant. To ensure there is no repeat occurrence of flooding incidents through foul sewer network, it is also recommended to carry out a complex study of the foul network upstream of Leixlip Town centre, to identify and remove incorrect surface water connections.

APPENDIX 1

DRAWINGS



Client: Kildare County Council	Prepared by:	TOBIN Consulting Engineers, Block 10-4, Blanchardstown Corporate Park, Dublin 15, Ireland. tel: +353-(0)1-8030406 fax:+353-(0)1-8030409 e-mail: dublin@tobin.ie www.tobin.ie
Project: Lower Liffey Valley Regional Sewerage Scheme	Checked: GW	
	Date: 12.2010	
Title: Storm Water Overflow Assessment SWO 2 - General Location	Project Director: COK	
	Drawing Status:	
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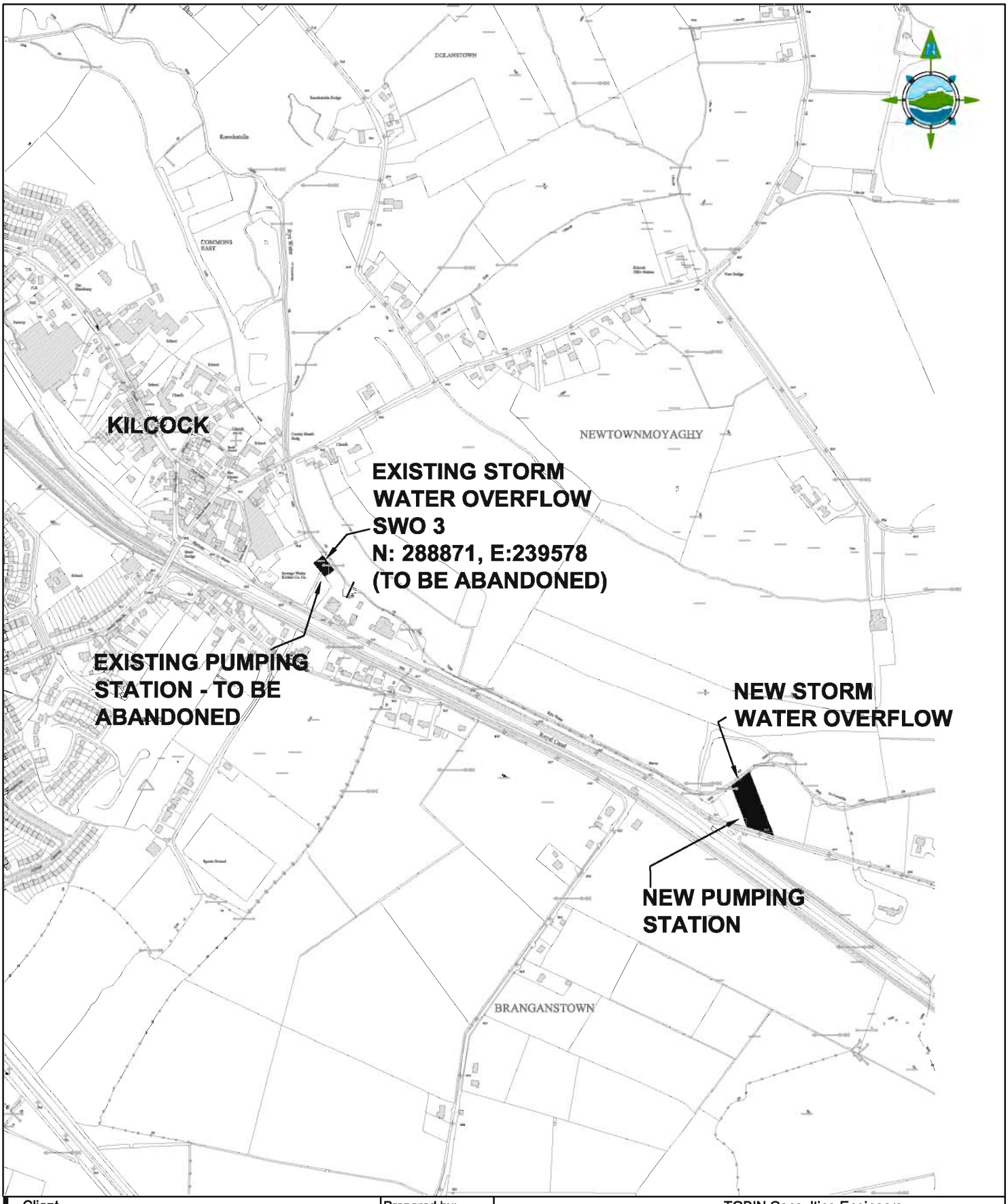
Drawing No. 1

Revision: A



Client: Kildare County Council	Prepared by:	TOBIN Consulting Engineers, Block 10-4, Blanchardstown Corporate Park, Dublin 15, Ireland. tel: +353-(0)1-8030406 fax:+353-(0)1-8030409 e-mail: dublin@tobin.ie www.tobin.ie
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	Date: 12.2010	
Title: Storm Water Overflow Assessment SWO 3 - General Location	Project Director: COK	
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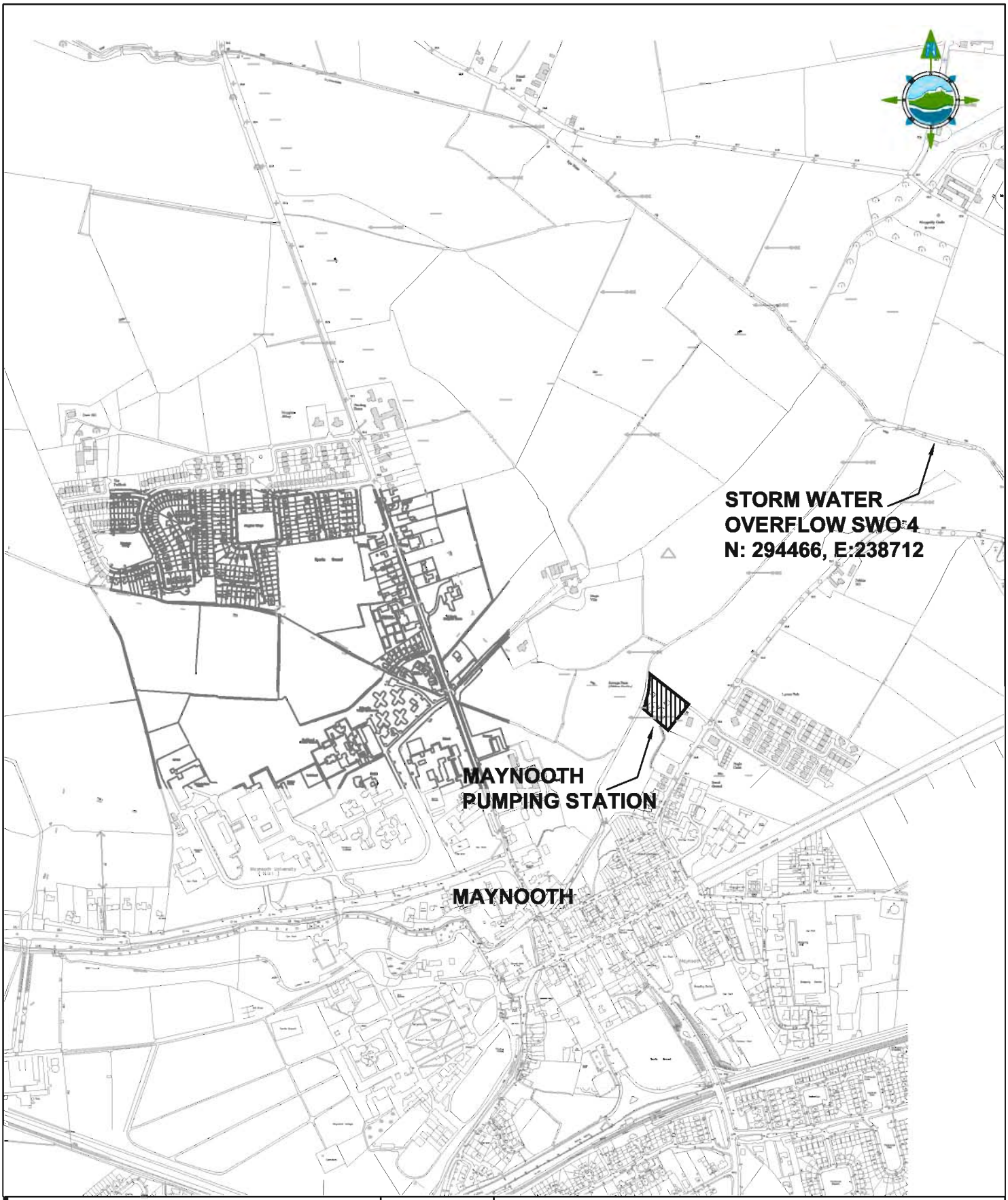
Drawing No. 2

Revision: A



Client Kildare County Council	Prepared by:	TOBIN Consulting Engineers, Block 10-4, Blanchardstown Corporate Park, Dublin 15, Ireland. tel: +353-(0)1-8030406 fax:+353-(0)1-8030409 e-mail: dublin@tobin.ie www.tobin.ie
Project Lower Liffey Valley Regional Sewerage Scheme	Checked: GW	
	Date: 12.2010	
Title Storm Water Overflow Assessment SWO 4 - General Location	Project Director: COK	
	Drawing Status:	
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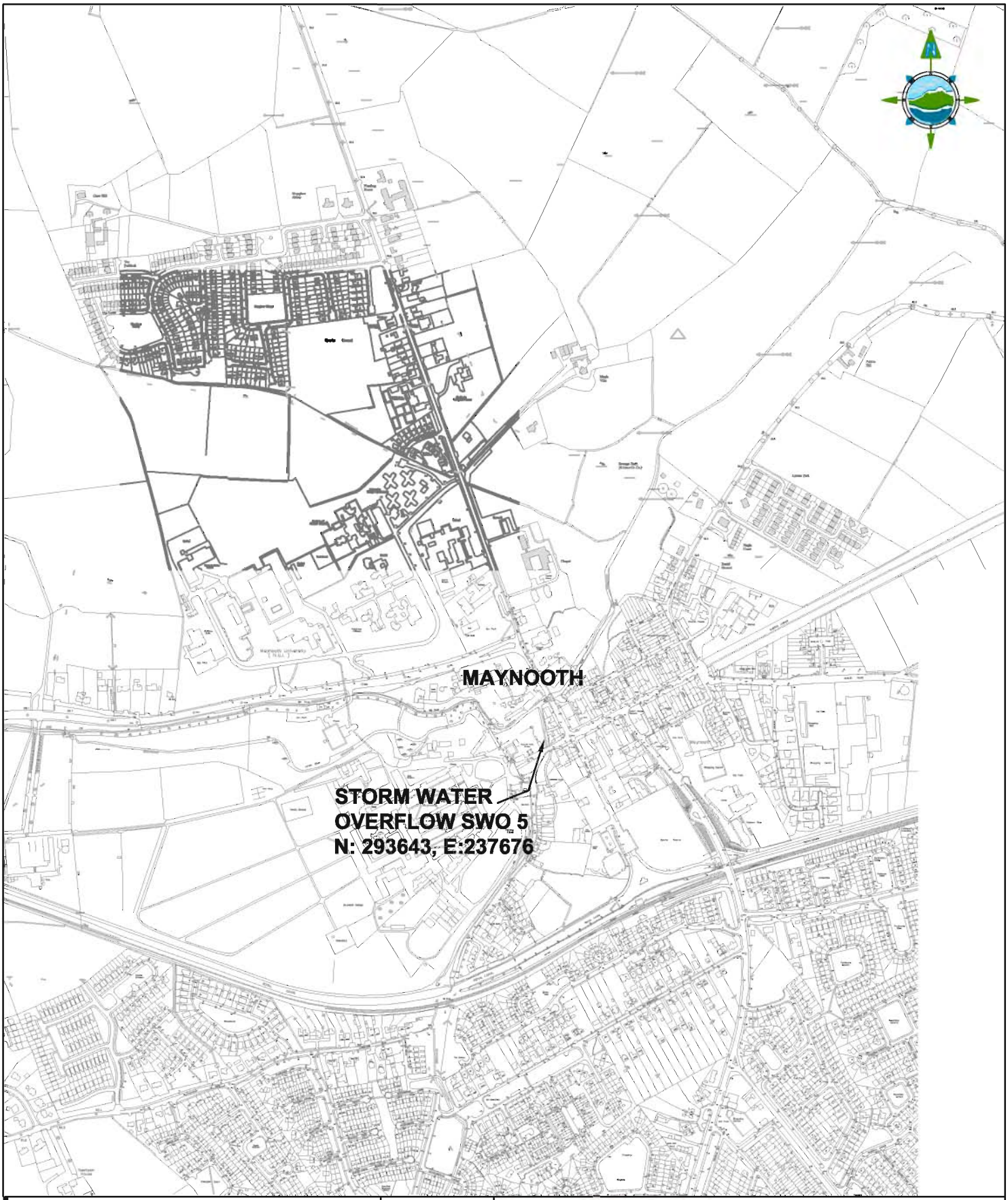
Drawing No. 3

Revision: A



Client Kildare County Council	Prepared by:	TOBIN Consulting Engineers, Block 10-4, Blanchardstown Corporate Park, Dublin 15, Ireland. tel: +353-(0)1-8030406 fax:+353-(0)1-8030409 e-mail: dublin@tobin.ie www.tobin.ie
Project Lower Liffey Valley Regional Sewerage Scheme	Checked: GW	
	Date: 12.2010	
Title Storm Water Overflow Assessment SWO 5 - General Location	Project Director: COK	
	Drawing Status:	
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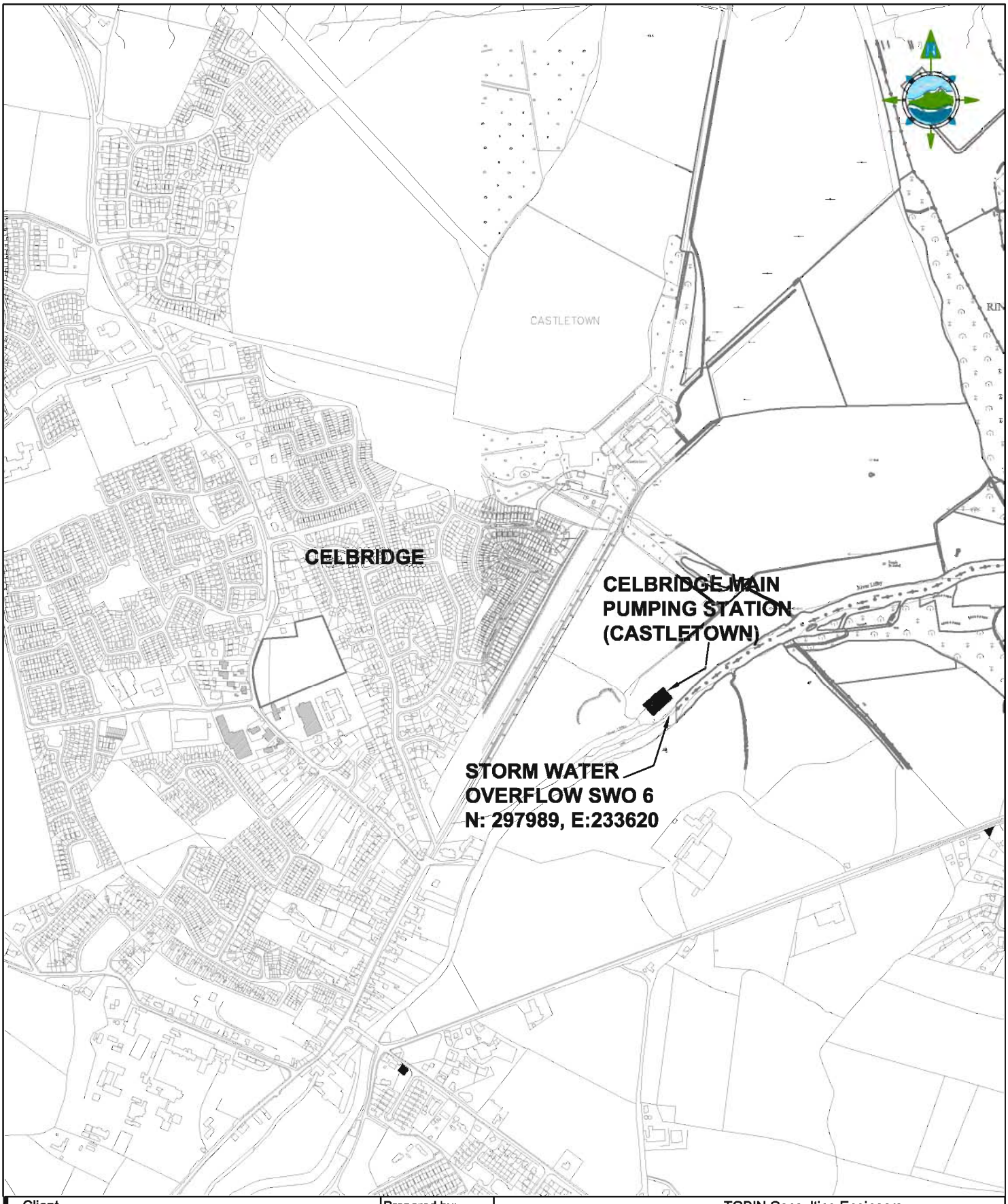
Drawing No. 4

Revision: A



Client: Kildare County Council	Prepared by:	TOBIN Consulting Engineers, Block 10-4, Blanchardstown Corporate Park, Dublin 15, Ireland. tel: +353-(0)1-8030406 fax:+353-(0)1-8030409 e-mail: dublin@tobin.ie www.tobin.ie
Project: Lower Liffey Valley Regional Sewerage Scheme	Checked: GW	
	Date: 12.2010	
Title: Storm Water Overflow Assessment SWO 6 - General Location	Project Director: COK	
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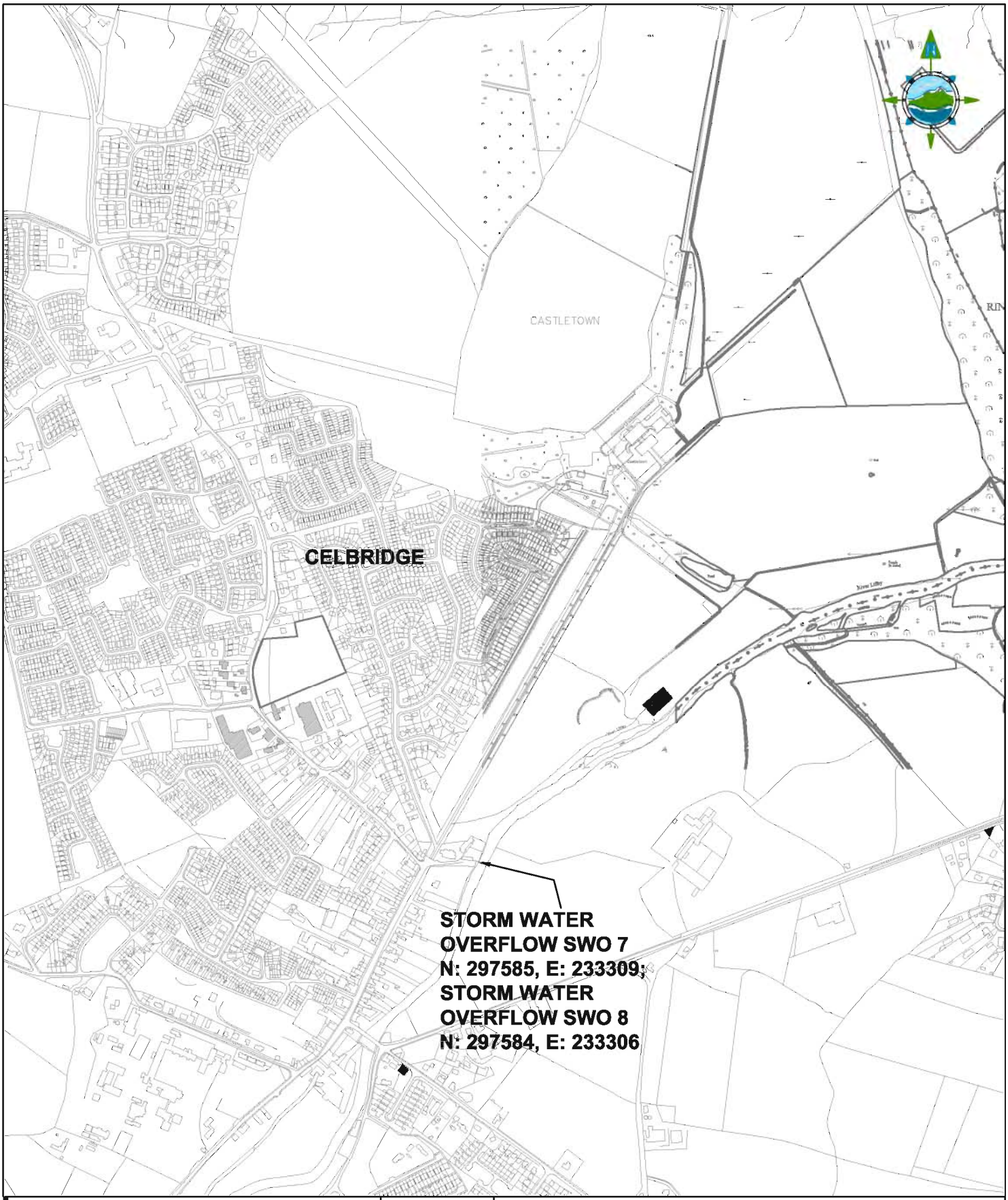
Drawing No. 5

Revision: A



Client: Kildare County Council	Prepared by:	TOBIN Consulting Engineers, Block 10-4, Blanchardstown Corporate Park, Dublin 15, Ireland. tel: +353-(0)1-8030406 fax:+353-(0)1-8030409 e-mail: dublin@tobin.ie www.tobin.ie
Project: Lower Liffey Valley Regional Sewerage Scheme	Checked: GW	
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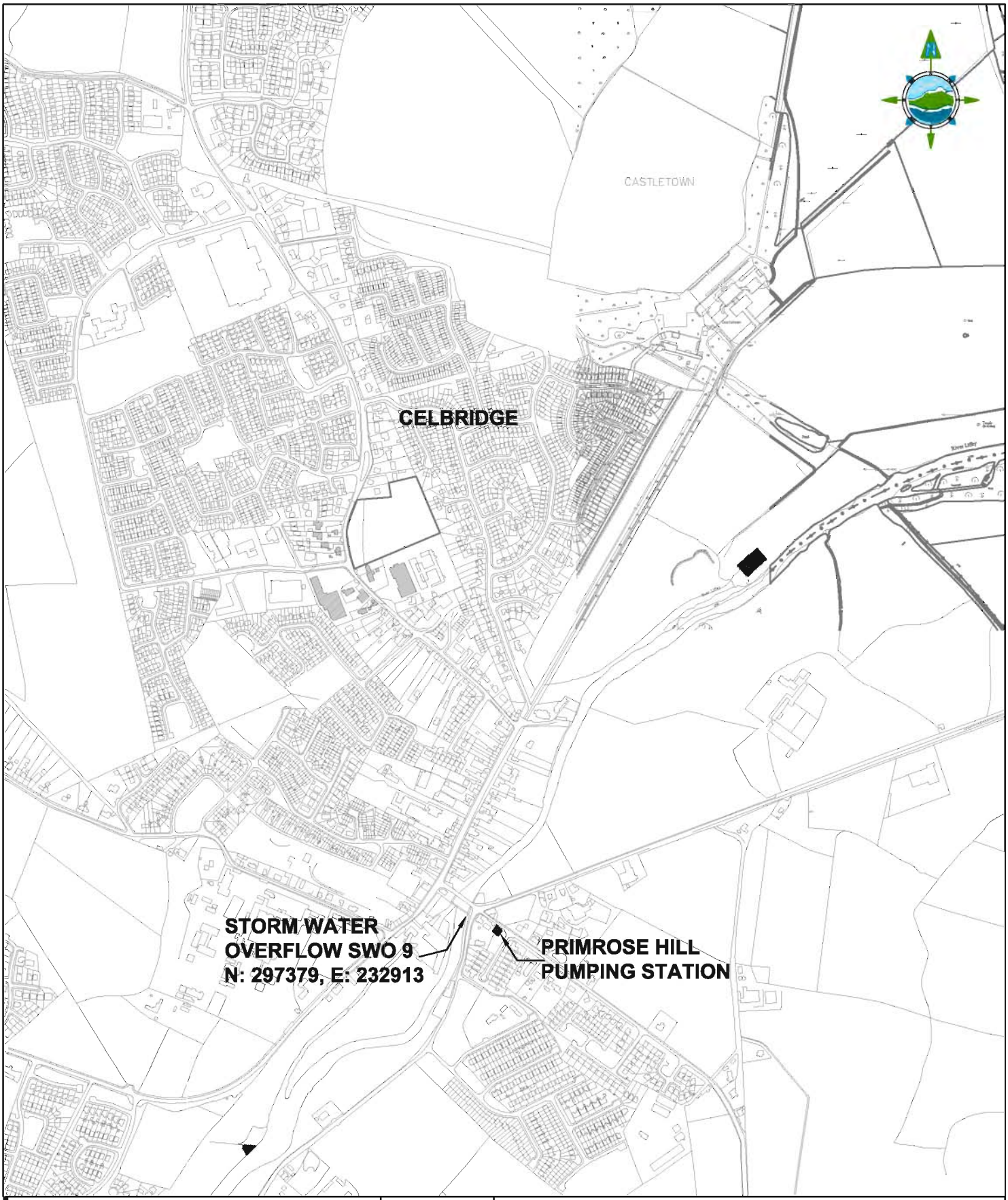
Drawing No. 6

Revision: A



Client: Kildare County Council	Prepared by:	TOBIN Consulting Engineers, Block 10-4, Blanchardstown Corporate Park, Dublin 15, Ireland. tel: +353-(0)1-8030406 fax:+353-(0)1-8030409 e-mail: dublin@tobin.ie www.tobin.ie
Project: Lower Liffey Valley Regional Sewerage Scheme	Checked: GW	
	Date: 12.2010	
Title: Storm Water Overflow Assessment SWO 9 - General Location	Project Director: COK	
	Drawing Status:	
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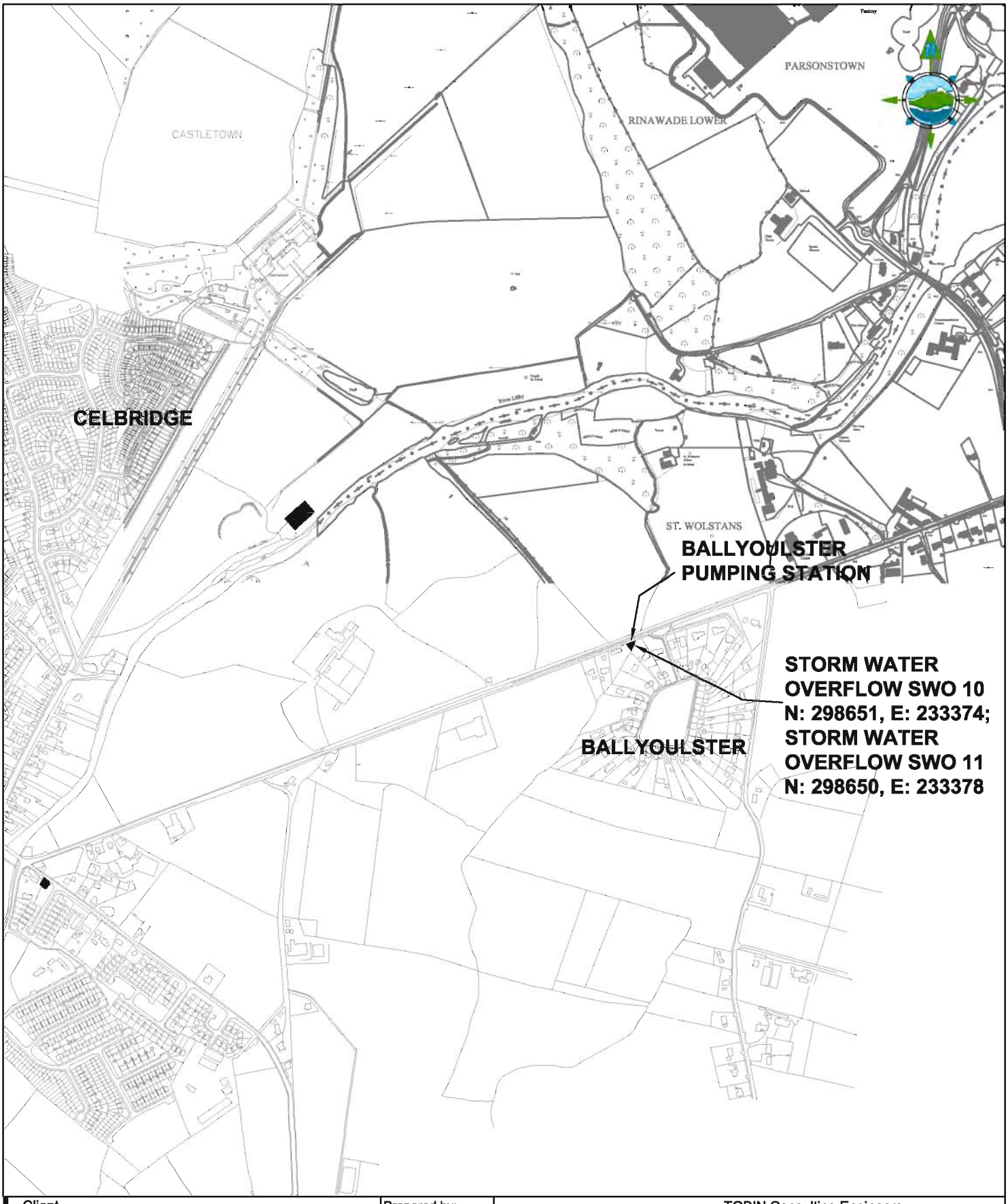
Drawing No. 7

Revision: A



Client: Kildare County Council	Prepared by:	TOBIN Consulting Engineers, Block 10-4, Blanchardstown Corporate Park, Dublin 15, Ireland. tel: +353-(0)1-8030406 fax:+353-(0)1-8030409 e-mail: dublin@tobin.ie www.tobin.ie
Project: Lower Liffey Valley Regional Sewerage Scheme	Checked: GW	
	Date: 12.2010	
Title: Storm Water Overflow Assessment SWO 10 and 11 - General Location	Project Director: COK	
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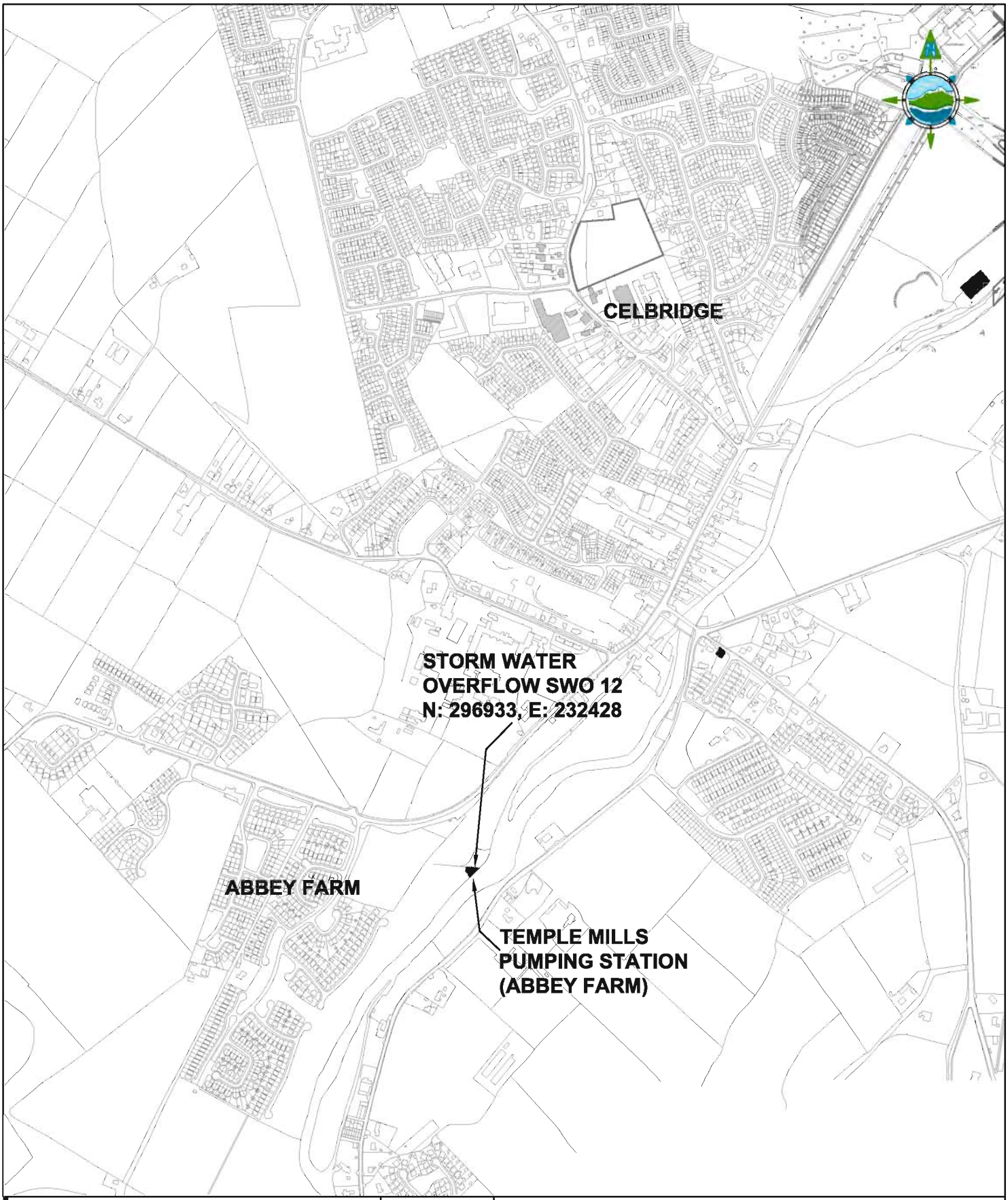
Drawing No. 8

Revision: A



Client	Kildare County Council
Project	Lower Liffey Valley Regional Sewerage Scheme
Title	Storm Water Overflow Assessment SWO 12 - General Location
Prepared by:	
Checked:	GW
Date:	12.2010
Project Director:	COK
Drawing Status:	
Scale @ A4:	NTS

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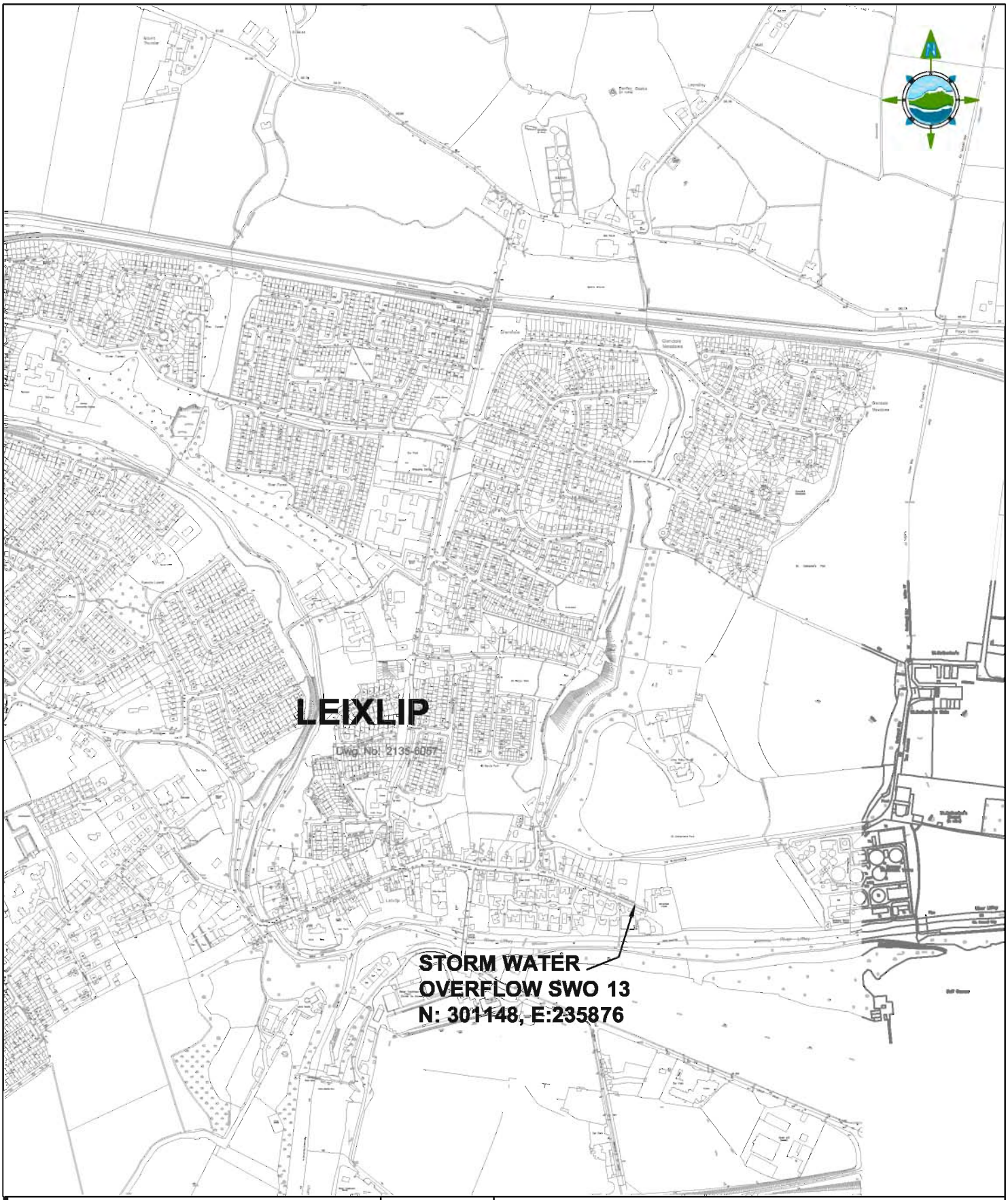
Drawing No. 9

Revision: A



Client
Kildare County Council

Project
Lower Liffey Valley Regional Sewerage Scheme

Title
Storm Water Overflow Assessment
SWO 13 - General Location

Prepared by:

Checked:
GW

Date:
12.2010

Project Director:
COK

Drawing Status:

Scale @ A4:
NTS

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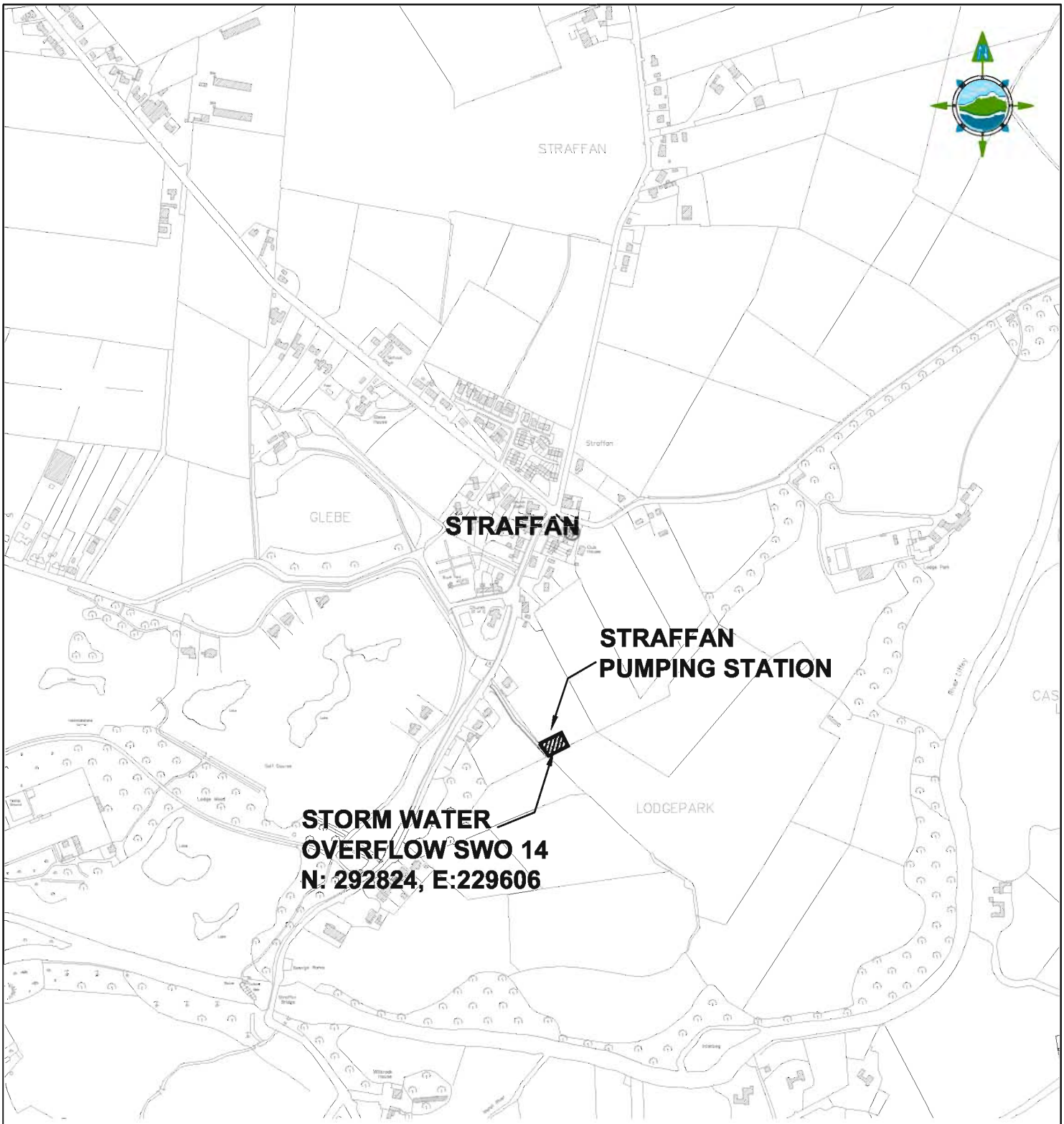
Drawing No. 10

Revision:
A



Client Kildare County Council	Prepared by:	TOBIN Consulting Engineers, Block 10-4, Blanchardstown Corporate Park, Dublin 15, Ireland. tel: +353-(0)1-8030406 fax:+353-(0)1-8030409 e-mail: dublin@tobin.ie www.tobin.ie
Project Lower Liffey Valley Regional Sewerage Scheme	Checked: GW	
	Date: 12.2010	
Title Storm Water Overflow Assessment SWO 14 - General Location	Project Director: DC	
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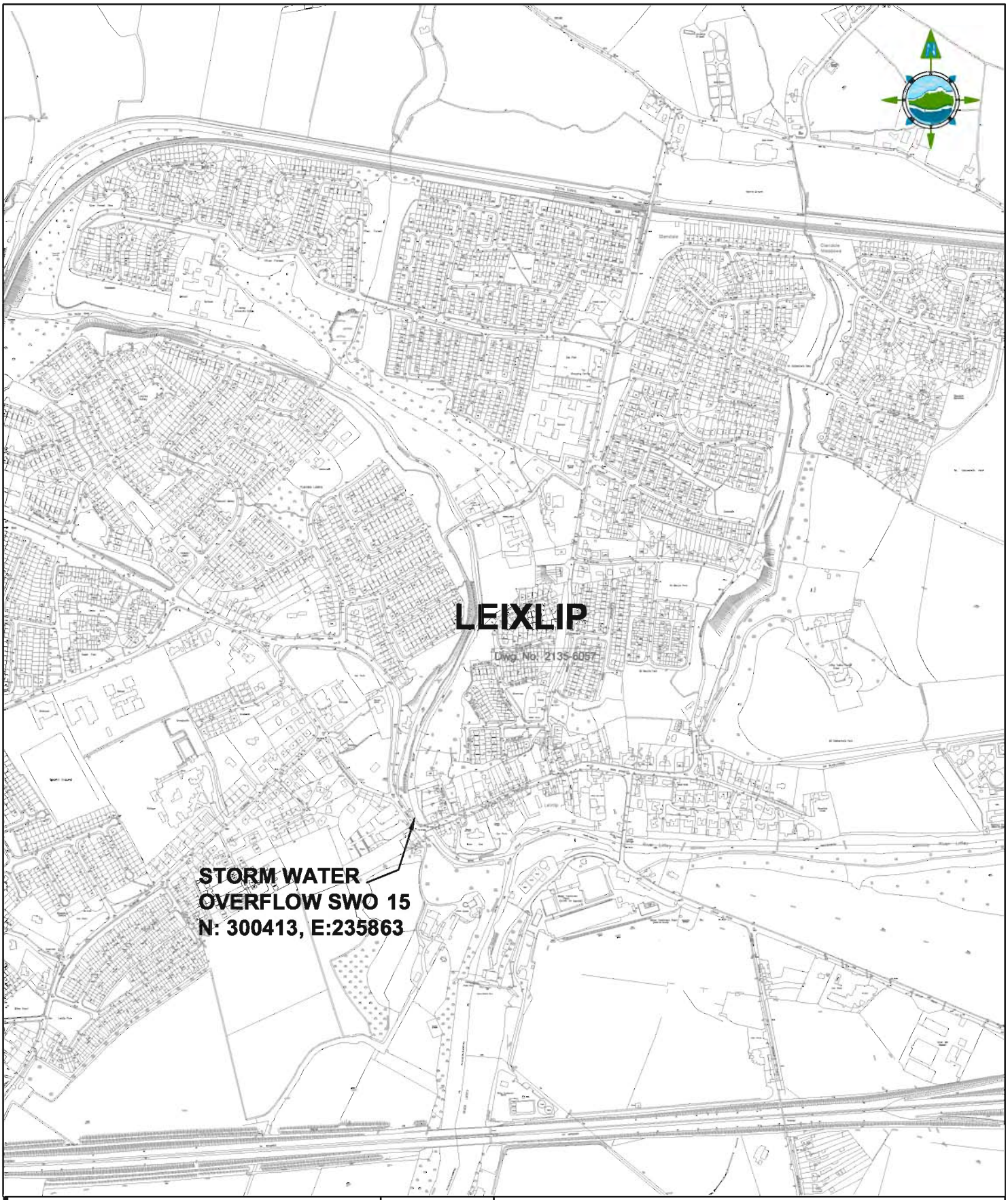
Drawing No. 11

Revision: A



Client: Kildare County Council	Prepared by:	TOBIN Consulting Engineers, Block 10-4, Blanchardstown Corporate Park, Dublin 15, Ireland. tel: +353-(0)1-8030406 fax:+353-(0)1-8030409 e-mail: dublin@tobin.ie www.tobin.ie
Project: Lower Liffey Valley Regional Sewerage Scheme	Checked: GW	
	Date: 12.2010	
Title: Storm Water Overflow Assessment SWO 15 - General Location	Project Director: COK	
	Drawing Status:	
	Scale @ A4: NTS	

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Drawing No. 12

Revision: A

Appendix 6

Ambient water & Effluent visual inspection (Sept 16th – Dec 31st 2013) – text results, numerical results submitted through EDEN

LLVRSS Visual Inspection Analysis For Effluent/Upstream and Downstream 2013

DATE	Effluent Colour	Upstream colour PtCo	Downstream colour PtCo
September 2013			
16/09/2013	clear		
19/09/2013	clear		
20/09/2013	clear	33	16
21/09/2013	clear		
22/09/2013	clear		
23/09/2013	clear		
26/09/2013	clear		
27/09/2013	clear	22	18
28/09/2013	clear		
29/09/2013	clear		
30/09/2013	clear		
October 2013			
DATE	Effluent Colour	Upstream colour PtCo	Downstream colour PtCo
01/10/2013	clear		
02/10/2013	clear		
03/10/2013	clear		
04/10/2013	clear	85	83
05/10/2013	clear		
06/10/2013	clear		
07/10/2013	clear		
08/10/2013	clear		
09/10/2013	clear		
10/10/2013	clear		
11/10/2013	clear	32	32
12/10/2013	clear		
13/10/2013	clear		
14/10/2013	clear		
15/10/2013	clear		
16/10/2013	clear		
17/10/2013	clear		
18/10/2013	clear	89	84
19/10/2013	clear		
20/10/2013	clear		
21/10/2013	clear		
22/10/2013	clear		
23/10/2013	clear		
24/10/2013	clear		
25/10/2013	clear	37	45
26/10/2013	clear		
27/10/2013	clear		
28/10/2013	clear		
29/10/2013	clear		
30/10/2013	clear		
31/10/2013	clear		
November 2013			
DATE	Effluent Colour	Upstream colour PtCo	Downstream colour PtCo
01/11/2013	clear	59	54
02/11/2013	clear		
03/11/2013	clear		
04/11/2013	clear		

05/11/2013	clear		
06/11/2013	clear		
07/11/2013	clear		
08/11/2013	clear	79	67
09/11/2013	clear		
10/11/2013	clear		
11/11/2013	clear		
12/11/2013	clear		
13/11/2013	clear		
14/11/2013	clear		
15/11/2013	clear	76	70
16/11/2013	clear		
17/11/2013	clear		
18/11/2013	clear		
19/11/2013	clear		
20/11/2013	clear		
21/11/2013	clear	78	72
22/11/2013	clear		
23/11/2013	clear		
24/11/2013	clear		
25/11/2013	clear		
26/11/2013	clear		
27/11/2013	clear		
28/11/2013	clear		
29/11/2013	clear	52	35
30/11/2013	clear		
December 2013			
DATE	Effluent Colour	Upstream colour PtCo	Downstream colour PtCo
01/12/2013	clear		
02/12/2013	clear		
03/12/2013	clear		
04/12/2013	clear		
05/12/2013	clear		
06/12/2013	clear	81	63
07/12/2013	clear		
08/12/2013	clear		
09/12/2013	clear		
10/12/2013	clear		
11/12/2013	clear		
12/12/2013	clear		
13/12/2013	clear	58	56
14/12/2013	clear		
15/12/2013	clear		
16/12/2013	clear		
17/12/2013	clear		
18/12/2013	clear		
19/12/2013	clear		
20/12/2013	clear	87	93
21/12/2013	clear		
22/12/2013	clear		
23/12/2013	clear		
24/12/2013	clear		
25/12/2013	clear		
26/12/2013	clear		
27/12/2013	clear	86	89

28/12/2013	clear		
29/12/2013	clear		
30/12/2013	clear		
31/12/2013	clear		

Appendix 7

Ambient Monitoring

LLVRSS Ambient Monitoring @ aSW1u - upstream of SW1

Date	BOD (mg/l)	Suspended Solids (mg/l)	Ammonia (mg/l N)	TON (mg/l N)	O-phosphate (mg/l)	pH	Total Nitrogen (mg/lN)	Mercury (ug/L)	Fluoride (mg/l)
10/01/2013	1	10	0.049	1.59	0.098	7.8	2.71	<0.03	0.06
07/02/2013	1	6	0.036	1.37	0.018	8.1	2.49	<0.03	0.13
07/03/2013	1	2	0.065	2.48	0.029	8.1	3.6	<0.03	0.15
04/04/2013	1	6	0.005	2.07	0.015	8.1	2.63	<0.03	0.14
02/05/2013	1	5	0.005	1.72	0.007	8.1	2.84	<0.03	0.2
30/05/2013	1	6	0.111	1.7	0.006	7.9	2.82	<0.03	0.17
27/06/2013	1	7	0.207	1.26	0.008	7.7	1.82	<0.03	0.06
25/07/2013	1	6	0.123	1.18	0.052	7.7	1.74	<0.03	0.14
22/08/2013	1	6	0.051	1.08	0.045	8.0	1.64	<0.03	0.14
19/09/2013	1	2	0.005	1.57	0.009	7.9	1.57	<0.03	0.35
09/10/2013	1	nd	0.025	nd	0.07	8.0	2.4	<0.02	0.1
06/11/2013	1	nd	0.025	nd	0.015	7.9	1.6	<0.10	0.05
04/12/2013	1	nd	0.06	nd	0.03	8.1	2.1	<0.10	0.1

nd = not determined

LLVRSS Ambient Monitoring @ aSW1d - downstream of SW1

Date	BOD (mg/l)	Suspended Solids (mg/l)	Ammonia (mg/l N)	TON (mg/l N)	O-phosphate (mg/l)	pH	Total Nitrogen (mg/lN)	Mercury (ug/L)	Fluoride (mg/l)
10/01/2013	1	6	0.025	1.64	0.022	7.9	2.2	<0.03	0.09
07/02/2013	1	5	0.093	1.74	0.02	8.1	2.3	<0.03	0.13
07/03/2013	1	4	0.056	2.68	0.022	8.2	3.8	<0.03	0.15
04/04/2013	1	3	0.005	2.65	0.014	8.1	3.21	<0.03	0.15
02/05/2013	1	2	0.025	2.89	0.008	8.2	4.01	<0.03	0.17
30/05/2013	1	7	0.076	3.2	0.02	8.0	4.32	<0.03	0.23
27/06/2013	1	8	0.104	2.84	0.034	7.8	3.4	<0.03	0.23
25/07/2013	1	3	0.167	4.58	0.073	7.8	5.14	<0.03	0.32
22/08/2013	1	5	0.069	3.3	0.041	8.0	3.86	<0.03	0.24
19/09/2013	1	5	0.098	4.44	0.06	8.1	5.56	<0.03	0.34
09/10/2013	1	nd	0.07	nd	0.07	8.0	4	<0.02	0.2
06/11/2013	2	nd	0.025	nd	0.03	8.0	1.8	<0.10	0.05
04/12/2013	1	nd	0.19	nd	0.05	7.9	3.4	<0.10	0.1

nd = not determined