Appendix A14.4 Estimation of Emission Rates from the Proposed Abbotstown Pumping Station and Wastewater Treatment Plant

A14.4 Estimation of emission rates

14.4.1 Introduction

This Appendix describes the methodology that was used for the estimation of emission rates from various sources associated with the proposed Project.

14.4.2 Emission Rate Estimates for Abbotstown Generator

The Pumping Station Generator is required to provide power in the event of an emergency power outage. The generator is not expected to be in use continuously, but will be switched on at regular intervals to ensure ongoing effective operation. Sulfur dioxide emissions originate from the sulfur in the fuel used in the combustion process. Since diesel is the fuel in use sulfur dioxide emissions will be relatively low as the maximum sulfur content is limited by regulation to 0.1%. Nitrogen oxides are also present in the emission stream as a result of the combustion process. Much of the emissions are in the form of nitrogen oxide (NO) which is expected to be substantially oxidised to nitrogen dioxide (NO_2) in the atmosphere. Carbon monoxide (CO) is also emitted as a result of combustion and fine particulate matter is also expected to be emitted in the form of PM_{10}.

The power requirement for the Pumping Station was calculated by the Designers based on the well established power requirements for this type and scale of activity. The basic information provided was the power rating for the generator together with typical and maximum power output and fuel usage. Suppliers of this type of plant also provided information on performance and emission rate from this type of combustion plant.

Sulfur emissions were calculated from the typical and maximum fuel usage for various scenarios based on the maximum permissible sulfur content in diesel fuels of 0.1%. Potential emissions of nitrogen oxides (NOx), carbon monoxide (CO) and particulate matter (PM_{10}) were calculated from the energy usage using standard methodologies. The calculation of emissions to atmosphere from combustion plants is described in several publications including the *Corinair Combustion In Energy & Transformation Industries (Emission Inventory Guidebook 15 February, 1996)*[1]. This is a guidance publication on calculating emissions from combustion plants which is recommended by the EPA as useful guidance in preparing reports to the EPA on emissions to air. These references have been used to estimate the emissions to atmosphere from the combustion plant associated with the proposed Project.

Using this methodology, an estimate of the emissions of each major pollutant is determined as shown in Table A14.3.1. This data was then used as input data for the dispersion modelling assessment of the potential impact on air quality of the emissions.

Table A14.3.1: Emissions estimate for Abbotstown Generator

Standby Power Rating, kW	2000
Max Diesel Use - standby, lph	603
Max diesel use - prime, lph	549
Exhaust Temperature, C	516
Outlet Diameter, mm	340
Flow, m^3/sec	3.68
SO_2, g/sec	0.000287
NO_x, g/se	0.051429
CO, g/sec	0.025714
PM as PM_{10}, g/sec	0.032143

[1] Accessible at http://www.epa.ie/pubs/reports/air/airemissions/epacorinaircombustionfactorspdf.html#.VgrHFI2FO71 ; accessed 18 October 2017

14.4.3 Emission Rate Estimates for Abotstown Odour Control System

The Pumping Stations will be of wet / dry well construction, i.e. the pumps will be mounted in a dry well with the suction pipework being constructed in the pumping station wet well. The main odour source will be the wet well with lower emissions from the dry well. Both chambers will be vented and the extracted air will be treated in an Odour Control Unit (OCU) before discharge to atmosphere through a stack above the height of the Pumping Station Building. The odorous gases present will include various organic substances, ammonia, hydrogen sulfide, methane and odour.

Information on the volume of the wet and dry wells, the proposed ventilation rate and the design flow capacity of the Pumping Station was provided by the design Engineers. The peak predicted **untreated** odour loading at the Pumping Station is 10,450 OU/m^3 which is determined from the volume of the wet and dry wells and the required air extraction rates as well as the projected odour emission rate for a facility of this type and size. The estimated emission from the Odour Control Unit under tpical and peak operating conditions are shown in Table A14.3.2.

Table A14.3.2: Emissions estimate for Abbotstown Odour Control Unit

Wet Well, m^3	3847
Dry well, m^3	3585
Wet Well, acph	3
Dry well, acph	2
Discharge, m^3/hour	18711
Discharge, m^3/sec	5.56
OU_E/m^3, typical	300
OU_E/m^3, peak	500
Velocity, m/s	11.05
OU_E/sec, typical	1667
OU_E/sec, peak	2778

14.4.4 Emission Rate Estimates for Dubber Odour Control Unit

There is a possibility that odours could be released at the point of transition from rising main to gravity sewer on the sewer connection from Abbotstown. This discharge is in the vicinity of the Dubber Cottages. As a precautionary measure, air will be extracted from this connection and treated in an Odour Control Unit (OCU) before discharge to atmosphere through a stack above the OCU. The odorous gases present will include various organic substances, ammonia, hydrogen sulfide, methane and odour. The Odour Control Unit will be the same size as that proposed for the Abbotstown Pumping Station although this is likely to oversize the abatement unit.

14.4.2 Emission Rate Estimates for Clonshagh CHP

The CHP plant will burn gas generated in the sludge digestor plant. Sulfur dioxide emissions will be present in the emissions but the emission rate is expected to be relatively low. Nitrogen oxides are also present in the emission stream as a result of the combustion process. Much of the emissions are in the form of nitrogen oxide (NO) which is expected to be substantially oxidised to nitrogen dioxide (NO_2) in the atmosphere. Carbon monoxide (CO) is also emitted as a result of combustion and fine particulate matter is also expected to be emitted in the form of PM_{10}. Other substances that may be present include hydrogen sulfide, ammonia and mercaptans. The CHP plant can also burn natural gas and there would be no change in the nature of the emissions for this fuel.

Emissions estimates were derived using the methodology described in the *Corinair Combustion In Energy & Transformation Industries (Emission Inventory Guidebook 15 February, 1996*). Using this methodology, an estimate of the emissions of each major pollutant is determined as shown in Table A14.3.3. This data was then used as input data for the dispersion modelling assessment of the potential impact on air quality of the emissions.

Table A14.3.3: Emissions estimate for Clonshagh CHP

	Maximum	Typical
Exhaust Temperature, C	38	38
Outlet Diameter, m	0.7	0.7
Flow, m^3/sec	12.53	12.53
SO_2, g/sec	1.205357	1.205357
NO_x, g/sec	1.205357	1.205357
CO, g/sec	5.062500	5.062500
PM as PM_{10}, g/sec	0.048214	0.048214
H_2S, g/sec	0.021696	0.007232
Odour, OU_E/sec	2411	2411

14.4.2 Emission Rate Estimates for Clonshagh WwTP and Odour Control Units

The main odour sources will be the inlet works, preliminary treatment stages and the sludge handling activities, with odour emissions also released from the other main elements of the waste water treatment plant. These include the following:

- the inlet works;
- the preliminary treatment stages;
- the primary settlement tanks;
- primary treatment stages;
- activated sludge plant lanes;
- sludge reception, handling, storage and processing facilities, and
- final treatment stages.

Odour emissions may arise at all stages of the treatment process. Estimates of odour emission rates were made using information derived from the following sources:

(a) Literature references, including the UKWIR TRD “Odour control in wastewater treatment’ and the WRc publication CP149 “Reducing odour from Sludge”;
(b) Measurement data for existing similar wastewater treatment plants; and
(c) Information provided by the operators of similar wastewater treatment plants throughout Europe.

A summary of the data used to derive the odour emission rate is presented in Table A14.4.4. This data is based on indicative design data for the WwTP and is a reliable estimate of projected maximum odour emission rates requiring treatment. Using the data presented in Appendix 14.4, a potential untreated odour emission rate for each Phase of operation is derived. Odorous gases generated at the various stages in the wastewater treatment process will be captured and vented for odour abatement in six dedicated odour control units (OCUs).

Indicative estimate of range of Untreated Odour Emission Rates from Various activities and Operations

Process Units requiring Odour Control			Odour emission rates													
Description	**Total covered area m2**	**Enclosed working Volume**	**volume per hr m3/hr**	**Low OU/m2-s**	**Average OU/m2-s**	**High OU/m2-s**	**Low OU/s**	**Average OU/sec**	**High OU/sec**	**Low OU/m3**	**Average OU/m3**	**High OU/m3**		**OCU sub-totals m3/hr**	**Total Area m2**
IPS				2	11	20	380	2090	3800	1900	10450	19000		**720**	190
Inlet grit trap / distribution sump	50	100	300												
Archimedian Screw pump housings	140	140	420												
MCC Building															
Prelim. Treatment															
Inlet channels	160	320	960												
Coarse Screens	70	210	630												
Macerators															
Fine Screens	70	210	630												
Launder	480	29	86.4												
Covered Skips	72	216	864												
Detritors	220	220	110												
grit pump sump and grit rake		48	144												
classifiers	6	3	9	3	20	130	3234	21560	140140	3390.92	22606.2	146940		**3433**	1078
Primary															
PST's distrn chmbr	4	8	24												
PST's	8712	17424	8712												
PST sludge well /PS (incl below)			144												
PST scum collection well /PS	4	16	48	2.4	12	26	20928	104640	226720	8438.71	42193.5	91419.4		**8928**	8720
ASP															
ASP distrn chmbr	8	8	8												
ASP	9400	28200	14100												
				0.7	2	3	6585.6	18816	28224	1680.48	4801.36	7202.04		**14108**	9408
FST															
FST Distrn chmbr	8	8	0.8	0.7	2	3	15800.4	45144	67716	1544.73	4413.53	6620.29		**36823**	22572
FST sludge collection well /transfer PS			3072												
FST's	22500	67500	33750												
Pumping Stations															
PST desludge/transfer pump sumps	4	24	144												
FST desludging chambers	64	512	3072												
RAS	25	125	500	4	300	578	5160	387000	745620	690.147	51761	99726.3		**26916**	1290
SAS transfer to storage tank	25	125	500												
Works liquors well (submers. PS)	25	200	1200												

Process Units requiring Odour Control			Odour emission rates												
Description	**Total covered area m2**	**Enclosed working Volume**	**volume per hr m3/hr**	**Low OU/m2-s**	**Average OU/m2-s**	**High OU/m2-s**	**Low OU/s**	**Average OU/sec**	**High OU/sec**	**Low OU/m3**	**Average OU/m3**	**High OU/m3**		**OCU sub-totals m3/hr**	**Total Area m2**
Sludge Treatment Plant															
Reception & Screening															
PST sludge storage/ buffer tanks	226	2034	12204												
PST sludge screen feed pump	227	113.5													
imported non-SAS reception /screen buffer tank	228	1026	6156												
indigenous SAS storage tank	229	1260	7557												
imported SAS reception tank	230	1265	5060												
imported raw /cess imports screen feed pump (also for imported SAS if required)															
imported and PST sludge screen press	232	116													
Skip or bagging system for screenings	72	216	1296												
post-screen transfer pump(s)															
post-screen [raw imports + PST] storage/buffer tank		3060	18360												
indigenous + imported SAS transfer pump to blender															
Thickening and THP															
Centrifuge building	150	1500	1500	4	300	578	3048	228600	440436	267.727	20079.5	38686.6		**40985**	762
Centrifuges		3	30												
thickened sludge holding tank(s)	133	598.5	4788												
centrate tank	250	875	8750												
liquors return pump															
thickened sludge transfer pumps to THP															
Cambi															
Flow split chamber	4	8	48												
Cambi Reactors (external)	n/a	276	276												
Cambi Building (heat exchangers, pumps, MCC, chem stores etc)		1500	1500												
Digesters buffer tanks	265	1193	7155	4	300	578	1876	140700	271082	397.762	29832.1	57476.6		**16979**	469
Digesters															
Nr	1062	7564	15128	4	300	578	60512	318600	613836	14400	75817	146074		**15128**	1062
digester services and CHP building	200	2000	8000												
Dewatering and Drying															
Dewaterer buffer tanks	265	1193	7155												
Dewaterer belt presses	72	288	2880												
Dewaterer building	300	3000	12000												
Dryer building	450	4500	18000												
Cake Handling															
barn				2.4	12	26	2618.4	13092	28366	235.074	1175.37	2546.64		**40099**	1091
runoff sump /submers. pumps	4	16	64												