

VOLUME 3 OPERATION & MAINTENANCE WORKS EMPLOYERS REQUIREMENTS

SECTION 7 – BELGOOLY WASTE WATER TREATMENT PLANT

7.1 INTRODUCTION

Belgooly is a small village located approximately 13 miles from Cork city along the R600 regional road. The plant is accessed via the Riverbank housing estate on the south western edge of the village and is designed to treat effluent from the village. The plant is fenced off with a 2.2m high palisade fence and a lockable double gate. The WWTP was initially constructed and commissioned in 2002. Two major upgrades have been carried out in the intervening period, the most recent of which being in 2011. The design population equivalent for the treatment plant is 1,000 PE. The details of the design loads for Belgooly WWTP are as follows:

Parameter	Design Loading	Units
Equivalent Population	1,000	persons
Total BOD	60	kg/day
Total DWF (@ 225 litres/PE/day)	225	m ³ /day
Maximum Flow to treatment (3 DWF)	675	m ³ /day

The extent of the Belgooly WWTP site is shown in the Tender Invitation Drawings in Volume 2. Waste Water enters the plant at the inlet screen and flows to the inlet pumping station. From here the water is pumped to a balance tank, which provides primary settlement and also acts as a storm water holding tank. Waste water is pumped from the balance tank and is split evenly between 4 separate treatment streams. Ferric dosing takes place before the flow is split. In the treatment streams the waste water undergoes primary settlement, biological treatment and final settlement. Effluent from all four treatment streams is combined at a forward feed pumping station and is pumped to two tertiary sand filters. Following filtration, clarified effluent enters a washwater storage tank and overflows to a UV disinfection unit. The final effluent discharges to the River Stick adjacent to the plant.

The existing plant information contained in this section has been compiled by the Employer's Representative based on the best information available for the Belgooly WWTP. The Contractor shall use this information to assist in the completion of the Pricing Schedule for the Operation and Maintenance of Belgooly WWTP in Volume 4 of the Tender Documents. A DVD is included at the end of this Volume containing additional information, where available, under the following headings:

- Process design calculations
- Functional design specifications
- As constructed drawings
- As constructed electrical drawings
- Operation and maintenance manual
- Sampling results
- Electricity and consumables data
- Monthly status reports
- List and details of equipment

- SCADA/PLC system
- Health and Safety Audit
- Waste Water Discharge Licence Application details
- Access Agreements
- WWTP Photos

7.2 WASTE WATER DISCHARGE (AUTHORISATION) LICENCE REQUIREMENTS

The Employer has not yet applied for a Waste Water Discharge Authorisation Licence from the EPA for the Belgooly agglomeration. Although a discharge licence is currently in effect (ref. Cork County Council Discharge Licence No. WP(W) 13/05), a Water Discharge Authorisation Licence application will be made by the Employer. The Contractor will be required to comply with the conditions and the requirements of the Waste Water Discharge Licence. Section 7.3 below sets out the performance requirements for the plant. It is expected that emission limit values contained in the Waste Water Discharge Authorisation Licence, once granted by the EPA, will not be any more stringent than the requirements set out in Section 7.3.

7.3 REQUIREMENTS FOR TREATMENT PLANT PERFORMANCE

7.3.1 General

The Performance Requirements for the completed process are set out in this Section.

7.3.2 Operating Parameters

The Operation and Maintenance Works Period for Belgooly starts from the Commencement date of the Contract for a period of twenty (20) years with an option available to Cork County Council to terminate the Operation & Maintenance Works at 5, 10 and 15 years after the commencement date, as provided for in the Schedule of Payments.

The Contractor shall operate and maintain the Works such that it is able to operate at all times at least up to the maximum capacity of the installed plant, and that it consistently achieves the performance criteria set out in this Section. The Contractor shall carry out the Operation and Maintenance Works on the following basis:

- Operate and Maintain the Works, from the issue of the Taking-Over Certificate, for 20 years from the commencement date of the Contract
- Provide detailed "hands-on" training, during the Hand-Over period, for the Employer's Personnel, or other personnel authorised by him.

The Belgooly Waste Water Treatment Plant shall be operated and maintained on the basis of a population equivalent of 1000 persons, with the following parameters:

▪ Population Equivalent (PE)	1,000 persons
▪ BOD ₅ Allowance	0.06 kg BOD ₅ /head/day
▪ Total BOD ₅	60 kg BOD ₅ /day
▪ DWF Allowance	225 litres/head/day
▪ Total DWF	225 m ³ /day (2.1 l/sec)
▪ Maximum flow to treatment (3 DWF)	675 m ³ /day (6.25 l/sec)

The effluent quality standards set as Performance Requirements shall be as follows:

Parameter	Emission Limit Value
BOD	10 mg/l
Total Phosphorus	2 mg/l Total P
Total Suspended Solids	15 mg/l
Faecal Coliforms	250 fc/100mls

The sludge storage facilities at the Belgooly WWTP shall cater for all process sludge generated by the process. The Contractor shall allow for return process loadings from the treatment process.

The Contractor shall provide a Performance Guarantee setting out the relationship between the volume of sludge to be produced by his proposed treatment process as a proportion of the biological load to the WWTP. The sludge volumes in the tender assessment will be adjusted based on the Performance Guarantee provided. The Contractor shall not be entitled to payment during the Operating and Maintenance Contract for sludge volumes in excess of that provided for in his Performance Guarantee.

7.3.3 Hours of Operation

The Waste Water Treatment Process shall operate on a 24-hour basis. For plant and equipment at the Waste Water Treatment Plant not requiring 24 hours of operation, the daily operating period shall be determined by the Contractor having considered the balance between the capital costs of providing the plant and equipment, the life cycle costs associated with its operation & maintenance, future capital replacement costs and the need for future expandability of the plant.

7.3.4 Sampling and Monitoring

The Employer requires a sampling and monitoring programme to comply with Employer's Requirements and current legislation together with overall monitoring of treatment plant performance as set out below. All monitoring equipment shall be calibrated in accordance with the manufacturer's instructions but not less than every 6 months.

Location	Parameter	Frequency	Sample Method	Output	Purpose
Inlet to WWTP treatment process downstream of screening, grit removal storm overflow/return and upstream of sludge return.	Suspended Solids	Weekly ¹	Time/Flow Proportional Composite	mg/l SS	Monitoring
	COD	Weekly ¹	Integrated Flow/COD Measurement	mg/l COD	Payment
				Weekly COD Profile	Monitoring
	Raw Influent Flow	Continuous	Integrated Flow Meter	Daily Flow - m ³	Payment
Daily Flow Profile				Monitoring	
BOD ₅	Weekly ¹	Refrigerated 24 hour Composite Flow-Proportional	mg/l BOD ₅ and kg. BOD ₅ day	Monitoring	
Outlet from treatment process	Total Phosphorous (as P)	Weekly ¹	Standard Method	mg/l P	Compliance
	BOD ₅	Weekly ¹	Refrigerated 24 hour Composite Flow-Proportional	mg/l BOD ₅	Compliance
				And kg. BOD ₅ day	
	Suspended Solids	Weekly ¹	24 hour Composite Flow-Proportional	mg/l SS	Compliance
	Pathogens (Fecal Coliforms & Escherichia Coli)			Standard Method	No. cfu / 100ml
	COD	Weekly ¹	Time/Flow Proportional Composite	mg/l COD	Compliance
				Weekly COD Profile	Monitoring
Flow	Continuous	Integrated Flow Meter	Daily Flow - m ³	Monitoring	
			Daily Flow Profile		

Table 7.3.1: Sampling and Monitoring Requirements by O&M Contractor

Notes on Table 7.3.1

- 1 Alternating days and times as determined by Liaison Monitoring Committee
- 2 At alternating locations, days and times as determined by Liaison Monitoring Committee.
- 3 Samples taken monthly October to April inclusive and weekly from May to September inclusive.

Table 7.3.2 below lists parameters to be randomly sampled and monitored without any prior notice by the Employer.

Location	Parameter	Frequency	Sample Method	Output	Purpose
Outlet from Belgooly WWTP treatment process upstream of any storm overflow/ bypass	Total Phosphorus (as P)	Random Without Prior Notice	Standard Method	mg/l P	Compliance ¹
	BOD ₅		Refrigerated 24 hour Composite Flow-Proportional	mg/l BOD ₅ And kg. BOD ₅ day	
	Pathogens (Fecal Coliforms & Escherichia Coli)		Standard Method	No. cfu / 100ml	
	Suspended Solids		24 hour Composite Flow-Proportional Or	mg/l SS	
	COD		Grab	mg/l COD	

Table 7.3.2: Random Sampling and Monitoring by Employee

Notes on Table 7.3.2

- 1 Samples taken monthly October to April inclusive and weekly from May to September inclusive. Appropriate Penalty shall not be applied where 2 subsequent random samples are compliant.

7.3.5 Potable Water

The potable water supply to the site is metered; the Contractor will pay for all costs arising from the provision of the water supply.

7.3.6 Noise

The Contractor shall operate the WWTP in compliance with the European Communities (Waste Water Treatment)(Prevention of Odours and Noise) Regulations 2005 (S.I. no. 787 of 2005).

Noise from the treatment process units shall be monitored annually to ensure that the specified design standards for plant items are adhered to.

7.3.7 Odour

The Contractor shall operate the WWTP in compliance with the European Communities (Waste Water Treatment)(Prevention of Odours and Noise) Regulations 2005 (S.I. no. 787 of 2005).

The following measures will be implemented by the Contractor at the WWTP:

- Good housekeeping practices shall be implemented at the site (i.e. yard areas to be kept clean, etc.), closed-door management strategy (i.e. eliminate puff odour emissions), and an odour management plan for the operators of the WWTP will be implemented.
- Accumulation of floating debris and persistent sediments in channels and holding tanks will be avoided by good plant maintenance (i.e. ensuring channels are kept clean, etc.).

7.3.8 Energy

The Contractor shall operate the WWTP in accordance with international best practice in terms of energy efficiency.

7.4 HEALTH AND SAFETY ISSUES

The Contractor shall comply with all relevant Irish Health & Safety Legislation. The legislation includes, but is not restricted to:

- Safety, Health and Welfare at Work Act, 2005
- Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. No. 299 of 2007)
- Safety, Health and Welfare at Work (General Application)(Amendment) Regulations 2007 (S.I. No. 732 of 2007)
- Safety, Health and Welfare at Work (General Application)(Amendment) Regulations 2008 (S.I. No. 176 of 2010)
- Safety, Health and Welfare at Work (Construction) Regulations, S.I. No. 504 of 2006
- Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2008 (S.I. No. 130 of 2008)
- Safety, Health and Welfare at Work (Construction) (Amendment) (No. 2) Regulations 2008 (S.I. No. 423 of 2008)

7.5 EXISTING PLANT INFORMATION AND PERFORMANCE

The DVD accompanying these documents includes all information available to the Employer's Representative on the Belgooly WWTP. The Contractor shall review this information prior to the plant site visit at Tender Stage. Should the Contractor require additional information regarding the plant this shall be obtained during the plant site visit at Tender Stage.

7.5.1 List of Known Defects

As there is limited operational data available for Belgooly WWTP, it is difficult to make a full assessment of recent and historic defects. The Employer's Representative carried out site inspections in August and December 2011. A number of items of additional works were identified at Belgooly WWTP to address ongoing operational issues and to enable the Contractor to effectively operate the plant in terms of compliance with the Employer's

Requirements and for accurate measurement of parameters for payment purposes. The required works are presented in Section 7.6.

7.5.2 Health and Safety Issues

Below is a list of Health and Safety Issues for Belgooly WWTP as outlined in the Health and Safety audit carried out by Cork County Council on Wednesday 20/07/2011.

1. There is no safety statement on site
2. There is no site specific risk assessment on site
3. There is no up-to-date Safety Data Sheet on site for the Ferric Sulphate
4. No safe operating procedures for various tasks on site
5. There is no first aid box on site
6. There is no fire extinguisher on site
7. There is no electrical matting on site
8. The bund on site is full of rainwater, which needs to be emptied regularly otherwise the bund will be ineffective in the event of a leak
9. There is a container adjacent to the boundary fence which should be removed as it could be used to gain entry over the fence
10. Some manhole covers on site are heavy duty and some are lightweight. None of them seem to be lockable
11. Access to the outlet to the stream for sampling is poor and steps should be provided here
12. There are some trip hazards on site which, due to the overgrowth are difficult to see. The weeds and vegetation need attention
13. It is possible to walk over the roof of some of the tanks as they are at ground level and their capacity to bear the weight of a person needs to be confirmed
14. The steps into the tank by the outlet with the timber fencing are very narrow and need to be addressed.
15. Further signage at the site gate is recommended, to include the council standard safety sign and the occupier's liability sign
16. There is no external lighting on site, just the adjacent street lighting

7.5.3 Inlet Works

Inlet screen:

Raw sewage gravitates from the collection network to the treatment plant via a 150mm inlet sewer and is screened to 6mm upon entry to the inlet pump station. The screen is a vertical inlet screen with shaftless lifting screw and compaction zone. The screenings are wasted into a wheelie bin. This section of the treatment plant was upgraded in 2011.

Plant	Qty.	Descriptions	Details	Commissioned
Screening	1	Inlet Screen	Filtran SFC/V2 6mm aperture Vertical inlet screen, 14 l/s capacity, 1.1kW	2011
	1	Compactor	Wash compactor with screen	2011

Table 7.5.1: Belgooly WWTP – Screening

Inlet Pumping Station:

From the screening chamber, the water flows to the inlet pumping station, where it is pumped to the balance tank. In times of high flow, the water in the sump overflows through a 200mm pipe directly to the balance tank. The balance tank can be bypassed if necessary, with the flow being pumped directly to the splitter chamber. This sump also includes odour control equipment to minimise any possible pollution.

Plant	Qty.	Descriptions	Details	Commissioned
Inlet Pumping Station	1	Pump Sump	Inlet pump sump	
	2	Inlet Pumps	Inlet pumps, Zenit, DGN 200/4/80 A1DT/50, 1.5kW, 80mm, 64kg, vortex impeller	2005
	1	Level Sensor	Pulsar blackbox type 130 level sensor	2011
	1	Odour Control	EVA315 passive activated carbon filters	2011

Table 7.5.2: Belgooly WWTP – Inlet Pumping Station

Balance Tank

From the inlet sump, the pumps transfer the screened sewage to a balance tank. This tank stores flows that are in excess of the plant's capacity and thus alleviates build-up of sewage in the plant's inlet pumping station. This underground tank has a capacity of 60m³ and is manufactured from Glass Reinforced Plastic. Two foul pumps are installed in the balance tank to pump flows forward to the splitter chamber for treatment. The combination of the balance tank and pumps ensures that the plant is fed at a constant controlled rate and avoids occurrences of overloading. A flow meter on the inlet to the splitter chamber monitors the flows. Once the flow has reached the splitter chamber it gravitates to the 4 packaged treatment units. An ultrasonic level sensor was also installed.

Plant	Qty.	Descriptions	Details	Commissioned
Balance Tank	1	Balance Tank	60m ³ glass reinforced plastic balance tank to standard Conder specifications	2011
	2	Forward feed pumps	Variable speed drive pumps, HOMA TP50V13/4 D, 10m ³ /hr @ 7m head, vortex impeller	2011
	1	Level Sensor	Pulsar blackbox type 130 level sensor	2011
	1	Splitter chamber		2005
	1	Flowmeter	80mmØ Siemens type SITRANS FM MAGFLO electromagnetic flowmeter MAG5100W c/w MAG5000 signal convertor (transmitter)	2011
	1	Odour Control	EVA315 passive activated carbon filters	2011

Table 7.5.3: Belgooly WWTP – Balance Tank

7.5.4 Ferric Dosing

Ferric sulphate is added to the water in the splitter chamber prior to biological treatment. This aids in the removal of phosphorous. The ferric sulphate is pumped to the splitter chamber by two ferric dosing pumps. An emergency shower and eye-wash were installed in 2011.

Plant	Qty.	Descriptions	Details	Commissioned
Ferric Sulphate Dosing	1	Ferric Sulphate Storage	Ferric Sulphate bulk storage tank, 1m ³	2005
	2	Dosing Pumps	Duty/Standby Milton Roy LMI Series AA9 dosing pumps	2005
	1	Emergency Wash	Emergency shower and eye-wash	2011

Table 7.5.4: Belgooly WWTP – Ferric Dosing

7.5.5 Treatment Stream 1: CASFLO Package Sewage Treatment Plant

This treatment stream consists of primary settlement, biological treatment and final settlement.

Plant	Qty.	Descriptions	Details	Commissioned
Treatment Stream 1	1	Treatment unit	CASFLO CAS-16 250PE unit	2002
	1	Primary Settlement Tank	2 stage settlement tank within unit	2002
	1	Biozone	Fixed film reactor and suspended floc dispersed growth system	2002
	1	Final Settlement Tank	SS settlement and sludge return system	2002
	1	Air blower	FPZ SCL K05-MS	
	1	Odour Control	EVA315 passive activated carbon filters	2011

Table 7.5.5: Belgooly WWTP – Treatment Stream 1

Primary Settlement Tank

The primary settlement tank is a two stage tank designed to maximize the removal of gross and suspended solids prior to transfer of the settled effluent to the biozone for treatment. The primary settlement tank also incorporates for a sludge storage volume (based on full load) depending on the desludge periods as identified for individual applications.

An odour filter has also been installed on the treatment stream.

Biological Treatment

The biological treatment phase utilizes BAF (biological aerated filter) technology which incorporates two proven principles of biological process in the form of a fixed film reactor for process stability and a suspended floc dispersed growth system for high transfer rates and operational control, to ensure a stable treatment process which is largely unaffected by shock loads. The process incorporates a submerged, high rate, plastic media on which a fixed film of biomass is grown. This film takes nutrition from the incoming settled effluent and is provided with oxygen by means of a small blower unit which aerates the media through HDPE membrane diffusers to provide fine bubble aeration. The action of the fine bubble aeration is carefully controlled to provide optimum oxygen transfer rates and to provide a scouring action to slough off excess biomass to keep the thickness of the fixed biological film

at optimum levels, thereby preventing the production of anaerobic bacteria and ensuring maximum process efficiency. The fact that the media remains submerged allows for an element of suspended floc dispersed growth which basically means that there will be biomass which is 'unfixed' to the media but achieves treatment through suspended aeration. The biozone incorporates a two stage process as standard that allows for constant mixing of incoming settled effluent to provide optimum treatment stability and to avoid any 'short-circuiting'. The use of a two stage biozone ensures a high degree of process efficiency to not only reduce BOD levels to that required, but will also achieve reductions in ammoniacal nitrogen in excess of standard requirements.

Final Settlement Tank

The final settlement tank is designed in accordance with the requirements of BS 6297 to ensure relevant surface areas and rise rates are achieved to provide maximum settlement of any suspended solids prior to discharge. The 'CASFLO' system also incorporates continuous and automatically timed humus sludge return systems to return humus sludge from both the final settlement tank and each biozone, back to the primary settlement tank. Additionally this system also provides for continuous recycling of treated effluent back to the PST to not only provide dilution of incoming settled effluent but to also ensure continuous flow during periods of low or no flow, thereby keeping the biomass in prime condition.

7.5.6 Treatment Stream 2: Bio-plus B18/90HC

This treatment stream consists of primary settlement, biological treatment and final settlement, each divided by internal baffles.

Plant	Qty.	Descriptions	Details	Commissioned
Treatment Stream 2	1	Treatment Unit	Bio-plus B18/90HC treatment unit	2005
	1	Primary Settlement Tank	Settling Zone with sludge draw-off	2005
	1	Biological Aerated Filter	Aerated filter with diffusers	2005
	1	Final Settlement Tank	Settlement zone with airlift sludge return	2005
	1	Air blower	FPZ SCL K05-MS	
	1	Odour Control	EVA315 passive activated carbon filters	2011

Table 7.5.6: Belgooly WWTP – Treatment Stream 2

Primary Settlement Tank

The primary settlement zone is designed according to BS6297:1983. It is designed to reduce the BOD of the influent sewage by 30-40%. The settled sewage flows on for secondary treatment to Stage Two of the Bio-plus plant. Surplus sludge is drawn off at regular intervals by suction tanker.

An odour filter has also been installed on the treatment stream.

Biological Aerated Filter

This section contains a high rate of plastic media, on which micro-organisms grow as film, using the sewage as food. The biological aerated filter is supplied with air from the remote air blower unit. The air is evenly pumped through the system by micro-porous diffusers.

Final Settlement Tank

The final settlement zone ensures that any carryover of particles, which are automatically sloughed off from the filter media as part of the process is settled and not carried over into the final effluent. The settled sludge which accumulates at the bottom of this zone is returned automatically by airlift periodically throughout the day.

7.5.7 Treatment Streams 3 & 4: Clereflo M250

This treatment stream consists of primary settlement, biological treatment and final settlement, divided into 5 sections in total. The tank is constructed of Glass Reinforced Plastic.

Plant	Qty.	Descriptions	Details	Commissioned
Treatment Streams 3 & 4	2	Treatment Unit	Clereflo M250 treatment unit	2005
	2	Primary Settlement Tank	Settling Zone with sludge draw-off	2005
	2	Biozone Chamber	Aerated filter with jet aeration system	2005
	2	Final Settlement Tank	Settlement zone with sludge return pump	2005
	2	Air blower		
	2	Odour Control	EVA315 passive activated carbon filters	2011

Table 7.5.7: Belgooly WWTP - Treatment Stream 3 & 4

Primary Settlement Tanks

Incoming sewage is separated and stored in the first section of the primary settlement tank, allowing only settled liquor to pass forward for biological treatment. De-sludging occurs from the primary settlement zone by vacuum tanker.

An odour filter has also been installed on the treatment stream.

Biological Treatment Tanks

The biological treatment stage comprises two separate zones in series, both using submerged aerated filter technology and the well-known jet aeration system – the VENTFLO inductor. The first biological stage treats the majority of the carbonaceous load, resulting in a low loading rate for the second stage and a subsequent high overall removal rate.

Final Settlement Tank

Biomass (humus solids) sloughed from the submerged media is separated in the final humus settlement stage and returned intermittently by pump, to the primary stage for co-settlement.

7.5.8 Forward Feed Pump Station

The treated water that passes through the 4 separate treatment streams is collected in the forward feed pumping station. The effluent is pumped by two duty/standby pumps to the sand filters for tertiary treatment. An ultrasonic level sensor is installed to monitor the level of the water and to dictate the pumping rates.

Plant	Qty.	Descriptions	Details	Commissioned
Forward Feed Pump Station	1	Pump Sump	Pumping chamber	2005
	2	Forward Feed Pumps	Duty/Standby forward feed pumps, Zenit DG 200/4/80, 1.5kW	2005
	1	Level Sensor	U/S level sensor	2005

Table 7.5.8: Belgooly WWTP – Forward Feed Pump Station

7.5.9 Tertiary Treatment: Sand Filters & Backwash

From the treatment streams, the waste water is pumped to the sand filters by the forward feed pumps. Here, the filters polish the treated effluent to achieve a higher discharge standard. After the effluent has passed through the filters it gravitates to a clear water backwash tank. The outlet from the backwash tank is at a high level which ensures that this tank is always full under normal operating conditions. This is in order to provide a reservoir of water so the filters can be backwashed. Between backwashes, the backwash tank fills and overflows to an ultraviolet reactor from where it is discharged to the adjacent River Stick.

When a backwash of one of the filters is requested, 2 submersible pumps installed in the backwash tank begin to pump clear water to the base of the filters. This water is travelling through the filters in the opposite direction than when the filter is in normal operation. Particles that have been captured by the filter are therefore removed during the backwash phase. After backwashing the dirty backwash water gravitates back to the inlet sump from where it is again passed through the plant for treatment.

Plant	Qty.	Descriptions	Details	Commissioned
Sand Filters	2	Sand Filter chambers	Sand filters with graded sand	2005
	1	Air Scour Blower	Robuschi Robox ES 15/1P-RVP50 air blower	2011
	1	Backwash Chamber	Backwash chamber with high outlet pipe	2005
	2	Backwash Pumps	Duty/Standby backwash pumps, Zenit DRP 300/2/80	2005
	1	Sampler	GMS automatic sampler	2005
	1	Washwater Pump	Duty pump, Pedrollo NKM 2/3, 3m ³ /hr @ 4 bar	2011

Table 7.5.9: Belgooly WWTP – Sand Filters

7.5.10 UV Treatment & Outfall

Having passed through the backwash tank, the effluent flows through the Ultraviolet treatment unit. Prior to being UV treated, the flow is measured and sampled. The final effluent then discharges to the River Stick directly adjacent to the treatment plant site.

Plant	Qty.	Descriptions	Details	Commissioned
UV Treatment & Outfall	1	Flowmeter		2005
	1	Sampler		2005
	1	UV Treatment Unit	Trojan UVSwiftSC ultraviolet treatment unit	2006

Table 7.5.10: Belgooly WWTP – UV Treatment & Outfall

7.5.11 Control

There is no control building. The control panel is housed in a steel unit on site.

7.5.12 Current Loadings to the WWTP

There is very little information on the flow entering the plant and no information on the flow exiting the plant. The average flow entering the plant for the months of June to August 2011 was 60.3m³/day. However this cannot be indicative of the DWF or the average flows for the entire year.

7.5.13 Performance of the Treatment System

Effluent Quality

There are also insufficient effluent quality data to make accurate conclusions on the performance of the treatment plant. There are data given for the months of May to August 2011. These results are given below. These particular results would indicate that the treatment plant is performing satisfactorily in terms of removing both organic and suspended solids loads as specified in the Urban Waste Water Treatment Regulations, 2001 (S.I. 254 of 2001, and as amended), but again, this is inconclusive.

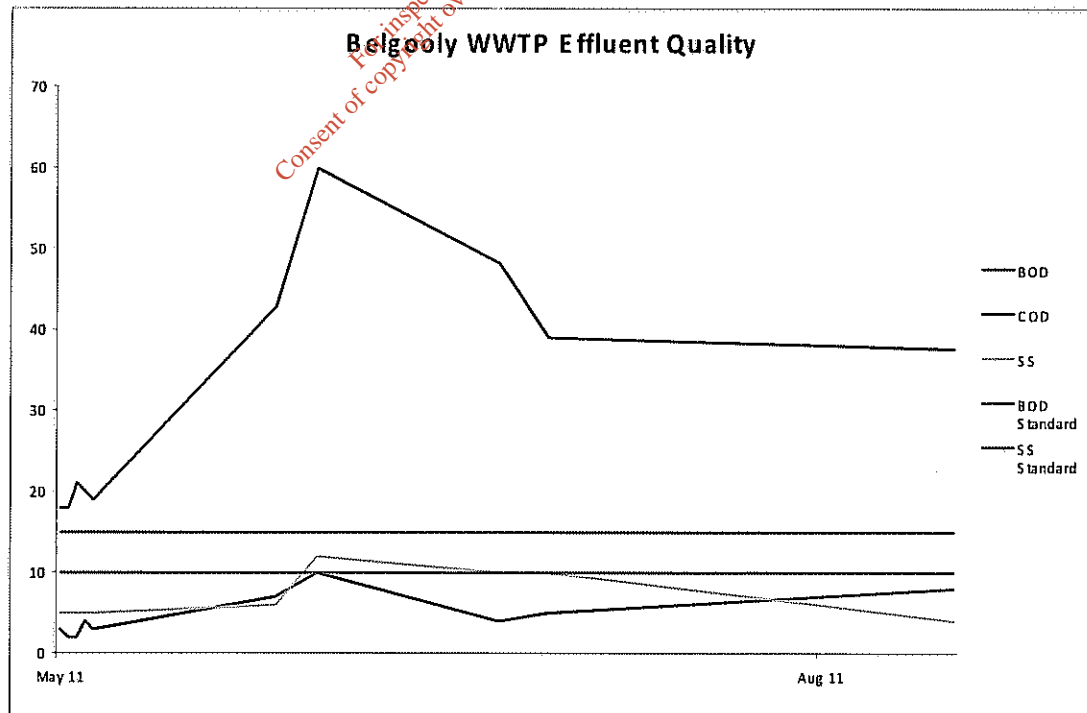


Figure 7.5.1 Belgooly WWTP Effluent Quality

The estimated average BOD, COD and SS removal efficiencies at the Belgooly WWTP for the months of May to August 2011, ignoring spurious results, were 99%, 95% and 98% respectively. These are again within the recommended limits for BOD, COD and SS. Belgooly have not obtained a current licence since the latest upgrade to the plant, but from the Licence granted in September 2005, the BOD and Suspended Solids effluent standards were 10mg/l and 15mg/l respectively. From May to August 2011, effluent from Belgooly met these standards.

The BOD, COD and SS levels for influent and effluent for Belgooly WWTP have been plotted on Figures 7.5.2, 7.5.3 and 7.5.4 in conjunction with the effluent standard required by the regulations.

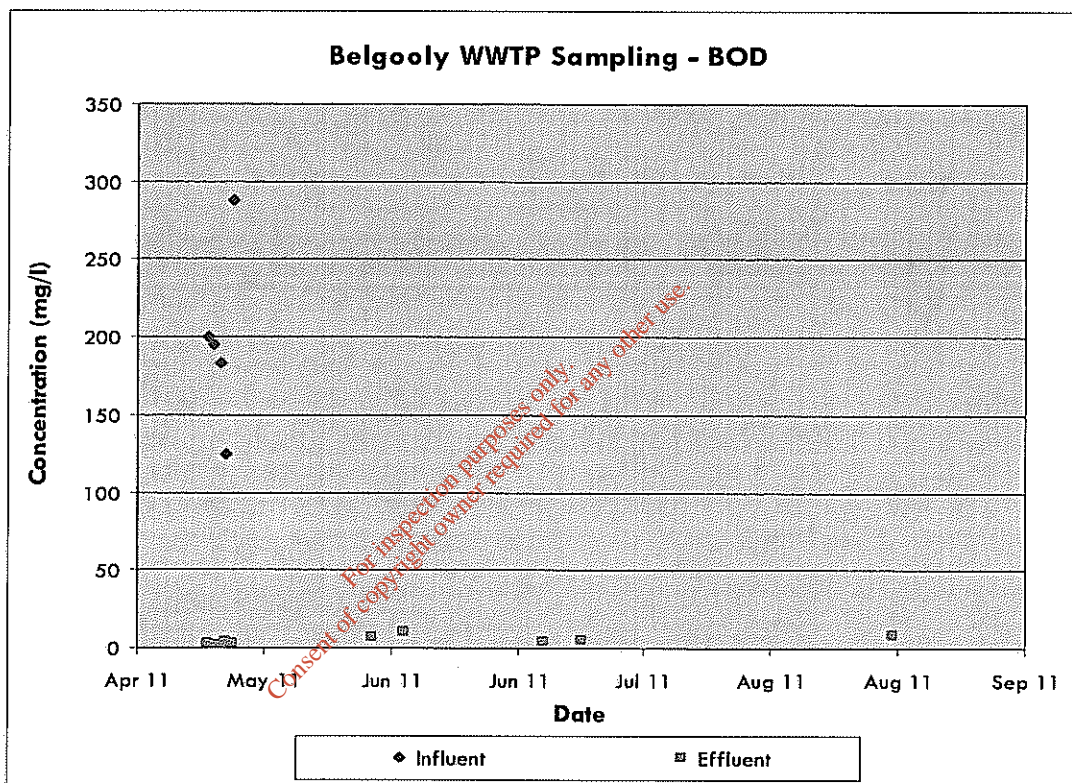


Figure 7.5.2 Belgooly WWTP Sampling – BOD

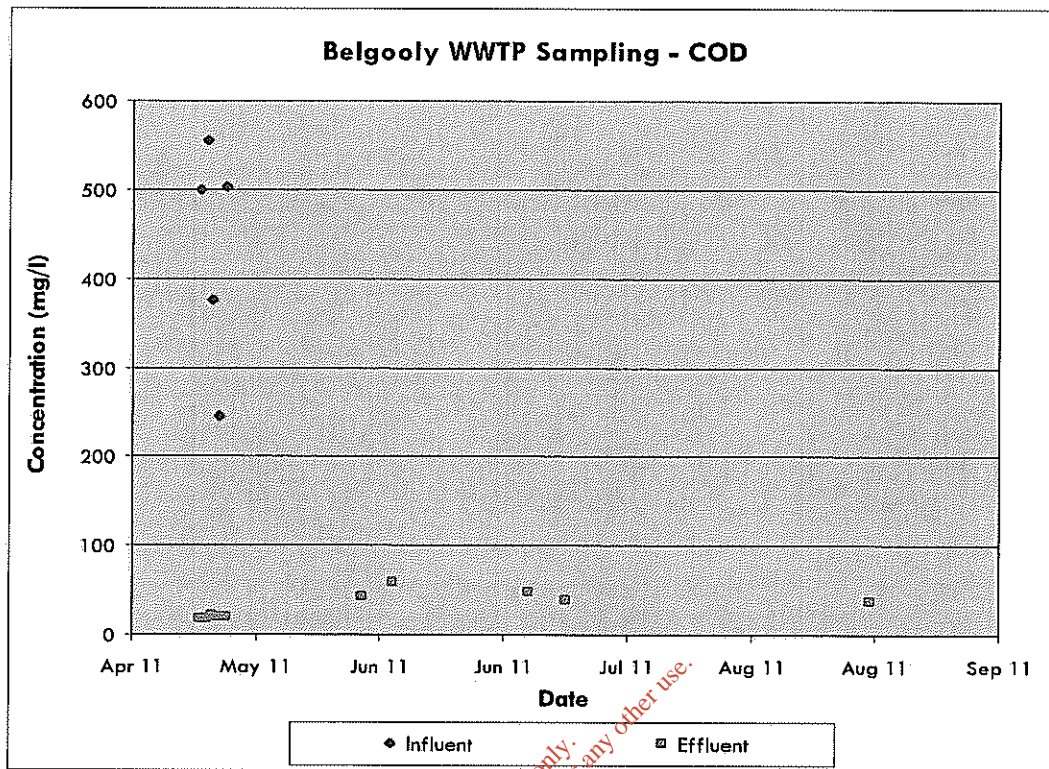


Figure 7.5.3 Belgooly WWTP Sampling – COD

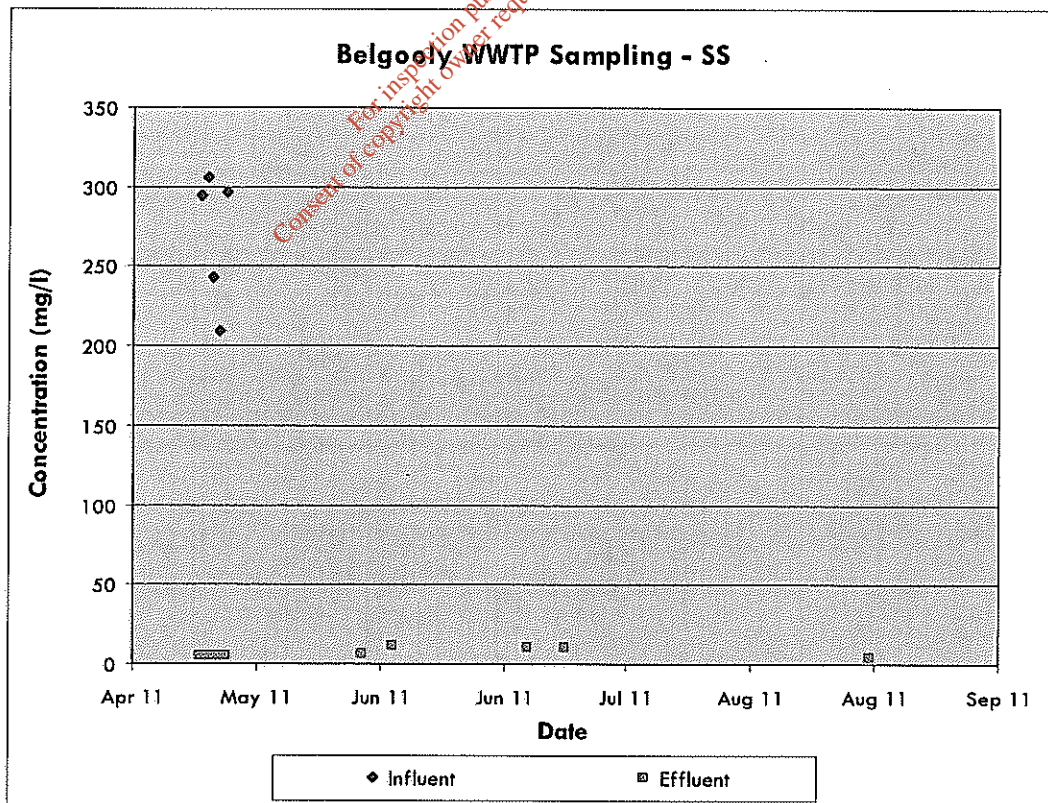


Figure 7.5.4 Belgooly WWTP Sampling – SS

7.6 REQUIRED WWTP UPGRADES

7.6.1 Description

A number of items of additional works have been identified at Belgooly WWTP to address ongoing operational issues and to enable the Contractor to effectively operate the plant in terms of compliance with the Employer's Requirements and for accurate measurement of parameters for payment purposes. The Contractor shall enter a price for installation and commissioning all works described in this section in Section DB7 of the Schedule of Payments for Belgooly WWTP. Payment for these additional works shall be divided evenly over the first 3 years of WWTP operation.

This Payment Schedule includes a section for the Contractor to add further civil or mechanical electrical works the Contractor may deem necessary following his site visit.

7.6.2 General Requirements

All additional civil works or mechanical and electrical plant or equipment installed by the Contractor at the WWTP during the Operate and Maintenance Period shall comply with the following Employer's Requirements for Design Build Works.

The material design of mechanical and electrical plant and equipment, pumping stations, treatment process tanks and the buildings shall be fit for purpose and entirely compatible with the environment in which the various units are to operate.

The design life of the various process units and buildings designed by the Contractor shall be 40 years as a minimum for civil engineering and building works, and 20 years for mechanical and electrical works. In this context, the Tenderer shall demonstrate that any protective finishes proposed by him have been successfully employed in other similar applications.

All materials and equipment used shall be corrosion resistant and protected from frost with respect to the prevailing environmental conditions of their installation. All plant, pipework and equipment installed shall be suitable in all respects for:

- the treatment and conveyance of domestic waste water and sludges to the required standards,
- the storage, containment and dosing of chemicals necessary as part of the Contractor's chosen treatment process, and
- the handling of return liquor and sludges generated by the Contractor's chosen treatment process.

Process plant and equipment including all pumps and air blowers (if part of selected process) shall be provided on a duty/standby basis.

The Contractor shall be responsible for the selection of all process equipment and instrumentation and shall ensure that it is suitable for use in a Waste Water Treatment Plant.

7.6.3 List of Required Works

The works described in this section shall be deemed to include but not be limited to the following:

- a. Supply/manufacture/delivery/off-loading/installation of process Plant and Materials
- b. Provision of associated structures, Materials and Plant, comprising:-

- Civil and building works
 - Excavation & disposal of excavated material
 - Mechanical and electrical installations
 - Control and instrumentation installations
 - Handrailing, guarding, bridges, decking, ladders, etc.
- c. Integrating with existing equipment and structures
- d. Temporary works, facilities and Equipment

Flow metering and Sampling

- Install and commission flow measurement device upstream of the screen. Power and signal cabling to be installed in ducting to the Control Building. Flow data to be recorded on the SCADA system as described below.
- Refrigerated 24 hour flow proportional composite sampler to be installed and commissioned downstream of the inlet works and upstream of the Balance Tank (inlet sampler).
- Refrigerated 24 hour flow proportional composite sampler to be installed and commissioned downstream of the UV Disinfection Unit (outlet sampler). Remove existing sampler and dispose off site.

Inlet Works

- Access to the inlet works pumping station involves entry into a confined space. Limited space is available for safe set up of lifting equipment for maintenance purposes and for access to the sump for cleaning or other tasks. Chamber access to be reconfigured to allow lifting of pumps to be carried out from ground level and a safe means of access and egress to be installed and commissioned.
- Adequate internal lighting to be provided throughout the inlet pumping station.

Aeration Tanks

- DO Probes to be installed in the aeration section of each process stream. Ducting to be installed to the main control kiosk to allow display of DO level in each tank and enable control of blowers and mixer units.
- Provide standby blowers as follows:
 - Air Blowers 1 and 2 – provide one standby blower to be used in the event of failure of either blower. Reconfigure all air supply pipework and install new valves as required. Install existing blowers and standby blower in a new insulated and soundproofed kiosk with adequate access for maintenance of all blowers, valves and pipework. New Kiosk to be installed on a concrete plinth.
 - Air Blowers 3 and 4 – provide one standby blower to be used in the event of failure of either blower. Reconfigure all air supply pipework and install new valves as required. Install existing blowers and standby blower in a new insulated and soundproofed kiosk with adequate access for maintenance of all blowers, valves and pipework. New Kiosk to be installed on a concrete plinth.
 - Air Scour Blower – provide one standby blower to be used in the event of failure of the blower. Reconfigure air supply pipework accordingly. Install existing blower and standby blower in a new insulated and soundproofed kiosk with adequate access for maintenance of all blowers, valves and pipework.

Process Control, Data recording and Telemetry

- Install and commission an SMS dial out alarm facility. The dial out alarm system for plant and equipment failure shall be provided by means of a programmable logic controller and a modem link to selected telephone numbers which will be advised on completion of the Contract.
- Install and commission an uninterruptible power supply (UPS) generated by a static inverter within the system and not the mains. It shall also contain a trickle charger and power failure backup to prevent loss or corruption of data by sags, frequently spikes or interruption in the mains power supply. The duration of power failure backup facility to be supplied shall not be less than 0.5 hours.
- Install and commission a Programmable Logic Controller (Allen – Bradley PLC – 5 or equivalent) for recording of signals from all items of plant and equipment.
- Install and commission a Human Machine Interface (HMI) unit. The HMI shall provide local operator interface and monitor field data. The HMI shall allow local adjustments of control instructions. The HMI shall be capable of displaying trending information for all items of plant.
- Install and commission an intruder alarm and fire alarm to be linked to the alarm dial out facility.
- Reconfigure process to enable greater denitrification and produce an effluent capable of meeting the specified requirements in terms of nitrogen concentration.

Siteworks

- Installation of additional ducting as required by the above works.
- Carry out all recommended mitigation works in the Site Safety Audit (Section 7.5.2).
- Ensure all process units are labelled adequately.
- All pipework and plant installed above ground to be protected from frost by installing suitable pipe insulation or heat tracing.
- Pipework installed above ground poses a significant trip hazard throughout the site. In addition, there is a risk of damage to the plastic pipework from persons standing on it or being struck by machinery. Suitable protection shall be installed over and around all pipework (steel frames anchored to the ground with removable open grid decking over pipework or equivalent solution).
- Ferric sulphate is currently stored in a 1000 litre IBC on site. The ferric storage bund is not covered from the elements. The Contractor shall remove and dispose of the existing IBC storage tank and associated bund. The Contractor shall install and commission a suitably bunded container certified for the chemical used for ferric sulphate dosing and reconfigure dosing and delivery pipework accordingly. Dosing pumps shall also be positioned over the storage bund to catch any potential spills. The new ferric sulphate storage and dosing area shall be located adjacent to the entrance to the site to enable safe access for delivery of chemicals. The emergency shower and eyewash station shall also be moved and located adjacent to the storage area.
- Install and commission a low level alarm system on the ferric storage unit, linked to the dial out system for the plant.
- Provide adequate and suitable lifting equipment to enable lifting of all equipment on site (mobile tripod or equivalent with block, tackle and lifting chains, certified by an independent authority).
- Provide footpath access to all units to enable positioning of lifting equipment and facilitate sampling and maintenance works to be carried out effectively and safely. Interconnecting footpaths between adjacent process units shall also be constructed.
- Remove all overgrowth and debris from the UV disinfection equipment chamber. Chamber to be powerwashed and cleaned out completely. Construct and install a suitable weatherproof enclosure over the entire chamber. The enclosure shall be

lockable and shall facilitate removal of all equipment for maintenance. Adequate internal lighting shall also be provided.

- Provide suitable and adequate external site lighting.
- Provide suitable safe access to the backwash tank (steps, handrailing, edge protection)

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31.07.09

Re: Hollycourt Developments Limited – Effluent Treatment Plant at Lybe, Belgooly, Co. Cork – Request for taking over

I refer to the above and the submission by Murphy McCarthy Consulting Engineers on behalf of Mr. Tom Collier of Hollycourt Developments Ltd.

I have examined the documentation submitted, visited the site and discussed the matter with the Environmental Protection directorate.

I have set out below the various issues that occur:

Background to the WWTP and Planning Context

Initially a wastewater treatment plant of 500 population equivalent capacity was granted under S/99/7058 (Forestbrook Development). Subsequently the WWTP was granted planning to expand from 500pe to 1,000pe under Planning Permission 04/1681 in February 2005 to cater for additional developments by Hollycourt Development granted under separate permissions.

Description of the WWTP Facility

The WWTP is located in the Riverbank housing estate and is bounded by the River Stick. The site is enclosed on two sides by a palisade fence. The remaining sides along the River Stick are unfenced (although shown as fenced in the drawings supplied). The site is flat with an overall area of approximately 0.152 Ha. The area over 50 metres from existing housing is less at 0.082 Ha. Allowing for a 4m wide riparian zone along the riverbank reduces the usable area further to approximately 0.065 Ha. Elements of the WWTP are constructed within 50m of dwelling # 1 are shown on the marked up Site Layout Plan. The main elements of the plant consist of:

- Lift pump station
- Splitter Chamber
- 4 nr 250pe propriety below ground biological treatment units (3 different manufacturers)
- Intermediate lift pump station
- 2 nr sand filters complete with backwash tank
- UV disinfection
- Flow monitoring and sampling
- Chemical dosing

- One or more control panels located in external kiosks.

The reputed design capacity of the WWTP is 1,000pe. The design standard required by the issued license includes the following parameters:

- BOD 10 mg/l
- SS 15 mg/l
- N 15 mg/l
- P 2 mg/l
- Faecal coliforms 250fc/100mls

Photographs provided in the Murphy McCarthy documentation are generally representative of the site.

The plant was developed in 4 separate stages – different manufacturers equipment has been used – although the underlying technology/process is effectively the same.

Operating Performance and Compliance with current Discharge License / Grant of Planning

A copy of the discharge license (WP(W) 13/05R) is included in the Murphy McCarthy documentation. The following items required (either implicitly or explicitly) by the license are not in place:

- Flow balancing*
- Outfall diffuser/tideflex valve**
- Bunding for chemical storage

*The inlet pumping station may provide some degree of flow balancing in practice, although not specifically identified as such in the Murphy McCarthy documentation.

**On the day I visited the plant I observed two separate outfalls discharging to the river – both consisted of a pipe cantilevering to just beyond the riverbank, with free discharge down to the river surface.

The plant has generated intermittent odours that has caused nuisance to the adjacent residents. The Environmental Protection Directorate has logged complaints regarding these odours. Area Operations South has also advised of numerous complaints of odour.

Recent performance monitoring results received from the Environment Directorate show that the plant is not performing as required.

Date / Licence Limit	BOD - 10 mg/l	SS - 15 mg/l
10/04/2008	24	41
08/05/2008	253	79
03/07/2008	58	
11/09/2008		15
16/10/2008	18	11
19/02/2009	62	28
21/05/2009	74	80
22/07/2009	84	40

This is in contrast to the view of the owner's agent that "in general the plant has worked satisfactorily since August 2007".

On the day of my visit (03/06/09) one of the two discharges was cloudy in appearance. I also observed the mixed liquor in one of the treatment streams – this appeared grey in colour indicating a low MLSS. Chemicals for removal of P were stored in a number of individual 25l containers on top of a tank and were not banded as required by both the Discharge License and condition of planning.

The Environmental Protection Directorate has advised that a prosecution case is pending against both the licensee and the operator for breaches of the discharge licence.

It is considered that a reputable and competent WWTP company has been operating the plant for some time. The unsatisfactory performance record and ongoing issues outlined above suggest a deficiency in the design and/or construction of the WWTP to treat the sewage loads generated – although deficiencies in the operation cannot be discounted.

From a preliminary examination, the WWTP does not conform to the grant of planning in a number of aspects:

- Fencing not completed in accordance with drawings and condition
- Control house not constructed
- Sludge storage tank not constructed
- Landscaping not completed
- More than one outfall constructed
- Not all chemical storage vessels are banded

Synergy with Belgooly Sewerage Scheme / Potential as permanent WWTP

The Belgooly Sewerage Scheme Preliminary Report (October 2005) considered the site of the Riverbank WWTP for the siting of the permanent Belgooly WWTP. Of a total number of 10 potential sites assessed, the Riverbank WWTP site tied with one other site as least acceptable. The site was also considered for the construction of the terminal pumping station for the proposed network. This option ranked third out of four feasible options. In my opinion the site is not suitable for the siting of a permanent WWTP on account of the inadequate site area available and the close proximity of residential development.

Upgrades to WWTP

The following upgrades would need to be considered prior to any taking over to ensure that WWTP could be operated and maintained in a satisfactory and safe manner:

- Site fencing and landscaping
- Welfare facilities / Control House
- Sludge holding tank
- Safe access to sand filters roof area
- Emergency eye wash
- Elimination of 'extra' outfall
- Construction of satisfactory outfall
- Works to inlet pumping station sump
- Other works as a result of a HAZOP survey

- Other works required to ensure the WWTP will treat to the required standard and without odour nuisance. This could include passive odour control, flow balancing, and aeration of the inlet pumping station.

Cost Implications (Initial Upgrade and O&M Cost)

The capital cost of upgrading the plant as above is likely to be of the order of €75k – €150k.

The average all-in annual operating cost of the WWTP is estimated at €75,000. This includes for routine operation and maintenance, emergency callouts, consumables, sludge disposal, monitoring analysis, safety plans and risk assessments, licensing costs.

The plant serves only residential development – no revenue would be generated from ‘water out’ from non-domestics.

Conclusions & Recommendation

The performance history of the WWTP has been unsatisfactory with a prosecution pending regarding ongoing issues,

There is no synergy with the proposed Belgooly sewerage scheme.

A capital upgrade of the plant is required to ensure that the WWTP could be operated and maintained in a satisfactory and safe manner by the Council. A preliminary estimate is €75k – €150k.

The average all-in annual operating cost of the WWTP is estimated at €75,000.

As it would appear that there is no statutory reason compelling the Council to take the facility in charge it is recommended that the plant not be taken over.

Note: If the owner fails to operate the plant correctly the Council can exercise its powers under Section 91 of the Water Services Act to take over the operation and maintenance on a temporary basis and seek to recover costs.

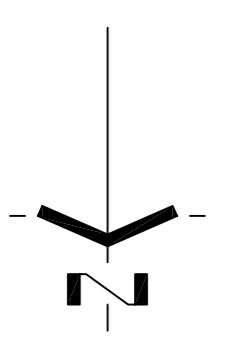
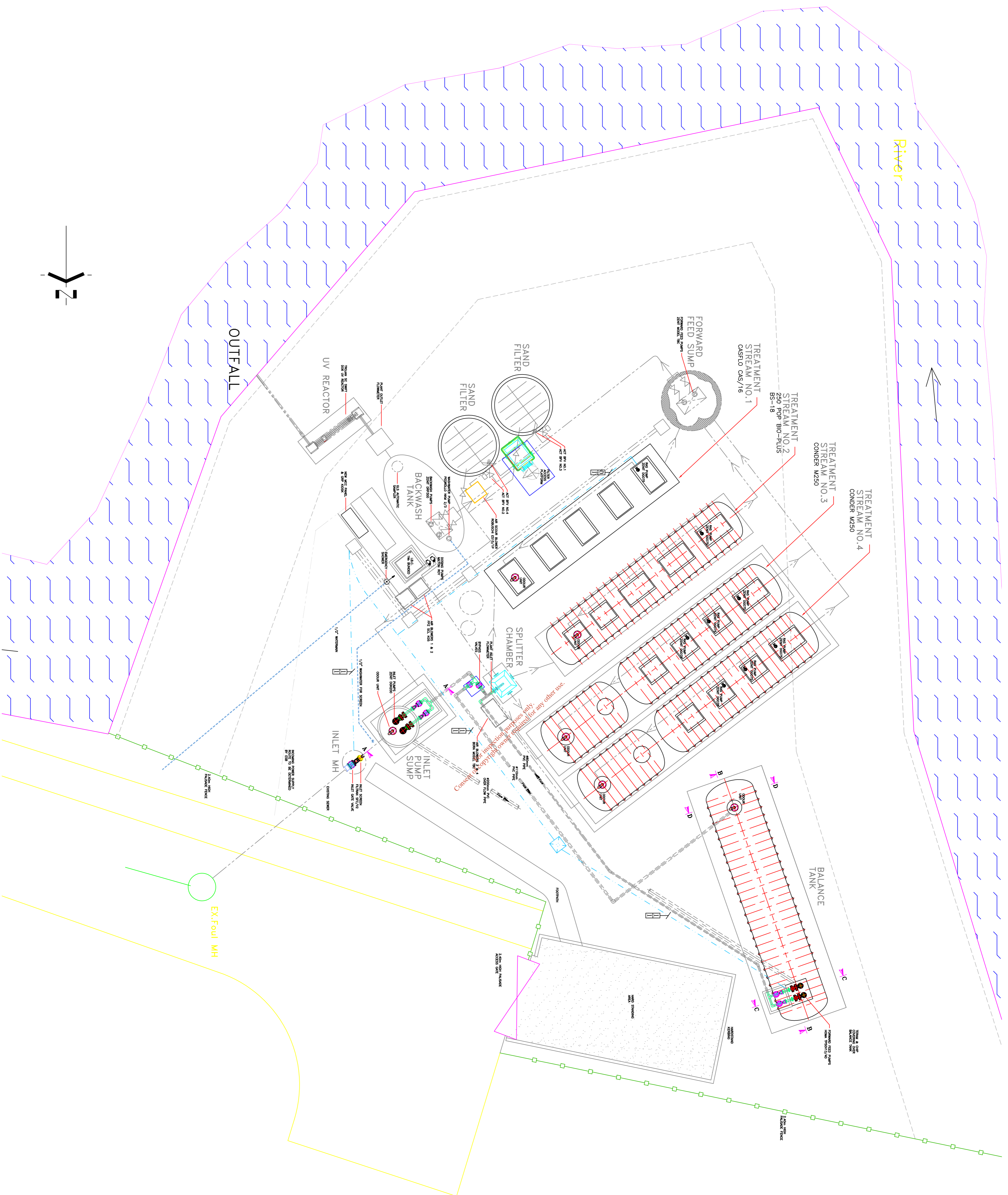
Dave Clarke

Senior Executive Engineer

Water Services Investment Programme – Project Office

Attachments: Murphy McCarthy documentation under cover letter dated May 29th 2009
Extracts Planning Ref 04/1681
Marked up Site Layout Drawing

IF IN DOUBT ASK DO NOT SCALE OFF THIS DRAWING



REFERENCE DRAWINGS

DRAWING NUMBER:	REV.

GENERAL NOTES:

- All power ducts to be 150Ø unless noted otherwise.
- All telem ducts to be 100Ø unless noted otherwise.
- All pipe invert levels taken from underside of outside diameter unless noted otherwise.

DUCT TAG
 = No. OF 150mm POWER DUCTS
 = No. OF 100mm TELEM DUCTS

- CABLE PULLING CHAMBER
- CABLE DUCT ROUTE
- DOSING LINE
- MAINS WATER LINE
- WASHWATER LINE
- LIGHTING COLUMN
- PALLISADE FENCE

Rev	Rev Dm	Cld	Apd	Date	Description
5	J/G	J/L	J/L	13-06-11	AS BUILT - REVISED WITH COMMENTS
4	J/G	J/L	J/L	06-05-11	AS BUILT
3	J/G	J/L	J/L	03-02-11	RE-ORIENTATION OF BALANCE TANK
2	J/G	J/L	J/L	26-01-11	MODIFICATIONS
1	J/G	J/L	J/L	22-12-10	MODIFICATIONS
0	J/G	J/L	J/L	17-12-10	INITIAL ISSUE

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Drawing Status:
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 Co. Mayo,
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 Email: sales@epsireland.com

Contract:
**BELGOOLY WWTTP
 UPGRADE**

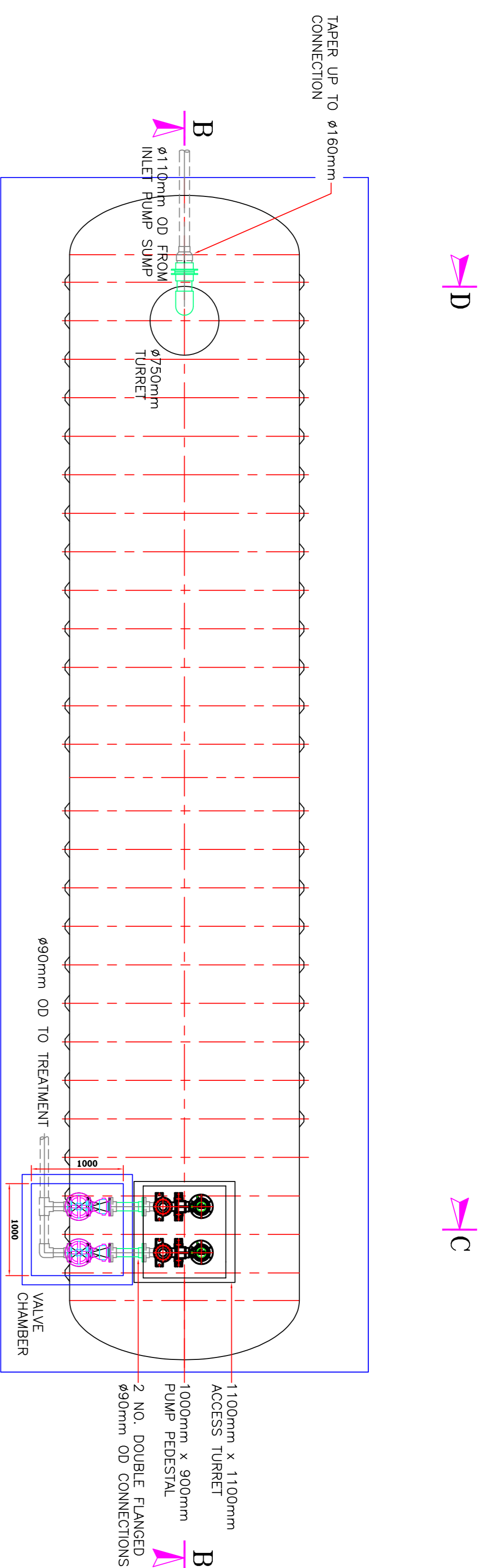
Client:
CORK COUNTY COUNCIL

Consultant:
**MURPHY MCCARTHY
 CENTRE PARK ROAD, CORK**

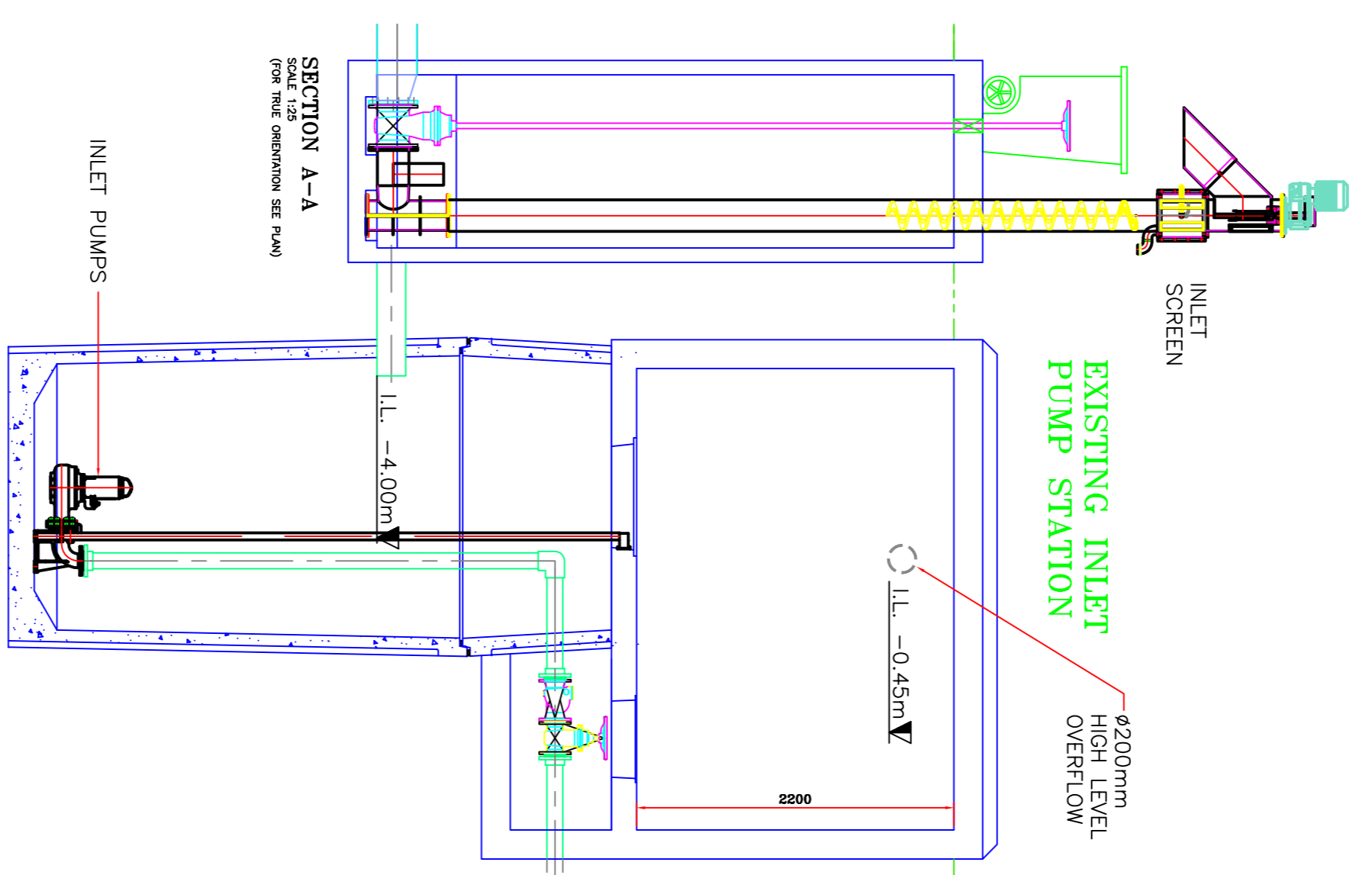
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**BELGOOLY WWTTP
 PLANT LAYOUT**

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Drawn By: J GOOGIN	Date: 17-12-10
Revision Suffix: 0 1 2 3 4 5	
Job No.: PC675	
Dwg No.: PC675-M001	
Workshop No.:	

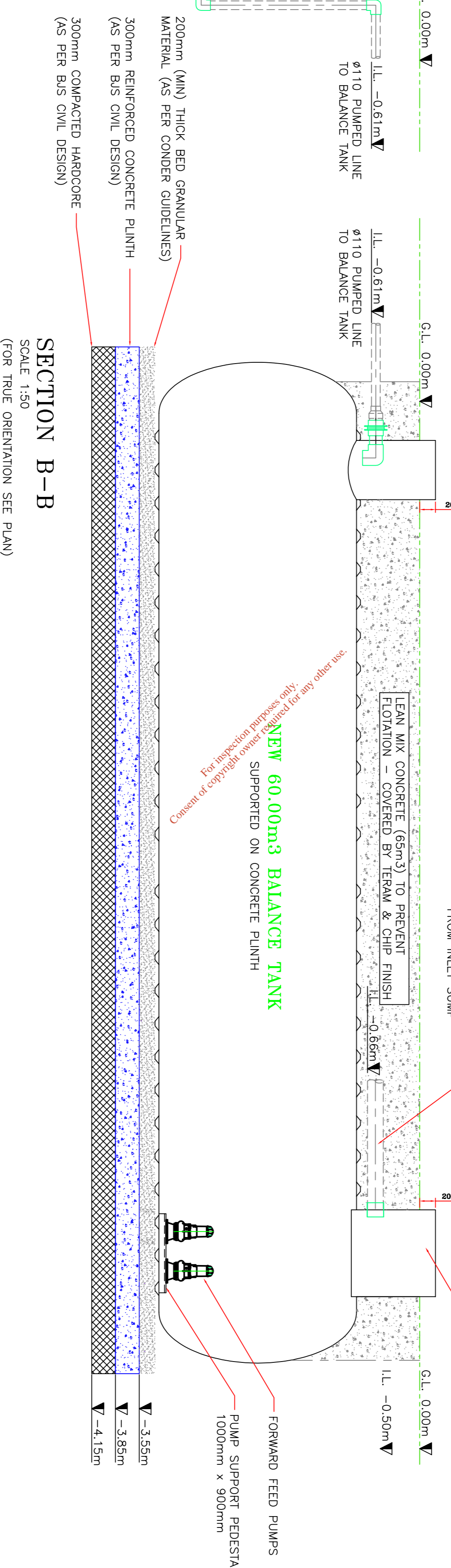
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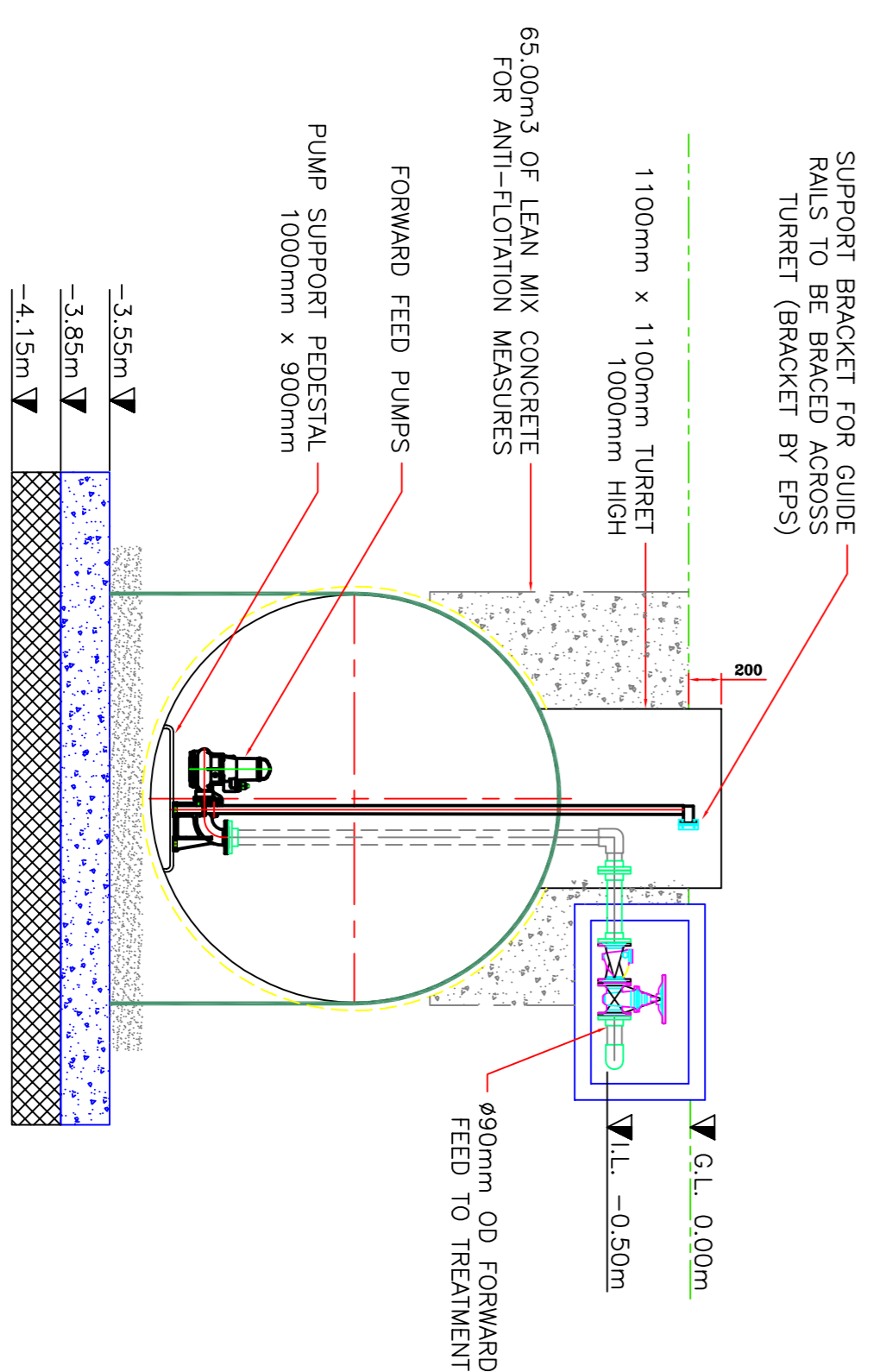
PLAN VIEW
SCALE 1:50
(FOR TRUE ORIENTATION SEE PLAN)



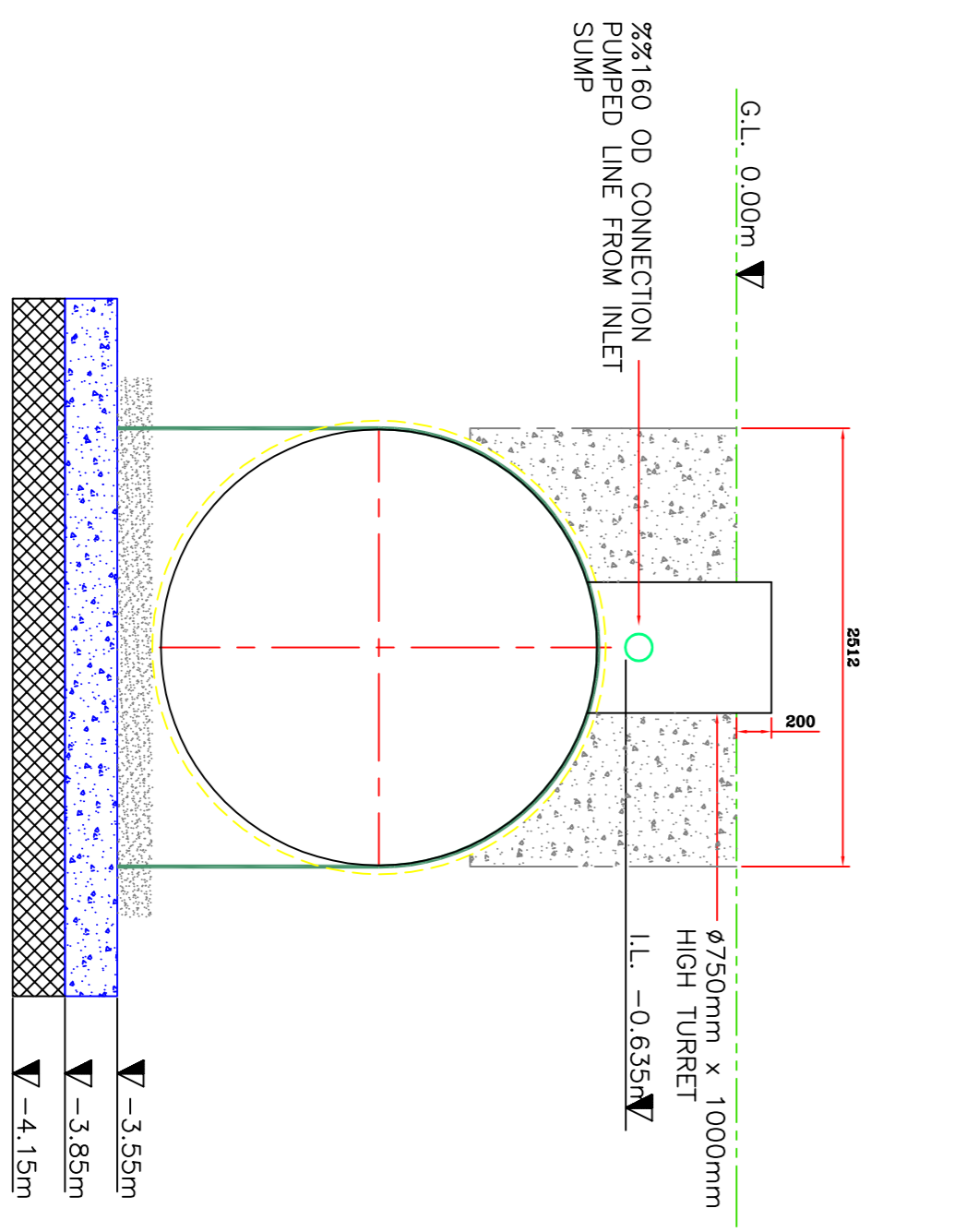
SECTION A-A
SCALE 1:50
(FOR TRUE ORIENTATION SEE PLAN)



SECTION B-B
SCALE 1:50
(FOR TRUE ORIENTATION SEE PLAN)



SECTION C-C
SCALE 1:50
(FOR TRUE ORIENTATION SEE PLAN)

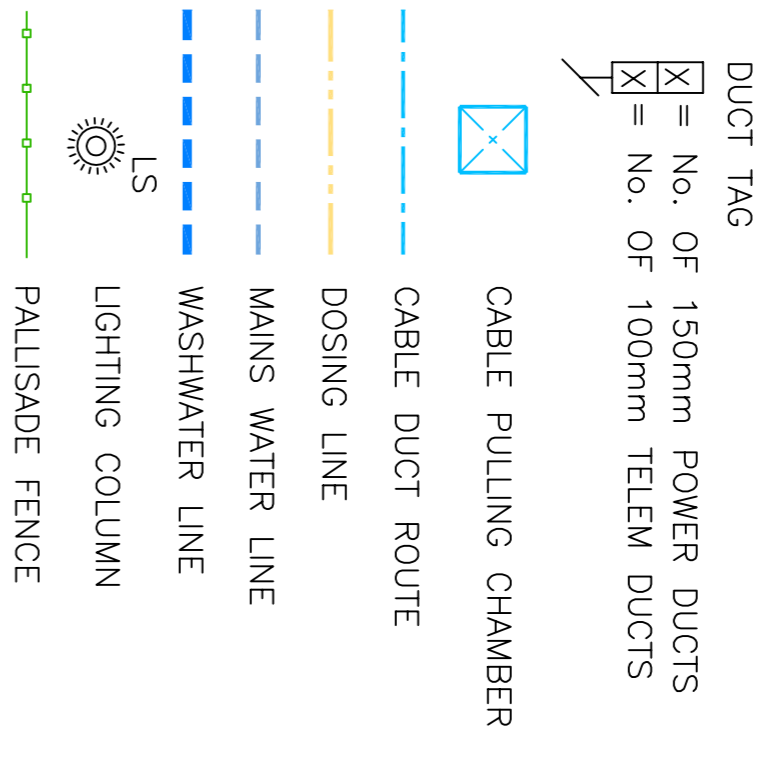


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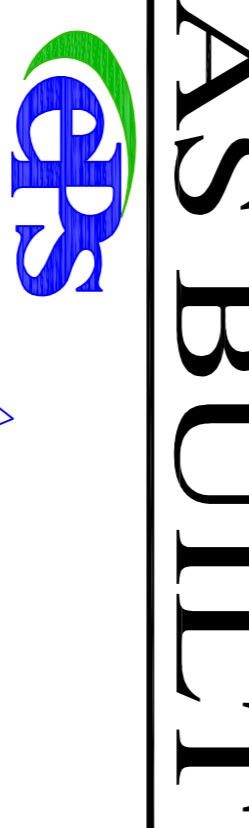
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Rev	Dwn	Ckd	Appd	Date	Description
5	J/G	J/L		13-06-11	AS BUILT RENISED WITH COMMENTS
4	J/G	J/L		06-05-11	AS BUILT
3	J/G	J/L		03-02-11	RE-ORIENTATION OF BALANCE TANK
2	J/G	J/L		26-01-11	MODIFICATIONS
1	J/G	J/L		22-12-10	MODIFICATIONS
0	J/G	J/L		17-12-10	INITIAL ISSUE

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Contract:
BELGOOLY WWTP
UPGRADE

Client:
CORK COUNTY COUNCIL

Consultant:
MURPHY MCCARTHY
CENTRE PARK ROAD, CORK

Drawing Title:
BELGOOLY WWTP
SECTIONS

Scale: 1:40	Plt: A1 @ 1:1
Drawn By: J GOOGIN	Date: 17-12-10
Revision Suffix: 0 1 2 3 4 5	
Job No.: PC675	
Dwg No.: PC675-M002	
Workshop No.:	

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REFERENCE DRAWINGS




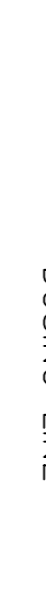
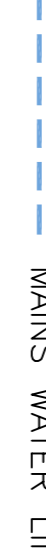

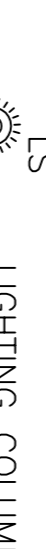
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DUCT TAG

- = No. OF 150mm POWER DUCTS
- = No. OF 100mm TELEM DUCTS

-  CABLE PULLING CHAMBER
-  CABLE DUCT ROUTE
-  DOSING LINE
-  MAINS WATER LINE
-  WASHWATER LINE
-  LIGHTING COLUMN
-  PALLISADE FENCE

Rev	Drn/Ckd/Issd	Date	Description
0	JIG	13-06-11	INITIAL ISSUE

AS BUILT

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Contract: BELGOOLY WWTP
UPGRADE

Client: CORK COUNTY COUNCIL

Consultant: MURPHY MCCARTHY
CENTRE PARK ROAD, CORK

Drawing Title: BELGOOLY WWTP
ANTI FLOTATION

Scale: 1:20 Plot: A1 @ 1:1

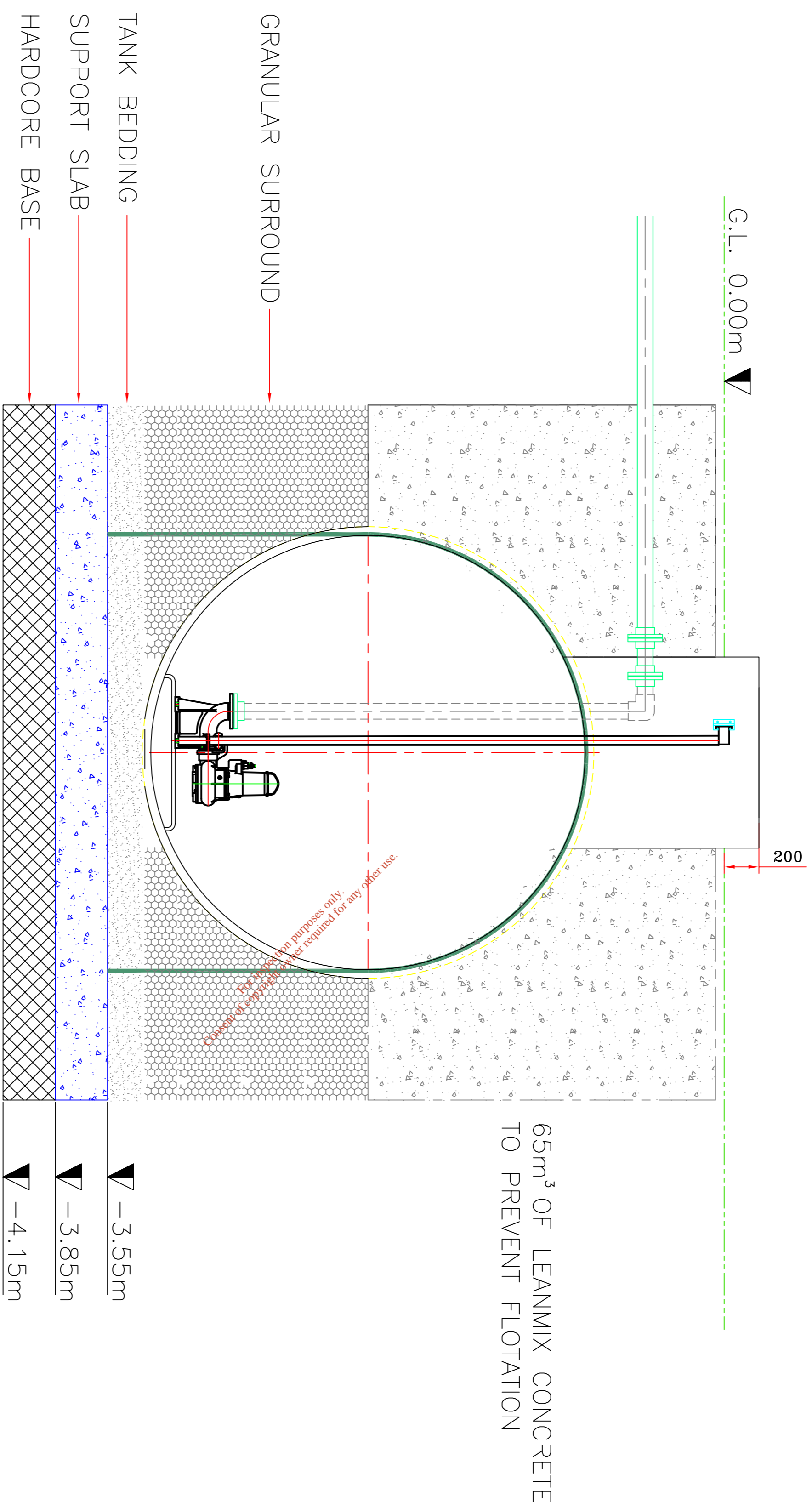
Drawn By: J GOOGIN Date: 13-06-11

Revision Suffix: 0

Job No.: PC675

Dwg No.: PC675-M003

Workshop No.:



ANTI FLOTATION SECTION
SCALE 1:20
(FOR TRUE ORIENTATION SEE PLAN)

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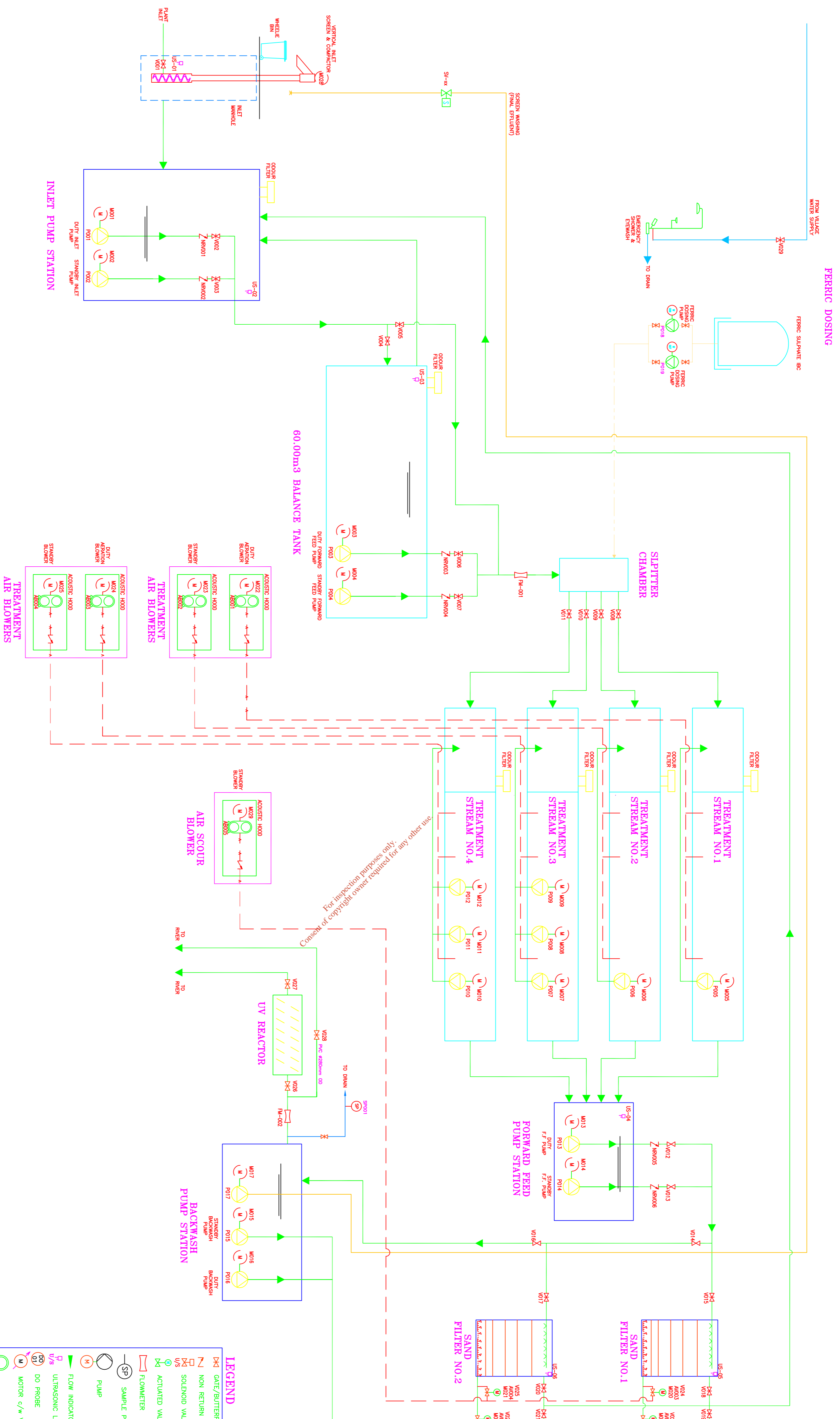
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LEGEND

DK1	Gate/Battery Valve
N	Non Return Valve
S	Solenoid Valve
U/S	Actuated Valve
FW	Flowmeter
SP	Sample Point
P	Pump
FI	Flow Indicator
ULS	Ultrasonic Level Sensor
DP	DO Probe
M	Motor 2/4 VSD
AB	Air Blower
HS	Handstop
S	Screen
PS	Screen Pump
B	Blower
M	Motor
BP	Butterfly Valve
V	Valve
SV	Solenoid Valve
NBV	Non Return Valve
FW	Flowmeter
AS	Auto Switch
LP	Level Probe
DO	Dissolved Oxygen
NO	Normality Open

Rev	Dwn	Ckd	Appd	Date	Description
1	JIG			13-06-11	AS BUILT REVISION
0	JIG	JL		17-12-10	INITIAL ISSUE

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Contract: **BELGOOLY WWTTP UPGRADE**

Client: **CORK COUNTY COUNCIL**

Consultant: **MURPHY MCCARTHY CENTRE PARK ROAD, CORK**

Drawing Title: **BELGOOLY WWTTP P&ID**

Scale:	NTS	Plt:	A1 @ 1:1
Drawn By:	J GOOGIN	Dde:	17-12-10
Revision Suffix:	0 1		
Job No.:	PC676		
Dwg No.:	PC676-P001		
Workshop No.:			