

PROJECT BRIEF

Caribbean Broilers Protein Recovery/Conversion Plant at Longville Park

Prepared for:

Caribbean Broilers Jamaica Limited
27 Upper Waterloo Road
Kingston 10

Prepared by:

Environmental Solutions Ltd.
20 West Kings House Road
Kingston 10

Submitted to:

Applications Secretariat Branch
National Environment and Planning Agency
10 Caledonia Avenue
Kingston 5

Submitted: April, 2011

Amended: August 2011

TABLE OF CONTENTS

1.0 Introduction 2

2.0 Recovered Proteins 5

3.0 Project Description..... 7

 3.1 Location and Zoning..... 7

 3.2 Activities from the Processing Plant to the Protein Recovery Plant to the Feed Mill 8

 3.2.1 The Processing Factory – Arnold Road..... 8

 3.2.2 Transportation of Raw Material to Protein Recovery Facility 9

 3.2.3 The Protein Recovery Facility..... 10

 3.2.4 The Final Product 19

4.0 Project Benefits..... 20

1.0 INTRODUCTION

Project Scope and Overview

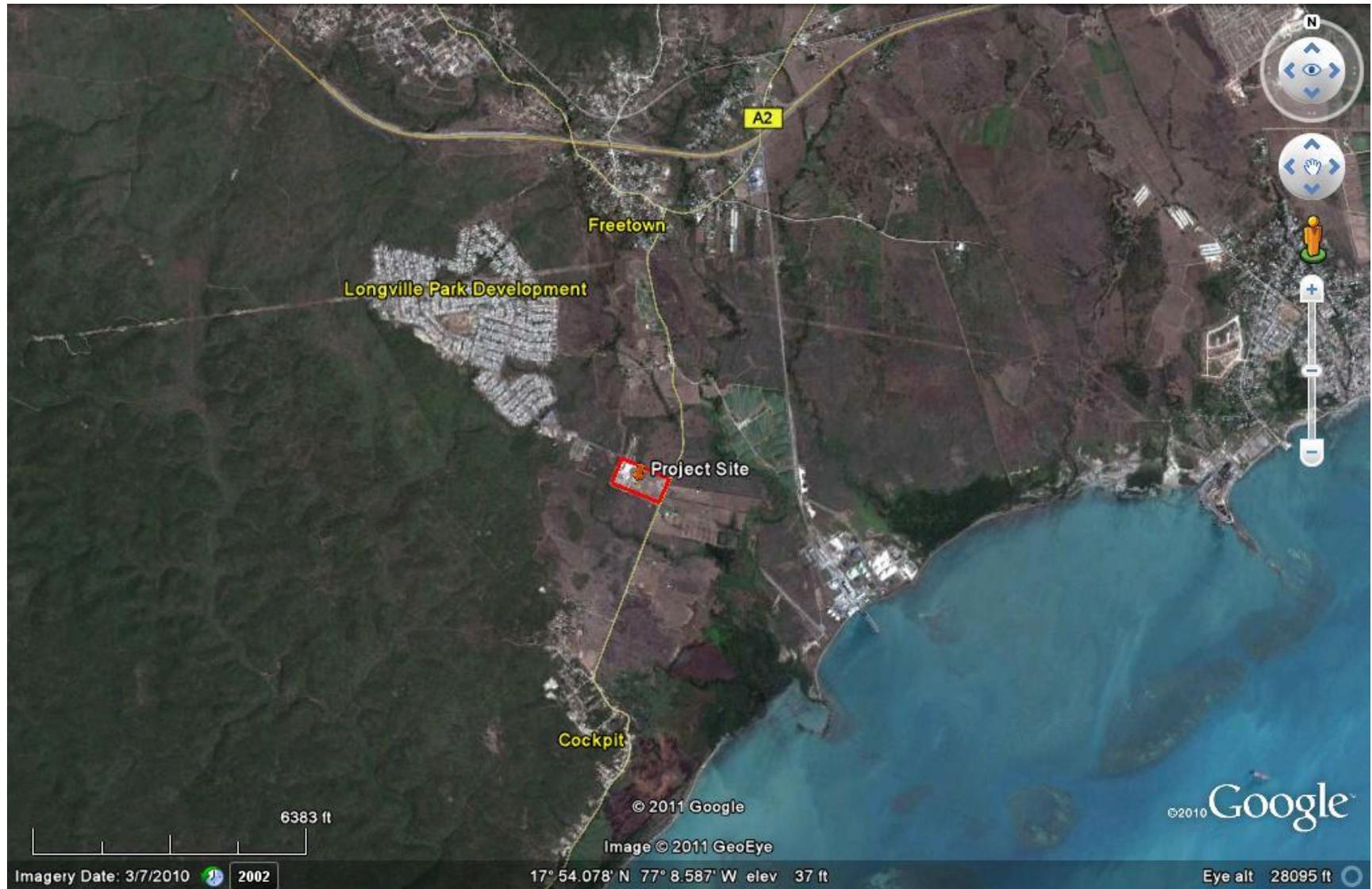
The Caribbean Broilers Group, a major producer of poultry products in Jamaica proposes to establish a protein recovery facility at Longville Park, Clarendon. The company has largely depended on imported corn and soy products as a primary source of feed for its poultry stock while it disposes of the unmarketable and inedible tissue (feathers, blood and offal) from the slaughtered animals in landfills. Hence the need to recover protein from these waste tissues is both financial and environmental in that the company will be able to lower its dependence on expensive imported feedstock and eliminate the need to dispose of the waste parts, a practice that poses an environmental risk as well as a public health risk.

The main objective of the project is to provide a sustainable source of raw materials that will substitute currently imported raw materials currently being used in Caribbean Broilers' feed mill. The production of such raw materials is envisioned to be environmentally friendly and would serve as an effective means of utilizing protein tissue of poultry (i.e. blood, feathers and offal) currently generated by the company's poultry processing plant that would normally be disposed in a landfill. The final products of the proposed facility are feather blood meal, poultry meal and poultry fat. The feather blood meal and poultry meal which are protein rich, highly sterile meals produced from hydrolysis, drying and grinding chicken feathers and blood and offals in natural proportions. This final products will be transported to the company's Feedmill at Newport Mills in Kingston for production of poultry feedstock that is initially for the use in Caribbean Broilers' contracted farms only.

While the company recognizes that the edibility of the meat products fed by the proposed poultry based feedstock is determined by a number of criteria including consumer acceptance, regulatory requirements, economics, hygiene, tradition, and ethnic background, they are also cognizant of the fact that the products produced from the recovered poultry material make important economic, environmental, human, and animal health contributions to their allied industries and society. The proposed protein recovery facility, as a means of animal raw material handling and processing, proposes a safe and integrated system that complies with the fundamental requirements of environmental quality and disease control.

In addition to the use of good manufacturing practices and application of the company's quality system, CB Group is now in the process of implementing the hazard analysis and critical control point (HACCP) as well as ISO 9001:2008 certifications. Caribbean Broilers feed mill has already been certified and the processing plant at Arnold Road has passed stage one and is due for stage 2 in July 2011. Therefore both the plant and the feed mill will be certified before the Protein Recovery/Conversion Plant is operational.

The Facility Location



Caribbean Broilers Property at Longville Park



2.0 RECOVERED PROTEINS

The advent of bovine spongiform encephalopathy or BSE (mad cow disease) raised international concern about the safety of feeding rendered cattle to cattle. Since the discovery of BSE in the United States, the federal government has taken some action to restrict the parts of cattle that can be fed back to cattle.

However, most animals are still allowed to eat meat from their own species. Pig carcasses can be rendered and fed back to pigs, chicken carcasses can be rendered and fed back to chickens, and turkey carcasses can be rendered and fed back to turkeys. In the United States some 37% of broiler protein is derived from rendered by-products. The country views the rendering process as an effective method for insuring biosecurity and as such its infrastructure, products, and the rendering industry are regulated by state and federal agencies.

The case of the United States is used here due to the fact that Jamaica currently imports a wide range of poultry products such as those made by Tyson Foods Inc, Oscar Meyer and Butterball to name a few, and also it is the largest exporter of poultry products internationally. It is the practice at the integrated companies in the US to develop the inedible material into feedstock for the animals rather than use corn or soy products. There is a direct correlation of the location of rendering facilities with broiler facilities across the US and particularly so in the south east where the bulk of our imported chicken and turkey products originate.



Rendered fats are generally lower in cost than vegetable oils such as soybean oil, which is used substantially in many countries. This allows for higher inclusion rates of fat and thus higher energy diets. These higher energy diets provide faster growth and improved feed conversion, providing a competitive advantage to the U.S. poultry industry. Rendered protein sources are also a boom to the poultry industry. A variety of high quality products are available including meat and bone meal (MBM), poultry by-product meal (PBM), and feather meal (FeM). Each of these is an excellent source of specific nutrients and generally provides a cost-effective source of protein. MBM provides an excellent source of amino acids and phosphorus which have recorded high digestibility (Denton *et al.*, 2005). PBM provides even higher levels of protein and energy and provides an excellent source of phosphorus. FeM is very high in sulfur amino acids. Combined, these products can be used to provide a substantial cost savings to the poultry industry and use of the products is quite high by the industry. Use of these products is estimated to save the industry as much as \$10 for each ton of feed produced in the United States. Strong utilization of these products by the poultry industry is the norm and is expected to continue into the future. All of this has led to reduced cost and maximum bird performance for the U.S. poultry industry. The attached papers provide more in-depth discussions on the benefits of recovered proteins.

Review of Relevant International Legislation

Since national legislation such as the Fertilizers and Feeding Stuffs Act do not provide specific guidance and regulation of species to species feedstock, some international legislation have been summarized for the purpose of this project brief. The Canadian Feeds Regulations 1983 discusses rendered feedstock under Section 5.1.11 (under Class 5). Both the Canadian Feed Inspection Agency and the US Food and Drug Administration Agency allow for the use of rendered feedstock from poultry and currently do not place a ban the use of this feedstock for feeding to poultry. The mentioned legislation is attached for further review.

3.0 PROJECT DESCRIPTION

Due to environmental and planning considerations influencing the design there was no need to have effluent discharges of any kind from the facility.

Internal pressures in the building will be negative and the vast amount of odor will be consumed by a thermal oxidizer heating the air to 850 °C. The Proposed Building will be 150' x 60' placed on the south eastern corner of approximately 50 acres of land owned by the CB Group.

Sewage will be contained and pumped to the Longville Park sewage treatment plant. Regular garbage will be contained in skips and removed by garbage contractors to approved garbage disposal sites.

Access to the site will be via an entrance off the Salt River Road. Drainage of site will be to the existing storm drain along the Salt River Road.

The developers have estimated to have a fully operating rendering facility by October, 2011. Estimated cost of project is expected in the order of J\$233,000,000.00.

3.1 Location and Zoning

The proposed project will include development of a facility for the production of poultry and feather meal. The site is located adjacent to farm lands on the northern, eastern and southern sides, and to the west a National Water Commission (NWC) Sewage plant, Longville Park Sewage Treatment Plant. The Longville Housing scheme is located within a 1 km sphere north west of the proposed site.

The site has no unique/special characteristics and is somewhat remote and surrounded predominantly by farm lands. The site is zoned as presently urbanized under the Esquivel Land use zones (12, 486 ha) of the Portmore to Clarendon Park Highway 2000 Corridor Development Plan 2004-2005 (as attached). The

adjacent area north of the proposed site is zoned for further urbanization and for development of light and heavy industry towards the south east.

3.2 Activities from the Processing Plant to the Protein Recovery Plant to the Feed Mill

The following section presents a description of all the activities that will be undertaken from the processing plant at Arnold Road (Kingston), to the protein recovery facility (Clarendon) and back to the Feed mill at Newport West (Kingston)

3.2.1 The Processing Factory – Arnold Road

At the present processing facility located at Arnold Road, Kingston, the feathers and offal drainage systems converge at a point in the processing factory where both feathers and offal mix together and then pass through a rotary screen. They are then augured into a holding vessel before being discharged into the lorry destined for landfill. However, in order to facilitate complete separation of all the products this will be redesigned as follows:

- A new gantry will be constructed which will support three separate vessels, one for blood which will be positioned at the front end of where the trailer will be positioned, one for feathers at the middle and one for offal at the rear. The gantry and vessel will be supported on steel legs at a height to allow the collection trailer to be positioned below so as to discharge into the trailer by gravity
- A new trough for the birds to bleed into will be erected in the factory which has been designed to capture all of the blood so as it can be pumped to the blood vessel on the gantry.
- The heads will fall directly into a blow vessel and will be blown to the offal vessel on the gantry.
- Intestines etc. will also be blown to the offal vessel on the gantry
- There will also be a blow vessel positioned at a central location in the factory where baskets of trimmings etc. can be also blown to the offal vessel on the gantry
- There will always be small amounts of debris falling into the sumps on each of the eviscerating machines. This debris will be transported by the offal floor drainage system (which will no longer converge with the feather drain) to a rotary screen and then conveyed to the offal vessel on the gantry
- Feathers will be removed by the pluckers and fall directly into the feather drain (which will no longer converge with the offal drain) and be transported to a rotary screen. The feathers will then be augured to the feather press for water removal and then fall into the feather vessel on the gantry
- Each of the vessels on the gantry will be designed to hold two hours production volume in case of any delay in positioning the empty trailer
- Each of the vessels will be water tight therefore avoiding dripping

- When the trailer is properly positioned below the gantry pneumatic valves will be opened by the operator and the products can be discharged into the relevant compartments of the trailer

The gantry and holding vessels are designed for trailer loading without spillage over the sides of the trailer, but in the event of any debris contaminating the exterior of the trailer there will be a high level walkway around the gantry allowing the operator to hose down the exterior of the trailer. Any such debris will pass through the current waste water screening process before entering the effluent treatment plant. Full training on trailer standards of cleanliness will be carried out coupled with an inspection procedure of each trailer before dispatch.

Raw Material

The raw material shall consist of:

- Fresh dewatered feathers
- Fresh chicken blood
- Fresh soft offal and meat

3.2.2 Transportation of Raw Material to Protein Recovery Facility

Raw blood is stored in a raw blood buffer storage tank that is positioned on the gantry at the poultry processing plant for the duration of approximately 2 hours prior to being discharge into the raw blood compartment in the bulk trailer for onward transfer to the protein recovery plant.

The raw blood within the processing plants buffer storage tank at this stage is continuously agitated by means of a driven geared motor agitator shaft with paddle arms this allows for complete blending of the material within the raw blood tank thus ensuring that the raw blood is kept in viscous and fresh state thus reducing microbe activity prior to processing.

The buffer tank and the bulk trailer will be shielded from direct sunlight thus eliminating the effects of direct sun light on the area or vehicle.

The blood housed in the bulk trailers' blood compartment will be transported to the protein recovery plant with the utmost urgency i.e. within a one hour period.

The offal buffer storage and blood buffer storage vessels will be retrofitted with an exterior cooling jacket and water discharged from the pre-chiller will be used to counteract the effects of the sun.



Typical Raw Material Trailer

The transportation route from the Processing Plant at Arnold Road to the Protein Recovery/Conversion Plat at Longville Park is as follows:

- Arnold Road unto Marcus Garvey Drive, unto Portmore toll booth which will take it unto the highway and then to Longville via the Vineyards toll booth.
- Alternative route would be Marcus Garvey Drive unto Spanish Town Road and the Highway through to Longville depending on traffic conditions.

3.2.3 The Protein Recovery Facility

RAW MATERIAL DELIVERY

At the processing facility the material will continuously be loaded as it is produced into a trailer (see attached Rendering Trailer brochure) with separate compartments for each separate material type. The trailer will hold approximately four hours slaughter time material. At the end of this period the trailer will be replaced with an empty one, and the full trailer will be covered and promptly dispatched to the proposed protein recovery plant before any decomposition of the material commences.

Upon arrival at the protein recovery plant the trailer will be inspected for quality before acceptance. The trailer will be reversed into a reception bay and the door will be closed behind it. The doors are electrically interlocked to the lids on the raw reception vessels ensuring the vessel cannot be opened unless all external doors are fully closed. At this stage the vessel can be opened and the selected material is tipped. The vessels lid is now closed and a ten minute timer will be activated ensuring the external doors cannot be reopened until the building air has been extracted to the odour abatement system. All the vessels have a continual extraction to the abatement system even when lids are closed.

The door can now be opened and the trailer can be removed and moved into the next position for removal of the next compartment's material. The same process of interlocks and time delays is applied each time a compartment is to be tipped. Please note that only one external vehicle door can be opened at any one time.

A fire escape door will be available at all times but will have an audible alarm fitted to ensure no abuse of door management takes place.

RAW MATERIAL CONSIGNMENT - ACCEPTANCE AND DISCHARGE PROCEDURE

The raw material supervisor will then pre-check the consignment documentation and verify as required. The raw material supervisor will then remove the cover that is fitted to the trailer. A visual inspection of the consignment will be undertaken to ensure that the materials conform to the Company's quality requirements. This inspection will encompass the following points:

- i. Material odour
- ii. Material colour
- iii. Material condition i.e. foreign material
- iv. Material type i.e. offal (including heads and feet), feather, cut up etc.
- v. Age of material verified against the collection document
- vi. After visual inspection the raw material will be subjected to a temperature log: the conforming acceptance temperature will be 38°C maximum and will be verified against the collection document temperature as dispatched from the processing factory.

After inspection the consignment documentation will be endorsed as follows:

- i. Material conforms to requirements and is cleared for acceptance and discharge for processing.
- ii. Material is non-conforming and is rejected.

Non-conforming material shall be documented and a copy of this document attached to the rejected material receptacle.

Covers that are fitted to the trailer will be re-closed by the raw material supervisor, the vehicles' wheels will then be power washed by steam cleaning.

Non-conforming or reject material shall be routed for disposal without undue delay; the vehicle will now exit the raw material area under controlled conditions.

Conforming or accepted material will be discharged into the appropriate raw material storage bin for onward transfer to the processing system.

After discharge of material the raw material supervisor will power wash the inside of the trailer. Wash-down water from receptacle and vehicle cleaning will be routed and collected in the wash-down water sump which is fitted with a 4.0 mm screen plate to remove any particles above the screen size. Water that passes through the screen section is collected in the sump body; the sump body is fitted with a submersible pump whereby collected wash-down water is pumped in to the raw material bin for processing. The solid particulates from the screen are manually discharged into the raw material bin after the vehicle has exited the raw material reception area and the external door is in the closed position.

The raw material supervisor will visually inspect the trailer's internal and external surfaces and ensure of its cleanliness, he will also visually inspect the trailer for its mechanical condition. The raw material supervisor shall inform the collection operative with his results. Should the trailer's mechanical condition be rejected the unit will be routed after exiting the raw material area to the engineering department for evaluation.

Covers that are fitted to the trailer will be re-closed by the raw material supervisor, the vehicles wheels will then be power washed, the vehicle will now be released for exiting the raw material.

RAW BLOOD RECEPTION

Raw blood is tanked on to site via road trailers that have a dedicated and sealed raw blood tank situated at the front (compartment 1) of the trailer.

The vehicle enters the protein recovery plant's raw material reception area under controlled conditions and procedures (see above). The reception area is kept under a continuous negative pressure thus eliminating any room air malodours escaping to atmosphere.

Raw blood is then discharged by vacuum pump from the trailers blood storage tank into the protein recovery plant's Bulk Raw Blood Storage Tank machine (refer to 3 on drawing) through a closed loop pipe spool arrangement.

The raw blood at this stage is continuously re-circulated via an air actuated diaphragm pump that allows for blending of the material within the raw blood tank thus ensuring that the raw blood is kept in viscous and fresh state prior to processing.

The raw blood storage tank is a sealed unit that is fitted with a Spirax Sarco AV15 vacuum breaker thus allowing for ingress of air during operating periods.

The Raw Blood Storage Tank is continuously vented to the plant's odour abatement system by point extraction to the activated carbon scrubbers for efficient deodorizing.

OFFAL RECEPTION

Offal is transported to site via sealed and covered three compartment bulk trailers. Offal is discharged from the processing plant's offal storage vessel into the trailer's offal section that is situated at the rear

(compartment 3) of the trailer.

The vehicle enters the protein recovery plant's raw material reception area under controlled conditions and procedures (please see above for protein recovery plant entry procedures: note the reception area is kept under a continuous negative pressure thus eliminating any room air malodours escaping to atmosphere during vehicle entry).

Offal is discharged directly into the Bulk Offal Bin 16 m³ Bulk Offal Bin machine (refer to 51 on drawing) awaiting onward transfer to the processing system within a 12 hour period, the offal bin is fitted with a sealed covered lid and the bin is continuously vented to the plant's odour abatement system by closed loop point extraction ducting to the activated carbon scrubbers for efficient deodorizing.

DE-WATERED FEATHER RECEPTION

De-watered feather are transported to site via sealed and covered three compartment bulk trailers, de-watered feathers are discharge from the processing plants offal storage vessel into the trailers de-watered feather section that is situated at the middle (compartment 2) of the trailer.

The vehicle enters the protein recovery plant's raw material reception area under controlled conditions and procedures please see above for protein recovery plant entry procedures, note the reception area is kept under a continuous negative pressure thus eliminating any room air malodours escaping to atmosphere during vehicle entry.

De-watered feathers are discharged directly into the 20 m³ Bulk Feather Bin machine (refer to 1 on Drawing) awaiting onward transfer to the processing system within a 12 hour period, the de-watered feather bin is fitted with a sealed covered lid that is continuously vented to the plants odour abatement system by closed loop point extraction ducting to the activated carbon scrubbers for efficient deodorizing.

RAW MATERIAL AREA-VEHICLE EXIT PROCEDURE

Prior to the raw material supervisor allowing exit from the area to any vehicle or personnel he will ensure that the following pre-exit check is verified:

- i. That all external doors are in the closed position
- ii. That all raw material bin lid are in the closed position
- iii. That the raw material reception area floor is clean with no raw material residue visible
- iv. The raw material access floor is clean and free from road traffic contamination and raw material residue

The raw material supervisor will ensure that that all raw material bin lids are in the closed position. The raw material supervisor will instruct the collection operative to prepare for exiting the raw material area.

The raw material supervisor will activate the external door, as detailed above the external door and the all raw material bin lids are inter linked with a fifteen minute time delay that will ensure that there is no evacuation of air from the raw material area to atmosphere.

Time sequence elapses and external door is in the open position, raw material supervisor will now instruct the collection operative to start the vehicle's engine and drive out of the raw material reception area to a pre-determined position, stop and switch off the vehicles engine and report to the operation manager for further instructions.

The raw material supervisor will activate the external door to the closed position, both the external door and raw material bin lid are now in the closed attitude and the sequence is complete and awaiting the next consignment.

With the above activities complete the raw material supervisor will inspect the area and report on the areas condition and that all raw material storage bin sealed lids and all other ancillary equipment is functioning to ensure that the procedure and equipment are functioning correctly.

The raw material supervisor will inspect the waste water sump and its filter grill where all material above 4.00 mm particle size will be manually discharged into the raw material bin for processing.

All the water will be routed to the site waste water drainage facility to the raw material bin for processing.

Cooking Time of Raw Material

With the objective being to obtain the highest possible specification for the finished product and reducing odour bearing gasses in the raw material it will be the objective of the company to process all raw material consignments within a twelve hour period.

Feathers and Blood

Blood will be transported in a totally enclosed tank at the front of the delivery trailer. Feathers will be mechanically pressed at the slaughter facility to a moisture content of 37.5% and transported in a middle compartment on the trailer.

The feathers and blood will be stored in totally enclosed holding tanks at the protein recovery facility before being transferred to a feather blood batch cooker. The sequence is as follows:

- The feathers and blood will be despatched from the slaughter house after four hours production
- The oldest feathers and blood in the trailer will be four hours old and the fresh material will always be on top
- The average age of the material in the trailer will be 2 hours old
- The trailer will be covered and despatched immediately to the protein facility
- There will be approximately 7 tons of blood per day
- There will be approximately 8 tons of pressed feathers per day

- Therefore we will have a total weight of 15 tons per day to process
- The batch cooker will have the capacity to hold 6 tons of feather blood in a cooking batch
- Three batches will comfortably handle all the feathers and blood that are produced in any days slaughter
- The cooking time will be less than 5 hours per batch, therefore cooking will be less 15 hours per day
- The design parameters will allow us to use 10 bar steam pressure although we plan to operate at 6 bar pressure
- If we operate at 10 bars the cooking time will be decreased by approximately 25%
- There is an additional processing capacity of 8 hours per day and if we increase steam pressure an additional 3.5 hours capacity so there should be no requirement for material to be carried over to the next day

Offal

Offal will be transported in a compartment at the back of the delivery trailer. Offal will be vacuum transported to this delivery trailer as it is produced at the slaughter house.

Offal will be stored in a totally enclosed holding tank at the protein recovery facility before being transferred to a separate batch cooker from that used for the blood and feathers. The sequence is as follows:

- The offal will be despatched from the slaughter house after four hours production
- The oldest offal in the trailer will be four hours old and the fresh material will always be on top
- The average age of the material in the trailer will be 2 hours old
- The trailer will be covered and despatched immediately to the protein facility
- There will be approximately 18 tons of offal per day
- The batch cooker will have the capacity to hold 5 tons of offal in a cooking batch
- Four batches will comfortably handle all the offal that are produced in any days slaughter
- The cooking time will be less than 3 hours per batch, therefore cooking will be less 12 hours per day
- The design parameters will allow us to use 10 bar steam pressure although we plan to operate at 6 bar pressure
- If we operate at 10 bars the cooking time will be decreased by approximately 25%
- There is an additional processing capacity of 12 hours per day and if we increase steam pressure an additional 3 hours capacity so there should be no requirement for material to be carried over to the next day

Temperature

Processing plant raw material storage temperature (four hour period) will be a maximum of 32°C.

On arrival at the protein recovery plant and after raw material verification is complete the protein recovery plant storage temperature will be a maximum of 36°C. Note vehicles will move from the poultry processing plant to the protein recovery plant direct with no planned stops and will be achieved within a one hour journey time, vehicles and/or trailers will not be parked or stored in direct sun light.

Protein Recovery Plant Processing Temperatures:

Feather Blood Line

Raw material transfer Feather Blood Line:	36°C maximum
Hydrolyze and Dry to 8% Residue Moisture:	145°C maximum (Microbe Free)
Meal Transfer and handling:	145°C reducing to 32°C

Offal Line

Raw material transfer offal pumping Line:	36°C maximum
Atmospheric cook to 8% Residue Moisture:	135°C maximum (Microbe Free)
Fat Extraction (press cake discharge)	90°C minimum 125°C
Meal Transfer and handling:	135°C reducing to 32°C
Fat Storage (pre dispatch)	70°C maximum

Room Air Abatement

Room air if not replaced regularly will carry odours, which if escapes can give rise to odour complaints. The method of ensuring this never happens is to maintain a negative pressure in the process rooms at all times ensuring sufficient air changes and ensuring air is only vented via the abatement systems. The facility will have two abatement systems for the room air:

- Combustion air to thermal oxidizer
- Activated carbon filtration system

The thermal oxidizer will have a Liquid Petroleum Gas (LPG) fueled burner fitted that will heat the vapour flows to 850 degrees centigrade. This burner will require approximately 2100 kg of combustion air to ensure the burner operates efficiently and this air is extracted directly from the cooked side of the processing building thus maintaining a negative pressure.

The room air from the raw reception building is extracted through an activated carbon filtration system because raw material will be arriving before the process has commenced and therefore before the thermal oxidizer has been fired up. This carbon filter system is also essential to act as an odour abatement system in the rare occasions when the oxidizer may fail as a backup during the cooling period whilst small amounts of vapours are still being generated.

Backup in Event of Thermal Oxidizer Failure

Under normal operating conditions, odorous air generated from the system, would be destroyed by processing through the thermal oxidizer. It should be noted that the oxidizer is also the primary steam generating facility for the plant. Therefore if the thermal oxidizer be taken off line for any reason, steam generation together with odour abatement would cease and production would stop. However, there will be a period of time when the temperature of the material being processed at point of oxidizer shut down will be at a minimum temperature of 100 °C and a maximum temperature of 145 °C, at these temperature thresholds water (H₂O) within the material will continue to volatilize due to the latent heat within the cooker, vapour will continue to be generated while the material within the cooker is above 100°C and until the material temperature within the machine reaches a lower threshold of approximately 65 °C to 75 °C .

Vapour generated during the period that the oxidizer is off line (cooker cooling down) will be routed automatically to an air cooled condenser followed by an activated carbon abatement system. The vapour flow after passing through the condenser will have been split into two factions:

1. The vapour that has now been condensed back to water (effluent) and is continuously drained from the condenser outlet header and is routed to the process vapour effluent collection tank. This effluent will be stored in the 4.5 m³ collection tank and will be pumped back to the raw material reception area for reprocessing when the oxidizer is resumed.
2. Those that have not condensed (non-condensable) odour bearing gases will be routed to the standby activated carbon filter duct whereby the non-condensable gasses will be diluted with foul air from point extraction and from room air (combustion air) and then treated in the Carbon Filter System.

Basic operating philosophy for back up odour abatement in the unlikely event of the thermal oxidizer shutting down will be as follows:

1. Thermal oxidizer is taken off line
2. Steam generation is stopped
3. Steam manifold valve SV1 from oxidizer to cooker systems closes automatically
4. Vapour by-pass line valve V1 closes automatically
5. Vapour line valve V2 on cooker opens automatically, inter lock with V1
6. Air cooled condensing system starts automatically, inter lock with V2
7. Carbon filter exhaust fan starts interlock with 6 above
8. Non-condensable odour bearing gasses are drawn from the outlet header on the condenser and integrated in to the main carbon filter duct system
9. Condensed liquid from the condenser is pumped to holding vessel for feeding into cookers when oxidizer comes back on line
10. Backup system shuts down when the temperature transducer positioned in the air cooled condenser inlet header registers 65 °C when vapour from the cooking system cease to be generated.

Wastewater

The technology to be used at the facility has been designed to eliminate discharges of waste water from the facility. All wash down water from the cooking processes will be collected and recycled. It therefore operates on a closed loop system that ensures no releases hence eliminating the threat of pollution to the environment. Also the raw material trailers will not be washed at this facility.

Energy

Every effort has been made at the design stage to ensure the project is energy efficient. As such the project scope will include a high efficiency, LPG fueled cogeneration plant that is expected to supply 392 KW of the total estimated connected power requirements of 422 KW required for the protein facility. The heat recovered from the generator system's exhaust will be used to preheat the vapour entering the thermal oxidiser, thereby reducing the fuel (LPG) required by the thermal oxidiser. This results in an integrated energy system which is nearly 60% efficient. In addition, through the use of clean LPG fuel, the airborne emissions from the cogeneration system are an order of magnitude lower than if this energy were produced by the large central power plants in Jamaica. This cogen unit will operate 16 hours per day. The vapour flow to thermal oxidizer will be 1810 kgs/hour and the temperature entering thermal oxidiser will be 110 degrees centigrade.

Also at the process factory a mechanical press will be installed which will remove in excess of 11,500 kgs of water daily which would require thermal energy to evaporate if not previously pressed out.

Caribbean Broilers' offal is currently moved around by using water systems but this contaminates water resulting in a load being applied to the slaughter house effluent system coupled with a percentage pick up of water to the offal which will also need thermal energy to evaporate. A vacuum transport system will be installed for the offal that will reduce water in the offal by at least 6,000 kgs per day and also reduce loading of current effluent system.

Occupational Hazards

The design of the process is such that the operators have little or no exposure to any risks while carrying out their daily duties. As part of the operation training manual a full risk assessment will be carried out and all operators will be fully trained before commencing employment. The main two risks identified are as follows:

- Pressure from the feather cooker during the hydrolyzing stage
- Exposure from hydrogen sulphides

When cooking feathers to release the proteins they must be hydrolyzed which will entail cooking them under pressure. The cooker will come under 3 bars pressure and during this period a pressure transducer will activate a light which will be a warning for all operators not to enter the area. This will be covered off during the training. The cooker will be tested during the commissioning period to withstand double pressure to ensure safety margin.

Also during the hydrolyzing period hydrogen sulphides are released from the product. These hydrogen sulphides are contained in the totally enclosed system and carried to the thermal oxidizer for destruction (in times of thermal oxidizer failure the cooker being used for feathers will automatically close its vapour valve so as to keep all hydrogen sulphides inside a sealed vessel until the oxidizer is returned to service).

The hydrogen sulphides will be retained inside the cooker and vapour lines at all times but as a precaution the operators will be supplied with a hydrogen sulphide monitor that will check for and small leaks that could appear on shaft gland packing seals, etc. This will also become part of the routine maintenance plan. Both maintenance and operators will be fully trained in this area.

3.2.4 The Final Product

At the end of the processing lines at the protein recovery facility feather blood meal will be produced, offal meal will be produced and poultry oil will be produced. The feather blood meal and also the

poultry offal meal will each be loaded into 1000 kg bags which will be sealed at the top after loading and stored on the racking system in the protein facility.

After the positive release phase (suitable micro test results) the bags will be loaded onto a trailer for dispatch to the mill. These bags will have a batch code attached and will be transported on a flatbed trailer to the Feed Mill. Poultry oil will be stored in a silo at the protein facility and then loaded into 1000 kg sealed containers, which will also be loaded onto the same trailer as the meal and sent to the mill. Storage is only for one day at a time and there will be three trips per week (every other day) by flatbed trailer to the mill.

4.0 PROJECT BENEFITS

Currently the offal, feathers and blood from the processing plant are going to a landfill site which poses obvious environmental concerns.

This protein recovery facility will have the capacity to process the material which is currently going to landfill which is in excess of 23,000 tons per year and convert these current waste products into over 7,000 tons of high grade protein which can displace some protein imports that are currently entering the island.

The proposed development will also reduce the cost of imported feedstock (e.g. corn and soya products).