APPENDIX F1

C.A.P. Technology

PROPOSAL FOR THE DESIGN, SUPPLY AND INSTALLATION OF AN EFFLUENT TREATMENT PLANT

Client: **Salisbury Poultry Ltd**

Site: **Maelor**

Ref No : **Q1609/16 (Rev 9)**

Date : **15th August 2016**

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CONTENTS

1. EXECUTIVE SUMMARY

CAP Technology is hereby pleased to present our proposal for the design supply and installation of a new effluent treatment plant to process all trade effluent generated by the new chicken processing facility on the Maelor site.

The specification of the system recommended in this proposal would treat all effluent produced from the processing of 1.0 million bird per week. Provision is however included to allow the plant to be economically expanded to process effluent from 2.0 million birds per week. The design offers considerable flexibility which would enable:

- The addition of an activated sludge to produce effluent of the same quality
- The plant could be converted to an MBR which would produce a higher quality of treated effluent if discharge standards are tightened
- Treated effluent could be recovered as potable water using reverse osmosis technology

Within this proposal we have offered to deliver all mechanical and electrical works associated with the project. We will work closely with Salisbury's chosen civil contractor to ensure that these works are fully co-ordinated and implemented as efficiently as possible.

The proposed plant would include the supply of new self-priming Sykes pumps, each capable of delivering unscreened effluent at a rate of 50 litres per second. These would now be installed to draw from a new sump located close to the effluent treatment plant. The screening station would include an externally fed rotary drum type screen having a capacity of 180 m^3/hour with space provided to add a second screen in the future. The screen would be mounted on existing staging allowing gravity discharge of screened effluent into the existing balance tank or divert tank. The screened solids would fall into a bin located beneath the screens at ground level. Both the balance tank and divert tank would be refurbished and fitted with venturi type aerators. DAF clarification is undoubtedly the most effective method of primary treatment, being able to remove 60% of the COD load. A system capable of processing effluent at a rate of 130 m^3/hour would be provided.

For the current discharge requirements we recommend an activated sludge system as the main stage of biological treatment. This is the lowest capital cost solution and will ensure that the treated effluent would comply with the envisaged discharge standard for the River Dee. We have included a tertiary treatment plant including a micro-screen and chlorination system. This would enable treated effluent to be recovered for use in low grade applications in the factory.

As the expansion is foreseeable, the design of plant we have recommended would allow for the economic expansion of the plant in the future. This would include:

- Options to upgrade the screening system for future volumes
- Provide DAF plant for future capacity
- Up-grading aeration system for future capacity

As operating costs are important, we have now included to upgrade the blowers to hybrid type which would give an the annual saving of £10,512 in terms of power.

The total lump sum cost for the design, supply and installation of all M&E works as detailed in this proposal would be:

£xxxxxx + VAT

We have also included a service contract providing full technical support for a period of 12 months from commissioning.

The total project would be implemented over a period of 8 - 10 months.

2. INTRODUCTION

Salisbury Poultry Ltd is currently constructing a chicken processing plant at the former dairy site at Maelor. There is no access to a municipal sewer therefore all trade effluent generated on the site must be processed through an on on-site treatment facility to enable the treated effluent to be discharged into the River Dee in accordance with consent conditions granted by the Natural Resources Wales (NRW).

It is understood that the factory will initially be designed to process 1.0 m birds per week. However, there are plans for the factory capacity to be increased to 2.0 m birds per week in the foreseeable future. Within this proposal we recommend a scheme which would ensure that all effluent from the production of 1.0 million birds per week is treated to a standard which would comply with the current NRW consent limits. When production increases to 2.0 million birds per week a second phase could be added. This could involve the addition of a parallel activated sludge process, in which case the plant would then have duty / standby equipment throughout, including the aeration vessels and the final clarifiers.

Alternatively when the plant needs to be expanded, the biological stage of treatment could be upgraded to an MBR plant. This would be beneficial if NRW stipulates a more stringent specification for the river discharge or recovery of potable water from the treated effluent is considered financially attractive.

The plant recommended in this proposal would include the following:

- Provision of new duty / standby raw effluent transfer pumps, each capable of delivering unscreened effluent at a rate of 50 l/sec
- Installation of a new raw effluent screening facility on the existing staging capable of receiving effluent at a rate of 180 m^3/hour, with provision made to add a second screen in the future.
- Refurbishment of the existing balance and divert tanks
- Installation of venturi type mixers & level control on both the balance tank and divert tank
- Installation of a DAF plant with a capacity of 130 m^3/hour
- Supply of 25 m^3 bulk chemical storage vessels to ensure economic cost for the delivery of chemical and safe operator working conditions
- Providing an activated sludge plant to process 1,500 m^3/day of raw effluent with a maximum COD load of 3,750 kg/day, with upgraded aeration system for the future requirements. The anoxic tank will be sized at 250 m^3.
- The final clarifier would be 12.9 m, diameter, hence capable of processing 1,500 m^3/day.
- Provision of a final effluent monitoring station in accordance with NRW requirements.
- Installation of a tertiary treatment system designed to process all effluent from the processing of 1.0 m bpw.
- The proposed plant would be fully automatic controlled from a plc based control system. This would be provided with sufficient I/O capacity for the future requirements.

The proposed scheme will produce treated effluent that could be used in low grade applications. Provided over 40% of the treated effluent can be used within the factory operations the total project should benefit for the Enhanced Capital Allowance under the HMRC & DEFRA guidelines. CAP will assist in making the appropriate application.

CAP Technology proposes to deliver all M&E aspects of the plant design, supply and installation of all M&E equipment, commissioning and performance testing of the plant.

CAP Technology has a proven record of delivering similar projects in the UK food and dairy industry in similar situations on a fixed lump sum turnkey basis. The project would be managed and implemented in strict accordance with the current CDM regulations. Therefore following completion of the civil works it is proposed that CAP Technology take complete control of the ETP construction site and manage the project accordingly.

As the site is close to CAP Technology's head office, we can offer unrivalled technical support, both during the delivery of the project and subsequent operation of the plant. Within this proposal, we are able to include a 12 month support agreement.

2. COMPANY PROFILE

C.A.P Technology

CAP Technology was established in 1990. We are a Company specialising in the supply and installation of industrial effluent treatment plants on a turnkey basis. We have the resources and ability to progress projects from initial feasibility studies through to the supply and installation of full scale plants.

CAP Technology has completed three very successful projects within the Dairy Crest Group including the upgrade of the ETP in 2003. We have much experience in the supply of MBR systems involving water recovery in the UK dairy industry.

Technology

A wide range of effluent treatment technologies have been developed and are supplied by CAP Technology. We are not restricted to installing particular systems, and therefore can openly evaluate the most cost effective process train for any particular application.

Plants recently supplied have included dissolved air flotation, biological aerated flooded filters, polish filtration systems, MBR plants and sludge de-watering plants.

CAP Technology now has a close association with Alfa-Laval, a leading manufacturer of submerged type membrane systems who are currently at the forefront of developments in this field.

Project Management

CAP Technology undertakes a wide range of projects. Many projects are undertaken on a turnkey basis, incorporating the latest plc control systems and meeting the stringent specifications imposed by the UK food industry, pharmaceutical industry and Water PLCs. In addition to providing detailed packages of manuals, we also offer full courses of operator and management training.

Major projects are delivered under the CDM Regulations (2015), with CAP producing all the relevant documentation, working practices, safety procedures and risk assessment.

In addition to maintaining public & products liability insurance in accordance with our legal obligations, CAP Technology carries £5.0m of professional indemnity insurance.

Quality

The Company follows recognised standards of quality control consistent with ISO 9002. Contracts have been successfully delivered for major UK organisations. Our efficient and accommodating approach to business enables all client's objectives to be achieved.

Health & Safety

CAP Technology recognises the risks associated with construction projects. We ensure we are fully compliant with all current health & safety legislation during the course of our work. We retain an IOSH accredited health & safety advisor to monitor our performance and regularly attend site to inspect our procedures during the course of projects.

References

The following are examples for projects implemented by CAP Technology in recent years:

Muller Wiseman Dairies

This was a turnkey project to design, supply and installation of a turnkey effluent treatment and water recovery plant. The scheme involved raw effluent reception with divert facilities, DAF clarification, biological treatment using submerged membrane filters and reverse osmosis for water recovery. The plant was designed to receive 1,300 m^3/day of raw effluent and achieve a recovery of 60%.

First Milk (Haverfordwest)

A turnkey project treating up to 2,000 m^3/day of effluent from a cheese factory for discharge into a sensitive watercourse.

The plant involved raw effluent balancing with divrt system, DAF clarification followed by a membrane bioreactor using Alfa Laval flat sheet membranes.




Golden Acres

The factory produces dry petfood pellets. An MBR plant capable of processing 450 m^3day was installed. Treated effluent is reused in factory scrubbering systems with surplus water being discharged to river.


4. SPECIFICATION

Design Flowrate

The plant provided in this proposal would be designed to process the effluent generated from a production rate of 1 million birds per week, but be expandable to treat the effluent produced from 2 million birds in the future.

Assuming a water consumption of 8 litres per bird, with the plant operating 6 days per week, average production of trade effluent is calculated to be 1,333 m^3/day.

To accommodate maximum flow conditions it is recommended that the effluent treatment plant should initially be designed on a maximum flowrate of 1,500 m^3/day. Following the planned expansion the ETP should be capable of processing effluent at a rate of 3,000 m^3/hour.

Three raw effluent transfer pumps will be provided, each capable of delivering unscreened effluent at a rate of 50 l/sec. The screening facilities would be capable of receiving effluent at a rate of 180 m^3/hour with options presented to upgrade this to 360 m^3/hour.

The DAF clarification plant would be designed to process effluent at a peak flowrate of 130 m^3/hour.

COD Load

Based on CAP Technology's experience of installing effluent treatment plants for the treatment of effluent from chicken processing plants, it is envisaged that the COD of the raw effluent would be up to 2,500 mg/l.

The proposed treatment plant would be designed to accept a maximum COD load of 3,750 kg COD per day.

It is important to use a DAF clarification process with chemical dosing as the primary stage of treatment. This will achieve a COD removal rate of over 60%. The COD of DAF clarified effluent will be below 1,000 mg/l. Therefore a COD load of less than 1,500 kg will be passed forward to the biological stage of treatment when processing 1.0 m birds per week.

When the site expands, this load will double. In case the process is upgraded using MBR technology, the aeration system in the main aeration tank would be increased to allow the additional air to be injected. This will however require the addition of a third blower.

Ammonia Load

The removal of ammonia is an extremely important aspect of the plant design.

Raw effluent should be screened to 1.0 mm before entering the balance tank. The raw effluent in the balance tank must be maintained under aerobic condition to prevent the release of ammoniacal nitrogen.

Provided this is achieved, the concentration of TKN entering the biological stage of treatment would not exceed 130 mg/l. In both cases the biological plant would be designed to accept this ammonia load.

Plant Performance

It is assumed that the treated effluent would be discharged into the River Dee. Although no consent has been granted for the discharge of effluent, it is assumed that the following level of performance must be achieved:

BOD_5	-	Less than 20 mg/l
TSS	-	Less than 30 mg/l
NH_4^+	-	Less than 5 mg/l
pH	-	6 - 9

The activated sludge process with clarification will achieve this level of performance.

If the disc filter fitted with 10 micron mesh is included, fine residual solids would be removed. The suspended solids concentration in this filtered effluent would reduce to below 10 mg/l/.

Water Recovery

With the inclusion of the polish filtration, a proportion of the treated effluent can be recovered for low grade applications. Provided up to 40% of the effluent processed through the treatment plant is recovered for re-use in the factory, the complete project would comply for the "Enhanced Capital Allowance".

The recovered water would be sterilised using sodium hypochlorite dosing. It would contain less than 10 mg/l suspended solids.

5. DESCRIPTION OF WORKS

Inlet to Works

It is intended to segregate all domestic effluent from the trade effluent. The factory drains for trade effluent flow by gravity to the rear of the site where an effluent treatment plant used to be installed.

Previously trade effluent from the factory was received in an existing sump. It is now intended to extend the gravity drains to the site of the ETP where a new sump would be constructed. It is proposed to install two new self-priming pumps to operate on a duty / standby basis, each new pump being capable of delivering 50 l/sec. These pumps have good solids handling characteristics and would be installed at ground level allows for easy and safe maintenance.

A new ultra-sonic level sensor would be installed to monitor the level in the sump. This would be used to automatically control the operation of the above pumps.

Screening

It is important to screen the solids from the effluent before it enters the balance tank. Although rundown screens are available for reuse, they would not be appropriate for the screening of chicken processing effluent. They would require constant manual cleaning.

CAP Technology proposes to supply new externally fed rotary drum type screens. These are well proven in the poultry processing industry. The units would be of 304 stainless steel construction fitted with a 1.0 mm wedge wire screening drums and would have automatic wash water facilities. The screening station would be capable of receiving raw effluent at a rate of 180 m^3/hour. It would be installed on the existing staging thereby allowing screened effluent to flow by gravity into the balance tank and screened solids would fall directly into a Eurobin that would be positioned below. Space would be provided to accommodate a second screen in the future.

Raw Effluent Balancing

Two vessels of steel panel construction are available for use on site. One is in good condition and is currently seen to be full of water. The other is empty and there is evidence of corrosion in the lower panels. However the bottom panels have 10 mm plate thickness which is very good for this type of vessel.

CAP Technology would refurbish both of these vessels. The bases would be cleaned and prepared to accept a SikaGuard coating. This will key into the rough concrete and provide a hard wearing corrosion resistant seal. The walls would be cleaned and minor damage repaired. This includes an appropriate section to cover the section of wall that has been cut away. A "CorroGuard" coating would then be applied to all surfaces.

It is proposed to re-use one of these vessels as a balance tank with the other would be kept available as a divert tank.

Two new side entry Landia venturi type aerator mixers would be installed on the balance tank vessel to efficiently mix the contents and maintain aerobic conditions. These aerations would provide over 50 kg O_2/hour. A similar venturi would also be installed on the divert tank.

A hydrostatic level sensors would be fitted to the vessels to monitor the level within the vessel.

It is proposed to return the surplus biological sludge to the balance tank. This will create some biological activity to reduce the COD of the raw effluent. Also, when the effluent is passed through the DAF plant, all waste sludge would be thickened to 6% dry solids.

DAF Clarification Plant

The raw effluent would be delivered to the DAF clarification system at a steady rate. The DAF plant would be capable of processing screened effluent at a rate 130 m^3/hour. Centrifugal type pumps would be used to deliver the screened effluent to the plant with a flowmeter and flow control valve being used to regulate the flow according to the rate set by the plant operator.

To maximise the level of COD removal across the DAF plant it is recommended that ferric chloride is used to coagulate the solids. The pH of the coagulated effluent would be monitored with sodium hydroxide being used to correct the pH to the desired value. Both the above reagents would be injected into a serpentine flocculator to ensure the efficient mixing of these chemicals.

25 m^3 bulk chemical storage vessels would be provided for the ferric chloride and sodium hydroxide. These vessels would be provided with ultra-sonic level sensors to monitor the level in the tank and provide a re-order level alarm. Duty / standby dosing pumps would be provided for each duty. They would be installed in cabinets of polypropylene construction. A safety shower would be provided in the vicinity of these chemical storage vessels.

At the end of the serpentine flocculator a flocculant solution would be dosed at a rate proportional to flow to flocculate the impurities prior to the effluent entering the DAF clarification vessel. The flocculant solution would be prepared automatically from an emulsion grade of flocculent.

The DAF clarification vessel would be a rectangular vessel of 304 stainless steel construction. As the effluent enters, facilities would be provided to inject a recycled stream of aerated effluent. The flocculated solids would quickly rise to form a floating sludge in the clarifier. Scrapers would draw this sludge into a sludge compartment from where it would be pumped into a 200 m^3 DAF storage vessel. This sludge vessel would be of GLS construction with an appropriate ground mounted passive odour filter being provided. The vessel would be provided with a hydrostatic level sensor to monitor the level and provide a high level alarm.

A portable odour control unit would be provided to filter the exhaust when the sludge tanker is collecting waste sludge thereby minimising any possibility of odours escaping during these operations.

The DAF clarifier would be provided with a cover of 2.0 mm sheet stainless steel. It would be provided with inspection hatches and connections to direct vent gasses to an odour control filter.

The clarified effluent would be drawn through a manifold on the base of the clarifier. It would flow over an adjustable weir, which would be set to optimise the consistency of waste sludge, thereby reducing sludge disposal costs. It would then flow into a sump from where it would be pumped into the activated sludge process. All site drains would also enter this sump allowing surface water to be processed through the system.

Activated Sludge Plant

The effluent would be treated using an activated sludge process to remove the COD and degrade the ammonia in the DAF clarified effluent. This process would consist of:

Anoxic Tank

The DAF clarified effluent would be pumped into an anoxic vessel along with the returned sludge from the final clarifier.

This vessel would be of glass lined steel panel construction. It would have a working capacity of 250 m^3, being 6.8 m diameter by 7.0 m high.

The effluent and sludge would enter tangentially at the bottom of the vessel. It would gentle mix before overflowing by gravity into the aeration tank. An external jet type mixer will also be provided to improve the mixing.

Aeration Vessel

Conditioned mixed liquor would pass by gravity from the anoxic vessel to the main aeration vessel.

A new aeration vessel would be installed. This would have a working capacity of 1,500 m^3, nominally 17.9 m diameter by 7.0 m high.

A fine bubble air diffusion manifolds would be installed on the base of the vessel. This manifold would be fed by two Rootes type blowers, configured to operate on a duty, standby basis. Each blower would be capable of delivering 2,200 Nm^3/hour.When operating under normal conditions, the blower would draw 56kW. An option has been provided to upgrade the blowers to hybrid type units. These would only draw 44 kW when delivering the same volume of air. This upgrade to the blowers would deliver a saving of over £10k per annum.

As the plant could be upgraded into an MBR system in the future, the aeration system has been designed to allow the up to 4,250 Nm^3/hour of air to be injected into the aeration vessel through the diffusers. This would enable to plant to be used as an MBR process without any further upgrading of the aeration vessel or diffusers.

A dissolved oxygen probe would be used to monitor the level of dissolved oxygen in the aeration vessel and control the operation of the blowers. A solids meter would also be provided to monitor the MLSS in the aeration vessel.

Final Clarifier

A new final settling clarifier would be provided. This would receive mixed liquor by gravity from the aeration vessel.

The clarifier vessel would be of GLS construction, with a sloped base feeding a central hopper. The clarifier would be provided with a half bridge scraper to direct settled solids to the outlet point. The clarifier would be fitted with scum boards and a scum removal system. A sludge transfer tank would be provided to receive the settled sludge and floating scum. Centrifugal type pumps would be used to draw the sludge from this vessel and deliver it either to the anoxic tank or to the balance tank when sludge has to be wasted. An automatic valve on a timer would be used to control the rate of sludge wasting.

Treated effluent would be drawn from a peripheral launder trough and flow by gravity to the discharge point. This trough would be fitted with scum boards to prevent any floating solids pass with the treated effluent.

Final Effluent Monitoring

All treated effluent which is not recovered for use in the factory would pass from an overflow connection in the collection vessel. It would flow by gravity to the discharge point via an MCERTS in-line magnetic type flowmeter. An in-line pH meter, thermometer and turbidity probe would be provided to give continuous verification of discharge quality. A flow proportional automatic sampler would also be provided to obtain a representative sample of effluent discharged from the site.

Polish Filtration

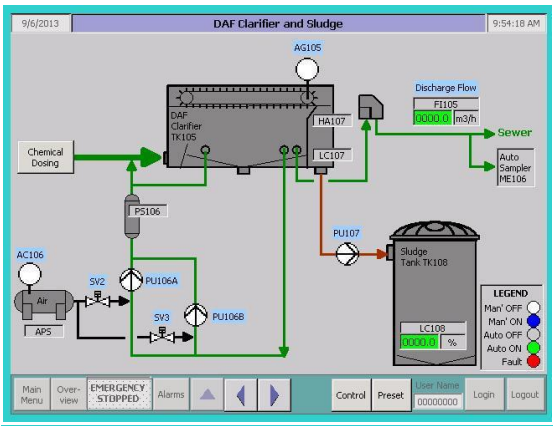
Treated effluent from the final clarifier would flow by gravity into a disc filter. This filter would be fitted with 10 micron mesh to remove any residual solids. Filtrate would then flow into one of the existing chambers which would be used for recovered water storage.

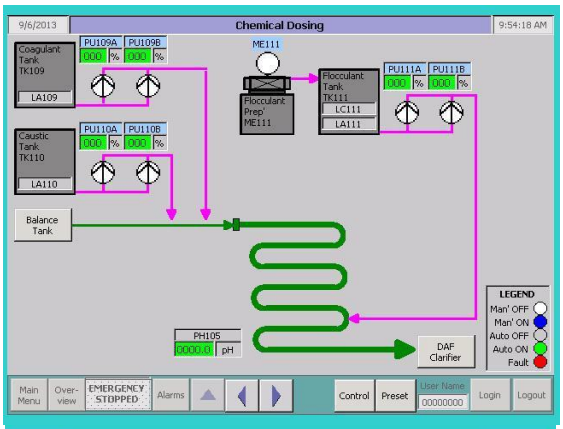
The filter would retain a body of filtered water which would be used for automatic washing purposes. The backwash system would automatically flush captured solids from the filter mesh with the backwash water being returned to the head of the works.

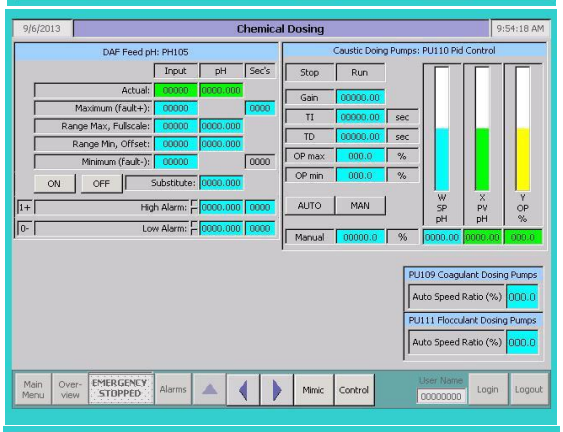
Duty / standby pumps would be used to return the recovered water to the factory. As the water is pumped from the recovered water vessel a sodium hypochlorite dosing unit would automatically dose solution to sterilise the water as it is returned to the factory.

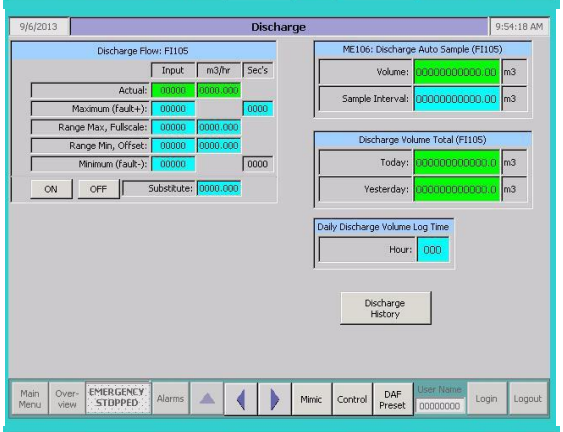
Control

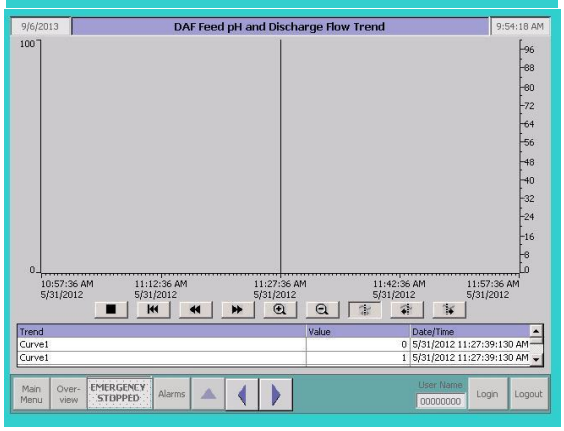
The control of the plant would be from a central plc control panel housed in the DAF building. Operation would be from a touch screen colour HMI. This would be configured to display all alarm function, trends of all key parameters with 40 days data storage. An Ethernet port would be available for connection to a factory SCADA system for remote monitoring of the plant.

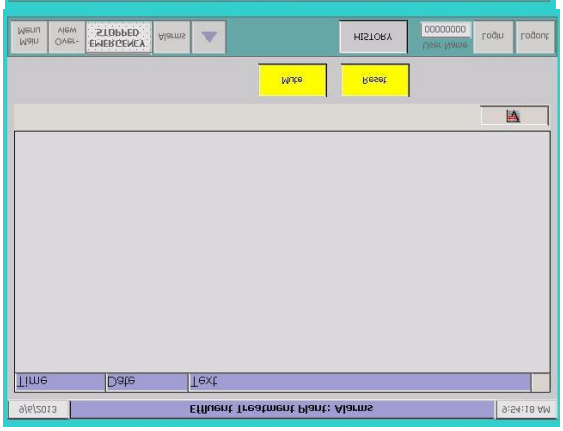












Strategy for Future Expansion

It is foreseeable that the capacity of the factory will increase to 2.0 m birds per week. Therefore we have given serious considerable to how the effluent treatment plant may be upgraded to meet the additional demands.

Effluent Reception

At this stage we have included a new screening station that will meet the predicted future flowrate. The three raw effluent transfer pumps would meet the envisaged increase raw effluent flowrate.

The existing balance tank is of a suitable capacity for the future requirements, therefore no changes would be required for the increased factory capacity.

DAF Clarification

We have included a DAF clarification system which would be capable of treating 130 m^3/hour. This will have the turndown capacity to operate efficiently at 65 m^3/hour before the increased production occurs.

Biological Treatment

The DAF clarified effluent sump would be designed for the future capacity. A decision would have to be made on the performance target for the expanded plant. However the plants offered in phase one allows for all possibilities to be implemented.

If there is no change to the discharge consent limits and NRW allows for the increased volume of effluent to be discharged into the river, it would be appropriate to provide a second activated sludge system. In that case a second aeration vessel would be provided on the site of the existing divert tank and a second new clarifier would be installed. Alternative divert facilities would then be provided.

Should NRW restrict the maximum consented discharge volume or tighten the quality limits, it would be necessary to upgrade the plant to an MBR system. In which case, the aeration system would only the installation of a third blower, with a new vessel provided to accommodate the filtration membranes. The quality of MBR effluent would be suitable for direct feed onto a reverse osmosis plant,

6. DRAWINGS

Proposed Layout	:	SBP -005 Rev E (sheet 1&2)
Process flow Diagram	:	SBP-003 Rev D (sheet 1- 4)

7. CAP SCOPE OF SUPPLY

The following design and technical services have been included:-

7.1 Design and Technology Package

a) Plant Design

This would include the detailed design of the scheme. We would confirm the engineering specification of all plant and equipment associated with the project.

b) Flowsheets

Engineering flowsheets for the new scheme would be prepared. These would include piping, instrumentation and electrical diagrams.

c) Layout

CAP personnel would agree an appropriate layout for the plant. This would be discussed with Salisbury prior to presenting finalised drawings necessary for the detailed civil design.

d) Operators' Manual

A new operators' manual would be prepared for the plant. This would include detailed operating instruction and contain specific fault finding charts.

e) Manufacturers' Details Manual

A manual would be issued giving full details of all the existing and new equipment. This would include:

- detailed planned maintenance schedule
- maintenance instructions
- full spares list

Note : Documentation

2 copies of all information would be provided, together with a disc copy where appropriate.

Autocad would be used for all drawings. Microsoft Word would be used for text.

As built drawings would be provided on completion of the project.

7.2 Technical Services

a) Project Management

CAP personnel would project manage and supervise all aspects of the project. The CAP appointed Site Engineer would be present on site throughout the project, liaising with the client's representative on a planned basis. Formal progress reports would be issued on a monthly basis.

b) CDM Regulations

This project would come under the CDM (2015) Regulations. CAP Technology would act as the principal contractor, and provide all information for the Health & Safety file.

c) Equipment Procurement

CAP personnel would co-ordinate the procurement and delivery of all goods associated with the project.

d) Commissioning

CAP personnel would mechanically and electrically commission all items of plant and equipment within their scope of supply.

e) Process Optimisation

CAP would undertake the process commissioning and start-up of the plant.

f) Training

CAP Technology would provide training for both operating and supervisory personnel in the operation and optimisation of the plant.

7.3 Equipment Scope of Supply

CAP Technology would supply and install all of the following items of equipment that would be associated with the project:

M & E Works

Effluent Reception

Item 1 Raw Effluent Transfer Pumps

2 off Ground mounted self-priming centrifugal pumps each capable of delivering 50 l/sec @ 15 m head.

Item 2 Level Control

1 off An ultra-sonic level sensor would be provided to measure the effluent level within the raw effluent sump and control the operation of the raw effluent transfer pumps.

Item 3 Local Control Panel

1 off Local panel to control the operation of the raw effluent transfer pumps. These pumps would operate on a duty / duty assist / standby basis. The panel will communicate with the mains plc control panel to show the operating condition of the pumps, sump level and alarms.

Raw Effluent Screening

Item 4 Rotary Drum Screen

1 off Rotary drum screen designed to receive peak flows of 180 m^3/hour of raw effluent. The screen would be of 304 stainless steel construction, fitted with a screen drum of 1.0 mm wedge wire construction.

The screen would be provided by GAP technology.

Raw Effluent Balancing

Item5 Balance Tank Refurbishment

CAP Technology would undertake the refurbishment of the balance tank. This would include:

- Preparing and applying a SikaGuard coating to the floor of the vessel
- Preparing the walls of the vessel and undertaking up to 10 repairs to localised areas of corrosion
- Applying a "CorroGuard coating all areas exhibiting significant signs of corrosion
- Supply and fit 45 sacrificial anodes to the vessel wall.

Item 6 Balance Tank Level Sensor

1 off Hydrostatic level sensor would be provided to monitor the level within the balance tank.

Item 7 Venturi Aerators

2 off Externally mounted venturi type aerators to mix the contents of the balance tank. They would ensure that a minimum of 50 kg/hour of oxygen is injected into each tank when operating at maximum depth.

Divert Facilities

Item 8 Divert Tank Refurbishment

CAP Technology would undertake the refurbishment of the balance tank. This would include:

- Preparing and applying a SikaGuard coating to the floor of the vessel
- Supply and fit a patch to the damaged section of tank
- Preparing the walls of the vessel and undertaking up to 10 repairs to localised areas of corrosion
- Applying a "CorroGuard coating all areas exhibiting significant signs of corrosion
- Supply and fit 45 sacrificial anodes to the vessel wall.

Item 9 Divert Tank Level Sensor

1 off Hydrostatic level sensor would be provided to monitor the level within the balance tank.

Item 10 Venturi Aerator

1 off Externally mounted venturi type aerators to mix the contents of the balance tank. They would ensure that a minimum of 50 kg/hour of oxygen is injected into each tank when operating at maximum depth.

DAF Clarification

Item 11 DAF Feed Pumps

2 off Pumps of centrifugal type to deliver raw effluent to the DAF plant. They would be capable of a maximum flow of 130 m^3/hour.

Item 12 DAF Feed Flowmeter

1 off In-line magnetic flowmeter to measure & totalise the flow of balanced effluent being delivered to the DAF plant

Item 13 Flow Control Valve

1 off Flow control valve with electric actuator to control the flow of effluent to the DAF clarification system.

Item 14 Serpentine Flocculator

1 off Serpentine flocculator complete with caustic, ferric chloride injection point, pH probe socket and flocculant injection point.

Item 15 pH Meter

1 off In-line retractable type pH probe and meter to monitor the pH of the coagulated effluent

Item 16 Sodium Hydroxide Dosing Pumps

2 off Variable speed / stroke diaphragm type pumps to dose 25% sodium hydroxide as required to control the pH of effluent.

The pumps would be installed within a kiosk of polypropylene construction.

Item 17 Sodium Hydroxide Storage Tank

1 off Bunded chemical storage tank with a capacity of 25 m^3 complete with all tanker off-loading pipework and discharge pipework.

The vessel would be provided with a rain skirt.

Item 18 Sodium Hydroxide Tank Level Sensor

1 off An ultra-sonic level sensor with local display and alarm would be provided to monitor the level.

Item 19 Ferric Chloride Dosing Pumps

2 off Variable speed / stroke diaphragm type pumps to dose ferric chloride as required.

The pumps would be installed within a kiosk of polypropylene construction.

Item 20 Ferric Chloride Storage Tank

1 off Bunded chemical storage tank with a capacity of 25 m^3 complete with all tanker off-loading pipework and discharge pipework.

The vessel would be provided with a rain skirt.

Item 21 Ferric Chloride Tank Level Sensor

1 off An ultra-sonic level sensor with local display and alarm would be provided to monitor the level.

Item 22 Flocculant Preparation Unit

1 off Fully automatic flocculant preparation unit and associated equipment would be installed to prepare a flocculant solution from an emulsion grade of product.

Item 23 Flocculant Dosing Pumps

2 off Variable speed positive displacement rotary screw type pumps to dose flocculant solution as required.

Item 24 Safety Shower

1 off A safety showers would be provided in the vicinity of the new chemical storage facilities.

Item 25 DAF Clarifier

1 off DAF clarification system suitable to process effluent at a rate of 130 m^3/hour. The clarifier would be a rectangular vessel of 304 stainless steel construction, complete with sludge scraper & sludge compartment. The overall dimension of the unit would be 11.0 m long by 3.2 m wide, with a working depth of 1.8 m.

Item 26 DAF Clarifier Cover

1 off The DAF clarifier would be provided with a cover of stainless steel sheet construction supported on a 304 stainless steel frame. The cover would be provided with removable inspection hatches and vent connections.

Item 27 Carbon Filter

1 off Ground mounted passive carbon filter to minimise to escape of odorous gases from the surface of the DAF clarifier.

Item 28 Aeration Pumps

2 off Aeration pumps of centrifugal type.

Item 29 Air Saturation Vessel

1 off Air saturation vessel of 304 stainless steel construction.

Item 30 Air Flowmeters

2 sets Air flowmeters and fittings for the aeration system.

Item 31 Air Compressor

2 off Hydrovane silent flow air compressors complete with 50 litre air receiver.

Item 32 DAF Staging

1 set Staging of galvanised steel construction to provide access to the clarifier weirbox.

Item 33 DAF Sludge Transfer Pumps

1 off Pumps of positive displacement rotary screw type to deliver DAF sludge to the sludge storage tank.

Item 34 Level Control

1 set Conductance type level probes to control the operation of the above pumps and provide a high level alarm.

Item 35 Sludge Storage Tank

1 off A vessel of GLS construction with a capacity of 200 m^3.

Item 36 Sludge Tank Agitator

1 off Externally mounted Landia mixer to efficiently mix the contents of the sludge tank.

Item 37 Carbon Filter

1 off Ground mounted passive carbon filter to minimise to escape of odorous gases from the surface of the sludge tank.

Item 38 Sludge Tank Level Sensor

1 off A hydrostatic type level sensor to monitor the level in the sludge tank.

Item 39 Tanker Exhaust Filter

1 off Trolley mounted passive carbon filter which would be connected to the tanker exhaust flange during sludge loading operations.

Item 40 Clarified Effluent Transfer Pumps

2 off Pumps of variable speed centrifugal type to deliver DAF clarified effluent to the anoxic tank. Each pump would be capable of delivering up to 40 - 80 m^3/hour.

Item 41 Variable Speed Drives

2 off Variable speed drives to control the operation of the above pumps.

Item 42 Level Sensor

1 off A hydrostatic type level sensor to monitor the level in the above tank

Activated Sludge Plant

Item 43 Nutrient Dosing Pumps

2 off Variable speed / stroke diaphragm type pumps to dose nutrient as required.

The pumps would be installed within a kiosk of polypropylene construction.

Item 44 Anoxic Tank

1 off An anoxic tank with a working capacity of 250 m^3 would be provided to condition the mixed liquor. This would be a vessel of glass lined steel panel construction, 6.8 m diameter with a height of 7.0 m. It would be constructed on a concrete base.

Cathodic protection for this vessel would be provided.

Item 45 Anoxic Tank Agitator

1 off Externally mounted Landia mixer to efficiently mix the contents of the anoxic tank.

Item 46 Aeration Vessel

1 off Aeration vessel with a working capacity of 1,500 m^3, 17.9 m diameter with a height of 7.0 m. It would be of glass lined steel panel construction constructed on a concrete base.

Cathodic protection to this vessel would be provided.

Item 47 Staging

An inspection platform would be provided adjacent to the aeration tank with access being provided by a galvanised steel ladder.

Item 48 Air Diffusers

1 off An aeration system would be provided such that the aeration tank may be used as an MBR system for the envisaged future loads. The aeration system would be designed to transfer the oxygen required to fully degrade the maximum organic load of 3,000 kg COD per day and 600 kg NH_4^+ per day. Under these conditions 4,250 Nm^3/hour would be delivered through the aeration system.

A fine bubble aeration manifold installed on the base of the aeration tank. The diffusers would be supplied by Suprafilt. They would be of EPDM rubber construction with a PTFE coating mounted on stainless steel tubes.

The air manifold would be of 304 stainless steel dairy tube construction terminating in headers at the top of the vessel. Air pipework for the blowers to the header manifold would be of thick wall carbon steel construction to minimise noise.

Item 49 Blowers

2 off Variable speed Aerzen Hybrid type blowers installed on a duty / standby basis would be provided. They would be housed within individual acoustic enclosures suitable for outside installation. Each blower would be capable of delivering up to 2,200 Nm^3/hour against 750 mBar.

These blowers would consume 44 kW when processing 1.0 m birds per week.

Item 50 Variable Speed Drives

2 off Variable speed drives to control the operation of the above blowers.

Item 51 Dissolved Oxygen Meters

1 off Dip type dissolved oxygen probes to monitor the level of dissolved oxygen in the mixed liquor.

The DO meter would be supplied by Hach Lange.

Item 52 Clarification Vessel

1 off Clarification vessel of GLS construction with a diameter of 12.9 m and wall height of 2.8 m. It would be provided with an inlet distribution drum, peripheral launder trough with scum boards and half bridge scraper.

It would have a sloped base feeding a central sludge boot.

Item 53 Sludge Transfer Tank

1 off Vessel of polypropylene construction with a working volume of 1.5 m^3 which would receive sludge & scum from the settling clarifier.

It would be provided with a hydrostatic level sensor to monitor the contents of the vessel.

Item 54 Sludge Transfer Tank Level Sensor

1 off Hydrostatic level sensor would be provided to monitor the level within the transfer tank and control the operation of the sludge transfer pumps.

Item 55 Sludge Pumps

2 off Pumps of centrifugal type to draw settled sludge from the base of the clarifier and deliver it to either the anoxic tank or the sludge storage facilities.

Item 56 RAS Flowmeter

1 off In-line magnetic type flowmeter to monitor the rate of sludge return

Item 57 RAS Flow Control Valve

1 off Pneumatically operated automatic valve to regulate the flow of RAS.

Item 58 Sludge Return Valves & Scum Valve

2 off Pneumatically operated automatic valves to direct settled sludge/scum for return or wastage.

Item 59 Final Effluent Flowmeter

1 off Flowmeter of in-line magnetic type to monitor the flow of effluent to river.

Item 60 Final Effluent Sampler

1 off Flow proportional composite sampler with single to provide a 24 hour composite sampler of effluent having been discharged to river. An option has been included to provide a refrigerated sample compartment.

Item 61 Final Effluent pH Meter

1 off In-line pH meter to constantly record the pH of effluent being discharged from the site.

Item 62 Final Effluent Turbidity Meter

1 off In-line turbidity meter to constantly record the turbidity of effluent being discharged from the site.

General

Item 63 Control System

1 off Control panel to house all motor starters and control equipment necessary for the automatic operation of the plant. The panel would be to IP54 rating, using Siemens plc controller. The control panel would be constructed in a wardrobe type panel of powder coated steel construction.

The plant would be operated from a PC located in the existing control room / lab.

Facilities would be provided for the trending of all operational parameters. Volt free contacts or an RS232 port would be available for remote alarming or connection to the factory's SCADA system.

The plc / hmi would include sufficient I/O capacity to allow the system to be re-programmed to meet the requirements of the 2.0 m birds per week plant.

Item 64 Pipework & Valves

All manual valves and pipework within the boundary limits of the project have been included. In general, either 304 stainless steel tube, ABS or UPVC pipework appropriately supported on galvanised steel brackets would be used.

In general, the large bore effluent pipelines would not be lagged or trace heated. We have included for lagging and trace heating all small bore or intermittently used sections of pipe that are considered at risk of freezing.

Furthermore, a risk assessment would be undertaken and any sections of pipework that are deemed to be at risk of freezing would be lagged and trace heated as deemed appropriate.

Item 65 Mechanical Installation

All aspects of the delivery and mechanical installation of the project have been included.

Item 66 Electrical Installation

All aspects of the electrical installation of the plant have been included in the CAP scope of supply.

It would be implemented in accordance with the latest edition of the IEE regulations.

Item 67 Site Lighting

Low energy LED site lighting would be provided for operator access to all working areas of the effluent plant. This would include PIR detectors where appropriate.

Item 68 Control Room

1 off Kiosk to house the control system and flocculant preparation system, The kiosk would be of GRP construction divided into two rooms. All appropriate heating, lighting and ventilation facilities are included.

Item 69 Underground Piping & Ducts

CAP Technology would supply and install all underground pipework and ducts associated with the project within the ETP boundary area. The pipework would be of fusion welded MDPE construction.

CAP Technology would lay the piperuns in trenches prepared by the civil contractor. Each pipeline would be pressure tested before it is backfilled.

Water Recovery

Item 70 Disc Filters

1 off Disc filter capable of filtering over 20 l/sec of treated effluent containing up to 40 mg/l suspended solids. The unit would be provided with 10 micron mesh, receiving final effluent by gravity from the settling clarifier. Filtered water would flow by gravity into one on the existing redundant chambers.

Backwash water would be drawn from a reservoir within the filter body. The automatic backwash system will keep the screening surface clean at all times.

The body of the filter would be of 304 stainless steel construction.

Item 71 Backwash Pump

2 off Backwash pump of centrifugal stainless steel construction with a capacity of $30m^3/hr$ @ 1.5 Bar

Item 72 Recovered Water Pumps

2 off Recovered water pumps of submersible centrifugal stainless steel construction to return recovered water to the factory. These pumps would be rated for a capacity of $70m^3/hr$ @ 3 Bar

Item 73 Hypo Chlorite Dosing System

One of self-contained hypochlorite dosing system complete with microprocessor control system.

Bunded stock tanks would be provided for the reagents.

A probe would be provided to measure and record the residual chlorine concentration. Dosing of sodium hypochlorite could be on the residual concentration of chlorine in the recovered water.

Item 74 Recovered Water Flowmeter

1 off Recovered water flow meter of in-line magnetic flow type to measure and totalise the volume of recovered water.

7.4 Civil Works

The civil works would be conducted by others with the full support of CAP Technology.

General

CAP will provide all layout and loading information to the civil contractor. The civil contractor would undertake the detailed civil design for all aspects of the project using a qualified structural engineer.

CAP Technology would liaise closely with the civil contractor and Salisbury Poultry to agree the best and most cost effective arrangement for the ETP. CAP Technology will manage the interface between the civil and M&E works.

7.5 Service Contract

Introduction

CAP Technology would include a service agreement for the first 12 months operation of the effluent plant which includes a maintenance and technical / process support package for the effluent treatment plant.

This agreement is based on providing technical support and undertaking a formal quarterly site visit to monitor the plant performance & assess equipment maintenance to ensure you achieve the optimum process performance.

The maintenance and process technical support package will ensure that the supplied equipment is maintained to a high standard and offers emergency assistance to ensure accurate and optimum treatment of your effluent is achieved at all times.

We will also provide on-going assistance and technical support throughout the contract period with an aim to provide managers with peace of mind and trouble free performance.

CAP Technology Scope of Supply

CAP Technology would manage the servicing of the plant and equipment associated with the new ETP and provide technical & process support to as follows:-

- ***CAP Technology*** would provide a routine maintenance schedule for ***Salisbury Poultry*** maintenance staff to undertake on a routine basis.

- ***CAP Technology*** would provide technical & process support for the operation and trouble shooting of the ETP. This would be from Monday to Friday & between the hours of 9am to 5pm.

- ***CAP Technology*** would provide an emergency call-out service for out of work hours at the following additional rates:-

  - Telephone Assistance = Free Of Charge

  - Site Visit :-

Day Rate	=	£500 per day
Weekend Rate	=	£750 per day
Overtime rate	=	£60 per hour
Travelling rate	=	£40 per hour
Mileage rate	=	FOC

- ***CAP Technology*** would carry out formal quarterly site visits undertaking the following:-
  - Generally inspect the operation of the plant
  - Review the process performance of the plant
  - Review the maintenance of the plant & equipment
  - Review & calibrate instrumentation as required and provide appropriate test certificates
  - Provide a quarterly process & service report

- ***CAP Technology*** would undertake to procure any spare components or process chemicals for the operation of the plant at the rate of cost + 15%.

8. EXCLUSIONS

The following aspects of the project are excluded from the CAP scope of supply:-

Civils

All aspects of the civil works would be excluded from the CAP scope of supply. This would include the site investigation, detailed civil design, preliminaries and site supervision during the course of the civil installation.

In summary and subject to change following agreement of the final layout, the civil works should include:

1. Raw Effluent Screening Station

The screen and associated equipment would be installed on a concrete slab. This slab would have a fall to an Aco drain to collect any spillages and surface water. This drain should be connected by gravity to the raw effluent sump.

2. Balance & Divert Tank Aerator Plinths

Two plinths, each 2 m by 1.5 m would be constructed adjacent to each of the existing balance tank bases on which the venturi aerators would be installed.

3. DAF Clarification Plant, Chemical & Sludge Tank Area

A level slab should be provided with overall dimensions of approximately 25 m by 16 m.

This area would accommodate the 200 m^3 sludge tank and bulk chemical storage tanks. The area would be surrounded with a perimeter wall of 200 mm height.

This area would also house the DAF clarifier and all associated equipment, the clarified effluent transfer tank & pumps and a kiosk for the flocculant preparation system, nutrient dosing system & control room.

This area would have a fall to an Aco drain, with the drain pipeline being directed to the DAF clarified effluent sump.

4. DAF Clarified Effluent Sump

A sump would be provided to receive DAF clarified effluent and site drains. This sump would have a diameter of 1.8 m and overall depth of 2.5 m.

5. Anoxic and Aeration

These vessels would be of glass lined steel panel construction installed on level concrete bases. The bases would be constructed in accordance with Permastore's typical flat base tank design. The overall dimensions of the vessels would be:

Anoxic vessel - 5.1 m diameter, total load150 tonnes

Aeration vessel - 17.9 m diameter, total load 1,600 tonnes

6. Final Clarifier

This vessel would be of glass lined steel panel construction installed on a concrete base with a conical bottom. The perimeter of the base would be constructed in accordance with Permastore's typical flat base tank details. The overall dimensions of the vessels would be:

Final Clarifier - 12.9 m diameter, total load400 tonnes

7. Blower Plinth, RAS Pump Plinth & Bio Plant Staging

A concrete infill area, nominally 6 m by 8 m which will contain plinths for the air blowers, RAS pumps and associated equipment and footing for bio plant staging would be provided.

The area between the above vessels should be concreted with central Acco drain returning to the DAF clarified effluent sump

8. Underground Pipes and Services

A number of underground pipes and ducts will be required in the area of the works. CAP Technology will supply, lay & test pipelines in trenches prepared by the civil contractor. On completion of testing the civil contractor will backfill the trenches.

9. Roadway & Site Access

Provision of 50 m long concrete access road to the effluent plant as per the layout drawing has been included. This should be appropriate for tanker deliveries and fork lift trucks access.

Raw Effluent It is assumed that all trade effluent would be delivered to the ETP through new or existing pipelines to an inlet chamber.

No allowance has been made for the replacement of the existing transfer pipeline between the inlet sump and the ETP.

Final Effluent It is assumed that final effluent would be discharged into a gravity pipeline within the boundary of the new ETP which will discharge to the river. Any modifications to this arrangement would be undertaken under a variation order.

Domestic Under this proposal, no provision has been made for the treatment of domestic effluent generated on the site.

Chemicals The supply of all chemicals required for the commissioning, performance testing and operation of the plant are the responsibility of the client.

Services Others would be responsible for providing the following isolated services to agreed terminal points on the plant. These include:

- 415V three phase power supplies to a distribution board located in the effluent plant MCC building.

- Cold water supply to agreed terminal points within the area of the effluent treatment plant.

Spares No spares have been included in the price quoted. The full spares schedule would be agreed when the final plant design established.

Permits No provision has been included to apply for any variations to the EA Permit to discharge or IPPC permit

Demolition No allowance has been made for the de-commissioning or demolition of the existing works.

General Any item not specifically detailed in the CAP scope of supply given above.

9. CAPITAL COST

9.1 M & E Works

The total capital cost for the M & E works associated with the design, supply, installation and commissioning of the proposed effluent treatment plant would be:

£xxxxx + VAT

10. COMMERCIAL TERMS AND CONDITIONS

10.1 Terms of Payment

The sum detailed in Section 9 above would be due in the following instalments:

10% due upon placement of order
15% due upon presentation of design package
65% due in monthly stage payments set against valuations for equipment delivered to site & installation work completed
5% upon hand over
5% upon completion of performance tests

10.2 Method of Payment

All payments are to be made by 30 day nett account.

10.3 Delivery Programme

Installation and commissioning of the treatment plant as detailed in this proposal would be 8 - 10 months from receipt of signed contract

10.4 Validity

This proposal is for valid for acceptance for 60 days from its date of issue.

10.5 Terms and Conditions

To be agreed.

For CAP TECHNOLOGY

John G Hampson
Director