BUDGET PROPOSAL
A Low Nutrient Bio-Bubble WwTP

Prepared for: [redacted]

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BIO-BUBBLE WASTEWATER TREATMENT PLANT

Introduction

This proposal consists of the supply of a Bio-Bubble compact waste water treatment plant designed to receive the loadings stated under "design criteria" and, meet the discharge concentrations listed under "final effluent quality", as detailed in the "design parameters" below.

The effluent will be retained in the Balance Tank ready for transfer to the Reactor on demand. Duct pipes connect between the Balance Tank and Reactor for the provision of a service duct for cabling and air tubing, effluent transfer and returned activated sludge. The waste water will undergo biological treatment within the Reactor prior to being batch discharged. A Stainless-Steel kiosk located nearby to the Reactor houses the control system and delivers low-pressure air to the Reactor via a connecting duct pipe.

Design parameters

The estimated design loading has been based on 2 x 4-bedroom properties

Design Criteria		
Population Equivalent (Max)	12	PE
Hydraulic Flow Per Person (Table 4)	150	Litres
Maximum Organic Loading	0.72	Kg
Maximum Hydraulic Flow	1.8	m^3/d *2
Optimum pH	7 – 7.5	
Final Effluent Quality		
Biological Oxygen Demand (BOD_5 ATU)	10	mg/l *3
Suspended Solids 105°C (SS)	20	mg/l
Ammonia (NH_3-N)	<1	mg/l
Total Nitrogen (Natural England have accepted a conservative 5mg/l performance as a precautionary level)	5mg/l	
To Consent Compliance	95	percentile

*1 grams *2 cubic metres per day *3 milligrams per litre

All waste water discharging to the system is assumed to have a treatable consistency of domestic sewage with no uncharacteristic inhibition or toxicity to biochemical carbonaceous oxidation (BOD reduction) and nitrification (ammonia reduction). Alkalinity concentrations and nutrient levels are assumed to be adequate to sustain biological nitrification at all times and without deficiency so as to cause any inhibition detrimental to process performance.

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As with all small domestic sewage treatment systems, care should be taken to avoid discharging excess solids into the system such as disposable nappies, sanitary towels, etc. We advise a hygiene (sanitary) bin should be placed in the WC for disposing of such items.

Please note that we have based the following equipment selection on a duty-only system supply. Furthermore, the plant has been designed to receive flows from a separate sewer drain system. Infiltration and surface waters are assumed to be taken elsewhere.

The Bio-Bubble has 2 modes of operation: Sleep Mode and Normal Mode. With this application, there will be 2 batch discharges every 24 hours from the Reactor.

Balance Tank Dimensions		
Number of Balance Tanks	1	
Tank Internal Diameter	1.8	m
Freeboard	<1.0	m
Gross Tank Depth (circa)	3.0	m
Gross Capacity	7.6	m^3
Reactor Dimensions		
Number of Reactors	1	
Reactor Internal Diameter	1.8	m
Freeboard	0.4	m
Gross Tank Depth	3.0	m
Gross Capacity	7.6	m^3

Drive systems applied

Item	No	Type
Main Aeration Compressors	1	HP200 (45dba)
Balance Tank Loading Pumps	1	AP50.50.08.A1
Reactor discharge Pump	1	AP35 40 06 A1

Inlet flows

We understand the effluent will gravity flow into the plant. It is also assumed the depth of the incoming drain invert into the tank will be no greater than 1,000 mm below ground level. Where, necessary, greater drainage depths can be accommodated but may incur additional costs.

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Balance tank

Sewage will be retained in a Balance Tank ready for transfer into the Reactor on demand.

A single Balance Tank is proposed with a gross volume of 7.6 m^3 constructed from pre-cast concrete rings. Tank construction materials are NOT included in our scope of supply; however alternative materials and construction methods are available depending upon site requirements. Under normal flow conditions, a membrane diffuser within the Balance Tank will intermittently mix the sewage to prevent settlement and alleviate variations in the incoming influent strength. The membrane diffuser receives a small proportion of air from the Reactor aeration blower housed in the stainless-steel control kiosk. In the event of a failure or loss of power to the plant, the Balance Tank holds approximately 48 hours retention. The Balance Tank can also be used to remove the incoming waste water during emergency situations.

Balance tank process monitoring

Twice each day, the level of the Balance Tank will be monitored to ensure there is sufficient waste water to initiate a treatment cycle. The PLC control monitors the level during a sequence of data windows throughout the settlement phase to determine the requirements for the next cycle. A separate level indicator will provide high level detection and raise an alarm.

Reactor loading pump

Wastewater will automatically be transferred into the Reactor from the Balance Tank by initiation of the submersible loading pump. The Pump will provide duty only operation and will be controlled by the pump float-switch in synergy with the Bio-Bubble patented "Intelligent Reaction" system to determine the volume of transfer. Simultaneous backup protection has also been incorporated with timed fill and discharge cycles to ensure continuous operation during wastewater transfer. The Pump is situated in the base of the Balance Tank and mounted on a galvanised lifting chain.

Bio-Bubble reactor

A single Reactor with gross volume 7.6 m^3 constructed from pre-cast concrete rings has been selected. Tank construction materials are not included in our scope of supply; however alternative materials and construction methods are available depending upon site requirements. Costs associated with the tank supply may be variable and will depend upon specific site requirements including ground conditions, drainage, access etc.

Reactor aeration grid

The system utilises the Bio-Bubble Advanced Aeration process and incorporates several exclusive internationally patented technologies. Advanced Aeration is a unique British development that instils the most favourable conditions by applying aeration to stimulate and cultivate healthy, naturally selected micro-organisms to form an activated sludge. A low sludge loading and advanced sludge-age promotes the formation of a healthy dense flocculation with clear liquid interface to produce a high quality effluent

A programmed cycle of biological treatment instilled by a sequence of aerobic phases utilising low-pressure air dispersed through membrane diffusers and, anoxic phases under quiescent conditions will ensue. When these phases have completed, a settlement phase will induce suspended active and inert solids to settle out from the treated liquor. A draw phase will discharge the clarified liquor to an outfall or watercourse to complete the cycle.

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Reactor aeration compressor

A linear air pump, located in the stainless-steel control kiosk, producing air at 200 litres per minute will provide the aeration. The blower will be controlled by "Intelligent Reaction" operating to the required cycle of events. Cycle selection will depend upon the level within the Reactor.

Discharge pump

Treated effluent will eventually be discharged from the Reactor through a submersible pump which is suspended from a lifting chain within the decant zone of the reactor. The pump will be controlled by "Intelligent Reaction" operating to the required cycle of events. Due to the high-quality final effluent required a 3 way valve has been included to enable the first part of the discharge to be returned to the balance tank.

Reactor surplus sludge removal

Bio-Bubble surplus sludge (humus) can be handled on site rather than having to incur the expense of tanking the sludge away for further treatment. Unlike other systems, Bio-Bubble humus is stable, inert and odourless and makes an excellent fertilizer. Provided the system is in good operation, the humus can be pumped onto adjacent grassland or woodland by our engineers during the annual service. A hose is simply lowered to the bottom of the Reactor after approximately 1 hour settlement and the required volume is removed. Although this distinct benefit is available, it would be prudent to have facilitation of a road or track with access near to the plant for tanker removal if this is required.

Reactor final effluent discharge

Depending upon stipulated consent requirements, the final effluent will be suitable for discharge to a river, pond, soakaway, ditch etc. The selected discharge method will be subject to final design approval and should be priced by the installation contractor.

A sample chamber may also be stipulated. This will retain a small proportion of the last discharge which can be used for laboratory analysis to check the quality of the final effluent.

Flow metering is not included; however, effluent quantities can be verified from the control system which retains information of the accumulated throughput. Where exceptionally strict stipulation requires the final effluent to be measured by a flow meter, this can be included at additional cost.

Control kiosk

A new stainless-steel kiosk with nominal dimensions 900 mm high 600 mm wide and 300 mm deep will be provided to house the controls. Our standard supply allows a maximum distance of 3 metres between the control kiosk and Reactor; however this may be extended if necessary but may be subject to further costs.

Power Supply

We have allowed terminals for a max cable size of 2.5 mm three core SWA . The power supply will need to be laid to the kiosk plinth with at least 1.5 m allowed for connection. A 220 V single phase supply with 16 A MCB and 30mA RCCD earth leakage protection separate to the house and any other services will also be required.

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Alarm system & remote running

Alarms can be sent to any designated mobile phone or to Advanced Aeration HQ via GSM text messaging. This is subject to a signal being available and comes supplied with ample credit from the outset; therefore, no other costs are involved apart from topping up credit to the card. Costs will depend upon the number of texts sent and can be charged at annual service renewals. This option provides the facility and added benefit of receiving details of plant status to ensure all machinery is functioning correctly and, the power supply has not been interrupted, without the necessity of having to visit site, in addition to alleviating potential site response charges.

Energy utilisation guide

'Sleep Mode' applies an approximate 75% energy usage reduction. Sleep Mode operation depends upon the load entering the plant, therefore energy use is related to the incoming flow.

Bio-Bubble sludge production

Sludge production is on average 85 % less than other treatment systems. Advanced Aeration pursues the natural qualities of an extended sludge age with the very advanced stages of endogenous decay. This approach yields a high-density floc contributing to significant improvements in sludge stability. On average 0.1 kg SS is produced per each kg BOD removed: far less than other treatment processes all with minimum surpluses greater than 0.7 kg SS/kg BOD. Moreover, the sludge stability yields humus concentrations of 3 % dry solids.

It is very likely the humus will not require removing for at least 2 or 3 years, however monitoring of the sludge will be undertaken during each annual service and removed whenever necessary.

Ongoing service & maintenance

The option of a service agreement is available to all plant owners. A service agreement will provide a comprehensive maintenance plan for the upkeep of your plant by an approved Bio-Bubble engineer. It also entails emergency cover for breakdowns where required without incurring a call-out fee over the normal response charge.

For emergency situations, such as when the use of facilities would be limited or pollution could occur, we aim a response within 24 hours of a reported failure. However, unlike practically all other systems, each plant has additional capacity which can be used without limiting facilities or having to affect a pollution discharge, therefore, out of hours or weekend responses are not normally required.

The annual service will include testing of all mechanical and electrical equipment in addition to process proving to ensure the final effluent will continue to remain within consent. The plant will be cleaned and tidied, and any parts showing wear or signs of pending failure will be replaced. Where required and providing sufficient land has been allocated, sludge removal will be undertaken. The option of collecting a sample of the final effluent for analysis by independent accredited laboratories can be included at additional cost. Free telephone technical support is available during office hours.

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Warranty

All Bio-Bubble installations are guaranteed against faulty components and workmanship for 12 months from the date of commissioning which is recorded on the Bio-Bubble completion certificate (See warranty exclusions / conditions below).

The warranty on the installation covers replacement of failed components and the labour involved to replace the failed component. Any failures or alarms must be reported to Bio-Bubble within 24 hours. The labour cost attributed to a warranty claim is subject to the installation of the specific Bio-Bubble alarm and monitoring system as agreed. It should be noted that failure of the alarm system supplied under the contract is covered; however; the owner must ensure the alarm system is not disconnected or remains non-operational for durations longer than 24 hours prior to the failure being reported.

Effluent quality

The quality of the final effluent is guaranteed to be within compliance of the consent standards set out within the terms of discharge negotiated with the Environment Agency. A copy of the Consent to Discharge must be forwarded to Bio-Bubble for our records.

Bio-Bubble reserve the right to pass on costs to the client attributed to failures that result as a direct consequence of any delay or lack of warning to Bio-Bubble of such a failure that is not a direct fault of Bio-Bubble. These include but are not limited to inorganic materials being disposed of down the system, lightning strikes, flooding and interference by non-approved personnel. There is no warranty on Effluent Quality for operating the plant outside the design loading.

Exclusions / Civils costings

The following site-specific items have not been included within our scope and are subject to survey and costing by a civils contractor:

- Site setting and civil works
- Tank installations & manhole covers
- Tank choice or tank components
- Sample chamber & valve chamber
- Any drainage or ducts including cable ducts
- Casting / laying of control kiosk base
- Supply, installation and certification of a power supply
- Inlet screening for inorganic material
- Obtaining an Environmental Permit

The installer appointed to carry out the works will be your own appointed contractor.

Written documentation of new build is required for zero rated VAT invoices; these must be supplied upon placing an order.