Attachment No. C.1

Section C

C.1.1 PROCESS DESCRIPTION

The biological process in the form of the Cyclic Activated Sludge System (CASS™) is aimed at oxidation and removal of soluble or finely divided suspended materials.

Reference should be made to the following internal documents:

- Osberstown WWTP Operation Manuals (Volumes 1 and 2)
- Osberstown WWTP Maintenance Manuals (Volumes 1 to 21)
- Performance Management System Volume 1 – Waste Water Treatment Plant
- Osberstown WWTP Standard Operating Procedures Manual
- Osberstown WWTP Safety Statement and Emergency Procedures Manual
- Osberstown WWTP Laboratory Health and Safety Manual
- Osberstown WWTP Laboratory Methods Manuals
- Osberstown WWTP Laboratory Quality Control Manual
- Kildare County Council Sampling Plan 2007

P1 = Final Effluent Primary Sampling Point
SW1-P = Final Effluent Primary Discharge Point on river

C.1.2 PLANT DESCRIPTION

C.1.2.1 Inlet Pumping Station

An inlet pumping station is provided to collect incoming raw sewage and to pump the influent wastewater to the elevated inlet works to allow subsequent flow through the works.

C.1.2.2 Preliminary Treatment (Inlet Works)

Preliminary treatment to remove non-biodegradable solids greater than 6 mm in size and grit is provided to treat all flows up to the specified maximum works flow.

C.1.2.3 Flow to Full Treatment Control

Screened and degritted flows pass by gravity from each dynamic grit separator to a storm water separation chamber.

C.1.2.4 Primary Treatment

Flows pass by gravity from the storm overflow chamber to the existing primary tank distribution chamber.

C.1.2.5 Intermediate Pumping Station

An intermediate pumping station is provided to pump settled sewage thereby permitting subsequent flow through the secondary stage of treatment by gravity.

C.1.2.6 CASS™ Flow Distribution

Settled sewage flows by gravity to the four CASS™ secondary treatment units *via* the CASS™ distribution chamber.

C.1.2.7 Secondary Treatment - Cyclic Activated Sludge System (CASS™)

Settled sewage flows from the CASS™ distribution chamber through feed pipes to the secondary treatment process units. The secondary treatment units are based on the compartmented variable volume reactor principle and utilise the proprietary cyclic activated sludge system (CASS™) process.

Unlike the conventional continuous flow activated sludge process the CASS™ compartment variable volume reactor is an intermittent process working on the "fill and draw" principle whereby the sewage is treated in a unit during a cycle of filling, aeration, settling and partial emptying. Typically there are six four hour cycles during a day. The process combines the basic functions of aeration and settlement in one unit and hence there are no final settling tanks.

Each basin is equipped with an electrically actuated surface skimmer to remove clarified, treated effluent at the end of the settle phase of the CASS™ process cycle. Two submersible pumps of similar ratings are provided in each basin, for Surplus Activated Sludge (SAS) and Return Activated Sludge (RAS).

The principal details of the secondary treatment units are as follows:

Total plan area of process basins (m^2)	5,027
Number of process basins	4
Decant depth (m)	1.36
Maximum total water depth (m)	4.7
Total hydraulic decant volume (m^3)	6,837
Maximum total process volume (m^3)	23,627
Total biological load including return works liquors (kg BOD/day)	4,416
Maximum hydraulic load including works return liquors (m^3/day)	53,016
Hydraulic retention time at DWF (hours)	21

C.1.2.8 Process Oxygen Requirements

For the purposes of air supply to the process, the CASS™ process basins are configured as two pairs. Each pair operates with one of the two basins being aerated at any one time. Process air is delivered to each basin *via* a grid of distribution pipes fixed to the tank floor.

C.1.2.9 Ferric Chloride Dosing

The CASS™ process will provide a signficant degree of biological phosphorus removal. In order to ensure compliance with the specified final effluent phosphorus limit, a chemical dosing system based on the use of ferric chloride is used to supplement biological phosphorus removal.

C.1.2.10 Final Effluent Discharge

The four basin configuration of the CASS™ plant ensures that only one of the four basin discharges at a time. Final effluent discharged *via* the CASS™ skimmers is conveyed by gravity pipework to a final effluent sampling chamber (P) and is then discharged *via* the outfall pipe (SW1-P).

A drop shaft on the outfall allows the outfall pipe to pass under the River Liffey. The outfall pipe then follows the river bank on the far side of the Liffey before discharging the works final effluent into the river *via* a series of tidal diffusers on the river bed.

C.1.2.11 Final Effluent Sampling And Recycling (Washwater Return)

A small proportion of the fully treated effluent from the plant is taken from the final effluent sampling chamber for recycling by a washwater booster package unit.

C.1.2.12 Storm Tanks

Screened and degritted flows from the preliminary treatment units in excess of the specified flow to full treatment are separated in the storm overflow chamber and flow by gravity to the storm tanks.

C.1.2.13 Storm Water Discharge

If the storm water event is sufficiently prolonged, the storm tanks will fill and eventually overflow the tank peripheral weirs and flow by gravity to an existing manhole on the outfall pipework downstream of the final effluent sampling chamber.

C.1.2.14 LABORATORY FACILITES AND ACTIVITIES

C.1.2.14.1 Staff

The laboratory is staffed by an Assistant Chemist and an Environmental Technician Grade I.

C.1.2.14.2 Facilities

The laboratory is housed in the administration building and consists of a laboratory office, wet chemistry laboratory, instrumentation and microbiology laboratories, store room and gas store.

C.1.2.14.3 Typical Parameters Monitored and Analysis Methods

The typical parameters measured and methods of analysis are detailed in the Osberstown Environmental Laboratory Methods Manuals Book 1 and Book 2.

Parameter	Method Reference No.
BOD	OLM101 or OLM102
COD	OLM103
SS	OLM104
MLSS	OLM104
MLVSS	OLM132 (Draft)
Settling Test (SVI)	OLM105
Volatile Fatty Acids	OLM131 (Draft)

% DS	OLM106 or OLM107
pH	OLM108
Dissolved Oxygen	OLM128 (Draft)
Temperature	OLM129 (Draft)
Total Phosphorus	OLM121 or OLM122 or OLM126
ortho-Phosphate	OLM119 or OLM120
Ammonia	OLM116 or OLM117
Ammonium	OLM118
Nitrate	OLM112 or OLM113
Nitrite	OLM114 or OLM115
Total Nitrogen	OLM127
Microscopic Analysis	OLM133 (Draft)
Alkalinity	OLM125
Anions	OLM134 (Draft)

C.1.2.14.4 Accreditation

The laboratory is part of the EPA Intercalibration programme and is listed as an approved laboratory for BOD, COD, SS, *ortho*-phosphate, ammonium and nitrate.

C.1.2.15 PROCESS AND DESIGN CAPACITY OF THE OSBERSTOWN WWTP

Construction Commencement	February 1999
Date of Completion	October 2001
Population Equivalent	80,000

Hydraulic Load

Dry Weather Flow (DWF)	20,000 m^3/day
Peak Storm Flow (2½ DWF)	49,992 m^3/day (= 2,083 m^3/hr)
Spare Capacity for Storm	1,617 m^3

Raw Sewage Load

BOD	4,800 kg BOD/day
COD	13,060 kg COD/day
Suspended Solids	6,080 kg/day
Ammonia	576 kg N/day
Total Kjeldahl Nitrogen	960 kg N/day
Total Phosphorus	208 kg P/day

Final Effluent Requirements

BOD	15 mg/L
COD	125 mg/L
Suspended Solids	35 mg/L
Total Nitrogen	25 mg/L N
Total Oxidised Nitrogen	20.05 mg/L N
Total Kjeldahl Nitrogen	4.95 mg/L N
Total Phosphorus	0.9 mg/L P

Inlet Works

Sallins Rising Main	250 mm ∅
Naas Gravity Main	750 mm ∅

Newbridge Rising Main	350 mm ∅
Works Inlet Pipe Diameter	900 mm ∅
Inlet Pumping Station Dimensions	6.55 m ∅ by 6.05 m depth
Number of Pumps	Four (4)
Inlet Pump Properties	2 x Variable Speed, 2 x Fixed Speed (420 L/sec)
On-line Monitoring	pH, Temperature

Screens and Grit Removal

Screen Chamber Dimensions	3.05 x 8.8 x 5.5 m (H x L x W)
Screen Make	Parkwood Escalator Type 6 mm screen (2 No.)
Screen Max. Through Flow	1,028 L/sec
Grit King Dimensions	4.7 m ∅ x 5.15 m
Normal Flow	232 L/sec
Peak Design Flow	514 L/sec

Primary Sedimentation

Primary Tanks Dimensions (Each)	24 m ∅ x 5.135 m deep
Primary Tanks Volume	1,696 m^3 each (2 No.)
Number of Sludge Pumps	Three (3) (2 duty, 1 standby, 10 L/s)
Intermediate PS Pump Properties	1 x Variable Speed, 2 x Fixed Speed (340 L/sec)

Cyclic Activated Sludge System (CASS)

CASS Basins	Four (4)
Dimensions	40 m ∅ x 5 m H
Total Volume per Basin at Top Water Level	6,283 m^3 each (4 No.)
Total Volume per Basin at Bottom Water Level	4,197 m^3 each (4. No.)
Bottom Water Level	3.34 m
No. of RAS and SAS Pumps per Basin	1 No. of each (2 No. total per basin)
Air Diffusion Type	Fine-air
Number of Air Blowers	Seven (7)
In-Basin Monitoring	Dissolved Oxygen, MLSS, Temperature
Ferric Dosing Tanks	2 No.
Ferric Dosing Tanks Capacity	33 m^3 each

Final Effluent Chamber (P)

On-line Monitors	*ortho*-Phosphate (by Digestion/Colourimetry) Ammonia (by ISE) Nitrate (by ISE) Suspended Solids
Washwater Return Capacity	34 L/s @ 6.7 bar

Storm Overflow

Storm Tanks Dimensions	28 m ∅ x 4.25 m deep
Storm Tank Volume	1,293 m^3 each (2 No.)
Number of Mixing Pumps	Three (3) per tank
Number of Return Pumps	Two (2) (One per tank)
Return Pump Capacity	100 L/s

General

Autosamplers	3 No. – 1 No. at Influent after Screens, 1 No. on after Primary Sedimentation, 1 No. at Effluent Chamber
Autosampler Type	Refrigerated, Flow- or Time Proportional

Sludge Handling Area

Max. SAS from CASS Basins	415 m^3/d
Max. Primary Sludge	130 m^3/d
Max. Imported Sludge	111.3 m^3/d
Sludge Buffer Tanks	2 No.
Sludge Buffer Tanks Capacity	340 m^3 each
Buffer Tank Pumps	2 No.
Drum Thickener Manufacturer	Alfa Laval Ltd.
Drum Thickeners	2 No.
Max. Throughput of Drum Thickeners	333 m^3/d each
Digester Feed Tank	1 No.
Digester Feed Tank Capacity	140 m^3
Digester Feed Tank Pumps	3 No. (2 duty, 1 standby, 3 L/s)
Anaerobic Digester Tanks	2 No.
Anaerobic Digester Tanks Capacity	1,317 m^3/day
Design Loading	7,874 kg/d (131.2 m^3/d @ 6% dry solids)
Sludge Recirculation Pumps	3 No. (2 duty, 1 standby, 7 L/s)
Gas Compressors	3 No. (2 duty, 1 standby)
CHP Units	Combined Power Ltd. Type 6MB (2 No.)
Boilers	Eurograde Plant Ltd. Strebel Ca7S6 Boilers (2 No.)
Gas Booster Pumps	2 No. (1 duty, 1 standby)
Digested Sludge Holding Tanks	2 No.
Digested Sludge Holding Tanks Capacity	916 m^3 each
Belt Press Feed Pumps	2 No. (4.25 L/s)
Belt Press Manufacturer	Solids Technology Ltd.
Belt Press	2 No. (Feed Rate 15 m^3/hour)