Environmental Impact Statement

in respect of the development of a Biogas Plant

for

Timoleague Agri Gen

at

Barry's Hall,

Timoleague,

Bandon,

Co. Cork

Prepared by

NRGE Ltd.

Mooresfort, Lattin, Co. Tipperary

Date: NOVEMBER 2012

(Revised May 2013)

PROJECT TEAM

MICHAEL SWEENEY	**NRGE LTD., MOORESFORT, LATTIN, CO. TIPPERARY.**
MICHAEL Mc ENIRY	**B.Eng CIWM NRGE LTD., MOORESFORT, LATTIN, CO. TIPPERARY**
DERMOT LEAHY	**B.Agr. Sc NRGE LTD., MOORESFORT, LATTIN, CO TIPPERARY**
JULIANNE O BRIEN	**BSCM, PDip (EnvPro), NRGE Ltd., MOORESFORT, LATTIN, CO TIPPERARY**
JER KEOHANE	**M.Sc MIEI GEOTECHNICAL & ENVIRONMENTAL SERVICES LTD, CARLOW RTC. CO. CARLOW**
AILA CARTHY	**VESI ENVIRONMENTAL 3013 INNOVATION PARK, EURO BUSINESS PARK, LITTLE ISLAND, CO. CORK**
RONAN JONES	**Dominic Delaney & Associates Archaeology**
THOMAS JENNINGS	**DBFL Engineers & Traffic Consultants**
MERVIN RICHARDSON	**JETWASH Ltd**
LARS BO ADAMSEN CONSULTANT	**M.Sc ANIMAL HOUSE DESIGN SKIOLS A/S, Saeby, DENMARK**
LARS BAADSTORP	**M.Sc BIOGAS CONSULTANT PlanAction A/S, Aarhus DENMARK**

REVISION	DESCRIPTION	ORIGIN	REVIEW	STAGE	NRGE APPROVAL	DATE
1	Issue 1 Planning Ref 12740	JO'B/MME/MS	MME/MS	Issued	Y	04/12/2013
2	Re-issued Planning Ref 1383	JO'B	MME	Issued	Y	14/02/2013
3	Revised	JO'B	MME	Issued	Y	14/05/2013

Table of Contents

Tables

Attachments

1. NON-TECHNICAL SUMMARY

This is the summary of the information contained within the Environmental Impact Statement, which reports the findings of the assessment into the environmental effects associated with the proposed development of a Biogas Plant at Timoleague, Bandon, Co. Cork.

The Environmental Impact Assessment, prepared by NRGE Ltd as a submission to be included in support of a Planning Application to Cork County Council and a Waste Facility Licence to the Environmental Protection Agency. The Environmental Impact Assessment has been produced in accordance with the European Community Directive Environmental Impact Assessment Directive 85/337/EEC (as amended by Directives 97/11/EC, 2003/35/EC, 2009/31/EC) and the Regulations implementing the Directive in Ireland: the Planning and Development Act 2000-2010, the Planning and Development Regulations 2001-2012 and the European Communities (Environmental Impact Statement) Regulations 1989-2000.

The proposed project has involved consultation with stakeholders locally, regionally and nationally, including statutory bodies and regulatory authorities, in an attempt to identify concerns and predict any likely environmental effects of the development, and the evaluation of these effects against specified criteria such as legal guidelines and limits.

This project has involved formal and informal discussions with a large number of stake holders from the local, regional and national categories, to help formulate an integrated model, that will stand up to detailed critical analyses. In the current climate such critical analyses will be applied not only from an environmental perspective, but also from an economical and sustainable perspective. The vision is to create a centre of excellence for an Anaerobic Digester and associated integrated business, which will provide a template that can be applied to other similar regions throughout the jurisdiction.

It is the intention of this summary to provide all the relevant information contained within the Assessment, in a non-technical and comprehensible manner. The Environmental Assessment is an evaluation of the potential significant likely environmental impacts that this development will have on the locality.

Timoleague Agri Gen Ltd. is a limited company with two directors, both of whom are active progressive farmers in the local community. These are Mr. Colin Bateman, upon whose farm the proposed development is located, and Mr. Martin O' Donovan, whose pig farm unit is located to the North of the proposed site.

The development will occupy a landscaped site of approximately 3.67 hectares (9.07 acres). The proposed development consists of a Biogas Plant consisting of 2 no Digester tanks, 2 no validation tanks, 1 no homogenising tank, 3 no geo-membrane lined manure storage

tanks, 1 no fibre store, 1 No Feed Tanks, Reception Building, Plant Building, Pasteurisation Tanks, Weighbridge and associated site works including an integrated constructed wetland, to produce renewable energy and fertiliser. The proposed Anaerobic Digester will reduce net emissions from Mr. O' Donovan's Pig Farm as it will require fresh delivery of manure from the pig houses. It will also effect a net reduction of emissions in the area.

This proposal will aid compliance with Nitrate Directive Regulations and incorporates emission reduction measures. A map (Scale 1:2500) in ***Attachment 1*** clearly outlines the site boundary, marked red.

Facilities

The buildings and their layout will be state of the art for the industry. A thorough review across Europe was undertaken of best available techniques to minimise emissions from the proposed development, and to maximise beneficial outputs. The Biogas Facility's storm water will be routed to a single storm-water monitoring point (identified as SW1 on Drawing 003 - *Overall Site Plan* included in ***Attachment 2***), and then piped to the land drainage watercourse. Each individual component of the Biogas Plant will have an independent leak detection system with an individual inspection chamber for each section. These inspection points are identified as LD1 to LD12 on Drawing 001 - *Site Plan* included in ***Attachment 2***, locations of which are indicated in ***Attachment 19***.

Employment

This development has the potential to provide for 2 full time jobs at the Biogas Plant and 1 part-time with indirect employment potential of 40-50 full time jobs in associated waste and biomass collection sectors. Planning for a sister project has being submitted to Cork County Council, for the development of a glasshouse facility adjacent to this site which will have an additional job creation potential of 20-40 direct job positions, while utilizing heat and CO_2 emissions from the anaerobic digester. (Planning ref: 1390)

Manure storage capacity

The proposed facility provides storage on site in three geo-membrane lined storage basins, 4,500 m^3 capacity each. The secondary digester has a 4,300 m^3 capacity. The pre-mix tanks have 220 m^3 and 1,500 m^3 capacity respectively. In addition there are separate plans to provide additional 7,000 m^3 storage on customer farms. This is a total of 22,020 m^3 which is equivalent to 29 weeks output on site.

Land-spreading Areas

The pig manure from Mr. O' Donovan's Farm is currently being recovered on customer farms as a fertiliser in the general area of South West Cork. There is a total of 2,461 hectares of good agricultural land available in the area for this purpose. Upon the completion of this Anaerobic Digester, this same list of customer farms will be used to recover the liquid digestate as a fertiliser source. The bedrock in the region is mostly Devonian Old Red Sandstones (DORS), containing a Locally Important Aquifer.

Timoleague Agri Gen Ltd. and O' Donovan Pig Farm Unit have, with the consent of the existing customer farm list sufficient capacity to recover the nutrients in the liquid digestate form, with sufficient capacity to provide a 20% reserve.

Manure Spreading

The application of digested manure to farmland is regulated under European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2009 S.I. No. 610 of 2010 and distribution of digested manure from this site will comply with those regulations.

Digested Manure will not be supplied to customer farms between 15th October and 12th January in any year except with the consent of the local authority, or any other relevant authority. Outside that period, digestate manure will be supplied from the site to a customer farmer, only in response to an order. Managed and used in this way, manure digestate produced at this Facility will not have any adverse impact on environmental parameters either inside or outside the site. However recognition must be taken of the fact that 50% of these traffic movements occur in the general area currently, and will continue to do so irrespective of the construction of this proposed development, in the form of current deliveries of pig slurry, belly grass, dairy sludge and other organic materials to farms in the general area for use as agricultural fertiliser.

It is planned to import an additional 25,567 tonnes of organic material per annum to mix with the pig manure to increase the efficiency of the proposed Anaerobic Digester. The additional organic material is laid out in ***Table 1*** below, along with the estimated volume and source of each. A menu of these materials will be used subject to their availability and appropriate 'mix' of materials.

The current volume of pig manure produced on Martin O' Donovan's farm is 14,600 tonnes. Planning permission has being granted to increase his sow number from 1,150 to 1,750, which will increase the slurry production to 23,000 tonnes referenced. It is likely that the construction required to house this additional stock will commence in quarter three 2013.

Table 1: The Intended Feedstock for Processing

TYPE	Volume
	(TONNES)
Pig Manure	23,000
Seaweed	5,000
Dairy Flotation Sludge	11,000
Feedmill Residuals	200
Fruit residuals	300
Residuals from vegetables	750
Other slurry fish manufacturing	300
Paunch pigs	300
Paunch cows	5,000
Flotation sludge	1,200
Fat trap waste	600
Draff via Beer Production	750
Bread	100
TOTALS	**48,500**

It is proposed to primarily target organic materials that are currently being land-spread, as this process will greatly reduce current environmental impacts, in accordance with current land-spreading directives. In accordance with Regulations: EC no 1069/2009, EC no 142/2011 and EC (TSE and Animal by-Products) Regulations (S.I. No 252 of 2008 as amended), the approval of the Environmental Protection Agency, Cork County Council and the Department of Agriculture will have to be granted, in order for the permission to treat other waste types at this proposed Anaerobic Digester.

This organic material will be imported onto the site at a rate of 49 weekly in/out movements. It will be delivered directly into the relevant pre-mix tanks. The high fibre material will be transferred directly into the underground pre-mix tanks, and liquid material will be pumped into the sealed storage tanks on site. Waste material will only be accepted on site from approved facilities, to be delivered by approved permitted contractors. All deliveries will be recorded on site, and this register will be available for inspection by

officials from Cork County Council, Department of Agriculture, Food and the Marine and the Environmental Protection Agency. Waste acceptance and characterisation procedures are included in *Section 3.5.1 - Waste Acceptance and Characterisation Procedure.*

The plan to develop an Anaerobic Digester in this area first took seed in 2003 when following a detailed review of all available alternative technologies to treat pig manure, it was decided the most suitable technology was Anaerobic Digestion, which is simply the natural breakdown of organic waste in the absence of air.
A Digester is a warmed, mixed, airless vessel which creates ideal conditions for the necessary bacteria to naturally break down this material. A chain reaction of different bacteria attacks the carbon in the digesting material, giving off methane gas as Biogas (65% Methane). This gas can be collected, contained, and then burned to create electricity and heat, or in some cases processed further into a vehicle fuel. It is now accepted within the EU that farming and life in general must become more sustainable with regards to protecting the environment, and maintaining rural life.

There is now a significant amount of legislation that is demanding this sustainable and integrated approach. The use of anaerobic digestion can help to meet many of these targets.

(i) The pig manure produced on Mr. O' Donovan's Pig Farm will provide the required fuel base for this Anaerobic Digester i.e. 23,000 tonnes (at full production) and will be supplied by a pipeline (planning for which will be dealt with separately), avoiding the use of vehicles to transport the manure to the AD facility.
(ii) The additional fuel waste required (25,000 tonnes) will be sourced locally, and transported to the Facility by lorry, at a rate of 49 in/out weekly movements.
(iii) The gas generated will be used to supply power to the Facility.
(iv) The excess power will be exported to the National Grid.
(v) The solids will be separated, including approximately 80% of the Phosphorous, currently being reviewed as a soil conditioner. Other alternative reuse options are also being investigated.
(vi) The liquid digestate will be used on customer farms, in accordance with a digestate fertiliser plan.
(vii) The odour impact of spreading digestate versus pig manure, belly grass, and/or dairy sludge will be reduced by 80% min.
(viii) The digestion process will destroy 98% of all pathogens & parasites.
(ix) The digestate is relatively stable, and will not produce a crust in storage.
(x) The digestion process will kill all weed seeds.
(xi) The digestate is a pleasant, clean and easy material to handle.

Application methods

The application of liquid digestate to agricultural land as a fertiliser will be carried out using specialist equipment fitted to tractor tankers which will ensure direct application to ground, thereby increasing the nitrogen uptake of plants.

Steps will be taken with the customer farms whereupon it is proposed to use liquid digestate and in designing the management of its use, to ensure that no contamination of surface and groundwater takes place. The proposed development of an Anaerobic Digester will significantly reduce the risk to surface-water and groundwater. The existing customer farm base has the capacity to recover the proposed volume of liquid digestate.

Storm/clean surface water

All clean water is separated from soiled water. Roof water is collected via galvanised gutters and downpipes and piped underground to a nearby watercourse via a stormwater monitoring point identified as SW1 on Drawing 003 - Overall *Site Plan* included in ***Attachment 2***. This monitoring point will be visually inspected on a weekly basis. A register of these inspections will be maintained on site for inspection. A water sample will be taken on a quarterly basis from this point (SW1) for analysis at an independent accredited laboratory.

The surface water collected from the open yard area in front of the reception building, and the access road will be collected and diverted to an integrated constructed wetland (ICW), before being discharged to the adjacent watercourse, via a monitoring point which will also be visually inspected on a weekly basis. A register of these inspections will also be maintained on site for inspection. All emissions from the facility (including storm water discharges) will be controlled and monitored by condition of the waste licence if granted by the Environmental Protection Agency.

The issue of water is detailed further in *Section 6.4*.

Surface Water

Teagasc have put in place a regional monitoring programme at a point up-stream from this site as part of their Agricultural Catchments Programme over recent years, wherein they have recorded flow rates and ambient monitoring has being carried out for phosphorus and nitrogen. Upon completion of this proposed development it is intended to engage with this programme to monitor any impacts from the displacement of applications to land of pig manure, and other organic materials, in this catchment area, with the digestate fertiliser from the anaerobic digester process.

In order to maximise farm outputs and profits, grassland and tillage production rely on a supply of essential plant nutrients Nitrogen (N) and Phosphorus (P). The use of these nutrients is regulated by recommended guidelines in feed and fertiliser and also the EC Good Agricultural Practice for Protection of Waters (S.I. No 610 of 2010) which implements the EU Nitrates Directive into Irish Law.

One of the main aims of Teagasc's Agriculture Catchments Programme is to protect and improve the quality of water, both surface and ground water. This programme intends to work with 300 farmers across six catchment areas in order to monitor and assess the measures implemented by the Nitrates Action Programme in compliance with the Nitrates Directive and the recommended guidelines.

It is intended to cooperate fully with Teagasc in this programme to monitor on-going future impacts from this proposed development.

See Teagasc report included in ***Attachment 4.***

Traffic

An assessment of sightlines at the entrance to this Facility was undertaken by Mr. John Mc Eniry in order to ascertain that adequate sightlines were available to support an increase in the level of traffic movement due to the proposed level of organic material to be delivered to the Biogas Plant. This report is included in full in ***Attachment 13***. However, recognition must be taken of the fact that 50% of these traffic movements occur in the general area currently, and will continue to do so irrespective of the construction of this proposed development, in the form of current deliveries of pig slurry, belly grass, dairy sludge and other organic materials to farms in the general area for use as agricultural fertiliser.

A topographical survey was carried out on the existing road from the proposed entrance for the Biogas Plant to Ballinadrollm Bridge, located North of the proposed entrance. The stretch of road varied in width from 6.1 to 6.5 and 300mm wide verges with 1.5 to 2.0m high stone walls on both sides. The stone walls have heritage merit and it is considered that their demolition would be unwelcome. It is proposed to maintain the foliage on top of the walls by cutting back in the appropriate season from September to March.

The issue of Traffic is detailed further in *Section 6.9*.

Noise & Odour

This planned operation will be developed on a green site therefore there are no existing significant effects on noise or odour.

On completion of the project, all aspects of the facility which have the potential to cause nuisance noise or odours will be housed in sealed and soundproofed buildings e.g. the Combined Heat and Power Unit and Generators. The only issues will arise from the delivery of the imported organic matter but this will not be a problem outside of the boundary of the site. This imported fraction of matter will also be transported in sealed containers helping control odours. Noise and Odour are discussed in detail in *Section 6.10 Noise* and *6.5 Air*.

Archaeological Features

An assessment of Archaeological Features in the vicinity of the proposed development has been carried out by Dominic Delany & Associates (***Attachment 7***). It is considered unlikely that there are any unknown archaeological remains or features in the vicinity of the proposed development, or that the development will impact, either physically or visually, on the archaeological heritage of this area.

Heritage Areas

The Biogas Plant and selected spread-lands will not have an impingement on any heritage areas **(*Attachment 7*).**

Cultural Heritage and Material Assets

Farming traditions in the area have been stock rearing, milk production, pig production and tillage. Animal manures are recycled onto the land reducing the cost of production.

Climate

The most important contribution of this biogas development in the protection of the environment is that it reduces emissions of methane and ammonia. Methane is a gas that has a huge effect on climate that would otherwise be released, uncontrolled, from the land-spreading of raw pig manure, belly grass, and dairy sludge. There are additional potential benefits via the CO_2 recovery systems with the associated proposed development of a Glasshouse facility (Planning Ref: 1390).

The issue of climate is detailed further in *Section 6.6*.

Population

The town of Bandon has a population of ca. 6,000 people**,** with a population of ca. 1,500 people in the town boundaries. The nearest settlement location adjacent to the proposed site is Timoleague village (1.5km) which has a population of ca. 300.

The proposed development will have a positive impact on human beings from the increased employment it will create, and the resultant reduction of existing impacts from emissions. The development will be located in an agricultural area; therefore the buildings will blend into the surrounding area. Also, the development will be landscaped with a screening of trees, shrubs and flowers. Thus, there will be no nuisance or loss of amenity (see ***Attachment 20*** - *Photomontage of the proposed Anaerobic Digester Facility.* A *Landscaping Proposal* is included in ***Attachment 14*** which includes details regarding the location and height of the proposed berms as well as details regarding numbers and the species of the trees. The mature trees and the historic wall located to the north of the site will be retained.

Effects of the development on air are insignificant outside the buildings and adjoining yards. Mitigation measures taken will minimise the effects of odour on the days of digestate spreading. The application of digestate will replace the current practice of pig manure

application to land, resulting in an 80% reduction of odours generated, due to gas extraction. Pig manure will also be moved fresh, in sealed pipes, from the farm to the Anaerobic Digester weekly thereby further reducing emissions from the pig farm. This proposed pipeline will be dealt with separately to the planning application for the Anaerobic Digester.

This report was prepared in accordance with the EPA publication - *Odour Impacts and Odour Emission Control Measures for Intensive Agriculture.*

Noise levels from the development are unlikely to be a nuisance. The main sources of noise will be produced by the traffic and the generator. The generator is a permanent source of noise but is quite low and considering the seclusion of the site, this should not be a nuisance outside of the site boundary.

The development will have an insignificant effect on the climate of the area.

Thus, the measures that have been put in place will ensure that impact/effects of the development on human beings, noise, air, climate and the interaction of human beings, fauna, soils, air, water, climate, landscape and material assets will be minimised.

In a discussion paper published by the Environmental Protection Agency (January 2005), it concluded that "*Anaerobic Digestion has the potential to deliver multiple environmental benefits, including reduced water pollution potential, lower green house gas emissions, and reduced odours from agricultural slurries".*

This proposed development has the potential to benefit all stakeholders adjacent to the proposed site and the customer farms. The net result of this proposed development will be a reduction of existing impacts to the order of at least 30% from the site and 80% from the application of digestate in place of pig manure, belly grass, and dairy sludge to customer farms.

This proposed development has the potential to provide an economic outlet for crops grown by customer farmers in the area, on lands that may not otherwise be utilised fully. These crops can be fertilised by the digestate from the process. This proposed development also has the potential to provide the energy to drive additional projects such as the proposed Glasshouse Facility located adjacent to this site, to be the subject of a separate planning application (planning ref no: 1390). This proposed Glasshouse Facility will utilise heat and CO_2 that would otherwise be released into the environment.

A full process control system (SCADA) has been prepared for this proposed Facility. This report has been prepared by our Associates who have over twenty five years experience in the anaerobic sector. It is based on the professional management systems currently operational on similar Anaerobic Digestion Facilities throughout Europe. It details the type

of system software, reporting, alarm systems, data exchange and functional systems required to operate a facility such as the proposed development. This expertise is available to the management and operators of the proposed development, at local and remote levels.

Monitoring and Register

Proposals for monitoring storm water emissions at the site and for monitoring soil fertility are set down in the Environmental Report. A register of slurry quantities, rates and locations of spread-lands will be maintained for inspection and monitoring by Cork County Council and other Regulatory Bodies.

An Annual Environmental Report will be submitted annually to the Environmental Protection Agency, in accordance with the requirements of a Waste Facility Licence.

The intention of the joint developers for this project is that the Anaerobic Digestion and Glasshouse projects will create a synergy to provide valuable employment in the local and regional economies, and at the same time become a centre of excellence which will aid the development of similar projects to benefit the regional and national economies.

2. INTRODUCTION

2.1 Legislation

European

❖ ***Nitrates Directive: Directive 91/676/EEC concerning the Protection of Waters against Pollution caused by Nitrates from Agricultural Sources (EC, 1991)***

The aim of this directive is to reduce water pollution caused or induced by Agricultural Sources and to prevent further such pollution.

The Nitrates Directive generally requires Member States to:

• monitor waters and identify waters which are polluted or are liable to pollution by nitrates from agriculture
• establish a code of good agricultural practice to protect waters from such pollution
• promote the application by farmers of the code of good agricultural practice
• identify the area or areas to which an action programme should be applied to protect waters from pollution by nitrates from agricultural sources
• develop and implement action programmes to reduce and prevent such pollution in the identified area: action programmes are to be implemented and updated on a four year cycle
• monitor the effectiveness of the action programmes
• report to the EU Commission on progress.

❖ ***Regulations (EC) No 1774/2002 of the European Parliament and of the Council of 3rd October 2002 laying down Health Rules concerning Animal By-Products not intended for Human Consumption.***

This law outlines the rules and requirements that an Anaerobic Digester can and cannot use. This regulation refers to health rules concerning animal by-products (ABP) not intended for human consumption (EC 2002).

Article 2 of the Regulation defines Animal By-Products (ABP) as *'entire bodies or parts of animals or products of animal origin referred to in Article 4,5 and 6 not intended for human consumption, including ova, embryos and semen'.* It is necessary to ensure that all ABP used in Anaerobic Digester Plants have sufficient pathogens reduction and that recontamination is prevented. This will ensure safe application of the treated material. Animal By-Products are divided into 3 categories:

Table 2: Animal-By-Products Categories

Category	Potential Use	Disposal or recovery method	Constraints
1. BSE suspects, Animals slaughtered in the context of the TSE eradication measures, SRM material, including dead, ruminant animals containing it, Parts of animals that have been administered certain prohibited substances under Directive 96/22/EC and Directive 96/23/EC, , Catering waste from international means of transport.	Nothing	Incineration or approved processing Plant	n/a
2. Manure, digestive tract content, milk, colostrums	Biogas Plant	Processed in a Biogas Plant, disposed of in a landfill site, composted	Must adhere to the National Standard approved by the DAFF. Max particle size: 400mm Min temperature: 60°C Min time in the unit: 48 hrs Manure and digestive tract content requires no pre-treatment, while all other materials in category 2 must be sterilised with steam pressure.
3. Feather, former foodstuffs, raw milk, fish or fish by-products, shells, hatchery by products, cracked egg by products, catering waste	Biogas Plant	Processed in a Biogas Plant, disposed of by landfill, or composted	Must adhere to the EU Standard. Max particle size: 12mm Min temperature: 70°C Min time in the unit: 1 hour

❖ ***Directive 2009/98/EC on the Promotion of the Use of Energy from Renewable Sources (EC, 2009)***

This Directive creates a framework to use renewable energy sources to reduce Greenhouse Gas Emissions. Under this directive, member states are required to set a renewable energy target for 2020.

The directive also requires Member States to establish a National Renewable Energy Action Plan (NRECP) using a template devised by the European Commission. The purpose of the NRECP is to ensure that Member States adhere to the Directive.

Ireland has set a target of 40% of electricity to be produced from renewable sources, and 12% of heat produced to come from renewable sources by 2020.

Irish

SI No 252 of 2008 EC (Transmissible Spongiform Encephalopathies & Animal By-Products) Regulations 2008 (OAG 2008)

This regulation outlines the procedures involved with the sale and supply of Animal By-Products and the import of Animal By-Product. It states that *'a person shall not operate a Biogas Plant other than in accordance with the approval granted for the purposed of Article 15 of the ABP Regulation'.*

2.2 Organisations and Bodies Consulted

Geological Survey of Ireland
The Heritage Service
Cork County Council
Environmental Protection Agency
Bord na Mona Environmental Consultancy Division
Met Eireann
Department of Environment
Department of Agriculture Food & the Marine
Teagasc
Irish Farmers Association
Danish Pig industry Advisory Service
Irish Bio-energy Association

Table 3: Organisations and Bodies Consulted

Organization Consulted	Discipline	Means of Consultation	Information obtained
G S I	Geology /Hydrogeology	Overview of Groundwater and Geological Maps	Assess G.W. Vulnerability
The Heritage Service	Archaeology	Mapping overview of Potential Heritage Sites for initial site selection	
Cork County Council	Planning/ Environment	Review County Development Plan and Waste Management Plan	
Environmental Protection Agency	Waste Facility Licence requirements	Internet Document Review of Guidance Notes	BAT Notes on Intensive Agriculture, Guidance Notes on materials movement
Met Éireann	Climate	Internet access	Wind and Rainfall data to correlate with Dust and Noise Assessments
UCD	Nutritional Consultancy	Use of Diet for odour abatement,	
Dept. of Environment	Environment/Planning	Review of Planning / Environment Legislation and Regulations	
Dept of Agriculture, Food & the Marine	Agriculture / Food	Review of Legislation and Regulations in respect of Animal By-products, Nitrate Directives, Animal Welfare, in the overall context of Harvest 2020 targets	
Teagasc	Farm Advisory	Contact with Farm Advisor	Items relating to Animal Welfare
Irish Farmers Association	Farm Representative Organization	Contact with Pig Sector Secretary	Policy in relation to the development of the Pig Sector and the Bioenergy sector

2.3 Difficulties encountered in compiling the required information

The processes and technology involved in the construction and operation of the proposed development are standard for agricultural developments and are well understood. The technical information on which to base an assessment of impact on environmental parameters is readily available in the public domain. There were no particular difficulties encountered and there is no reason to consider that there is any serious risk of error attached to plans and projections for the treatment of wastes to be generated in this development at Barry's Hall, Timoleague, Bandon, Co. Cork.

3. DESCRIPTION OF PROJECT

3.1 Description of activities

The proposal envisages the development of an Anaerobic Digester at Barryshall, Timoleague, Bandon, Co. Cork. It is planned to submit the related Waste Facility Licence application to the Environmental Protection Agency parallel with the submission of the planning application. Drawings of the proposed new structures are presented in ***Attachment 2***.

The site of the proposed development is situated in a relatively low lying rural location where agriculture is the main dominant industry. The area is surrounded on all sides by open countryside and is screened from the public roads by the natural undulating arrangement of the landscape.

3.2 Size and Scale of the Proposed Development

The size and scale of the proposed development have been chosen after consideration of such matters as the site, customer demand for manure, economic viability and labour efficiency. The development is designed to cater for the treatment of all the pig manure generated by Mr. Martin O' Donovan's Pig Unit, and the additional organic waste from local facilities indentified in ***Table 1*** - *The Intended Feedstock for Processing*.

The tariff available for electricity produced from alternative sources such as wind and anaerobic digestion in Ireland is among the lowest in Europe, therefore the size of the development reflects the economies of scale required to make the development viable.

3.3 Detailed Drawings

A site layout of the Biogas Facility is illustrated in ***Attachment 2*** of this Report

Area of proposed site
The area of the site is approximately 3.67ha (9.07 acres).

3.3.1 Design

The Biogas Facility is designed and will be constructed in accordance with the requirements of the Department of Agriculture's Animal By-products Regulations S.I. No 252 of 2008 (as amended by S.I. No. 291 of 2009 and S.I. No 345 of 2009.

3.3.2 Drainage

Run-off surface water from the roofs of the buildings, walkways and clean yard areas within the Facility are collected and discharged into underground pipes to an existing watercourse drain via storm-water monitoring point indicated as SW1 on Drawing 003 – *Overall Site Plan* in ***Attachment 2***.

An Integrated Constructed Wetland System (ICW) has been designed by Aila Carthy of AESI wetlands to treat the run-off water from the access road-way and entrance yard to this facility. This ICW system will be located adjacent to the access road (see *Site Plan* 002 in ***Attachment 2***) will act as a visual feature as one enters the site. All emissions from the facility (including storm-water discharges) will be controlled and monitored by condition of the waste licence if granted by the Environmental Protection Agency.

The phrase integrated constructed wetland (ICW) was invented in 1990 by Dr Rory Harrington who works for the Irish Department of Environment, Heritage, and Local Government. An ICW is defined as an unlined free flow constructed wetland addressing the objectives of cleansing and managing water flow from farmyards, and integrating the wetland infrastructure into the landscape and enhancing its biological diversity. The aesthetic placement of the last two wetland ponds adjacent to the site entrance will enhance the sites ancillary values, while at the same time enhancing habitat diversity and nature management. A supplementary report has been prepared and is included as ***Attachment 21***.

Confirmation of access

The proposed Biogas Facility will be serviced by a newly constructed road off of the local road L-4021-0 road. Proposed adequate on-site space will be provided in the layout of the site, to ensure that the turning movements of all vehicles associated with the Biogas Facility can be facilitated. On the site access road to the site entrance proper from the public road, two lay-bys are planned to provide for vehicles passing as shown on the *Site Plan 002* and the *Overall Site Plan 003* included in ***Attachment 2***. Sufficient parking will be provided on-site for all vehicles associated with the proposed Facility.

Landscape and topographical setting

The site for the planned Facility is located in a rural area. The structures will comprise of long low A-roofed houses. The tallest structures will be the main Digester Tank which will be 18.7 meters high and will have a green coloured PVC coated cladding.

3.4 Production

(Read in connection with Drawing No 029 ***Attachment 2****)*

3.4.1 Reception and Pre-mixing

The first stage of the Biomass Process is the reception of the biomasses. The imported biomass will be delivered to the facility by a tipping container (hook lift skip or tipping lorry). The load on arrival at the facility is weighed over the onsite weigh bridge, enters the reception building and is tipped into the reception hopper **(TK00 – Drawing No 029)**. The weight and the estimated dry-matter content dictate the quantity of pig manure to add to the reception tank to make the biomass pump-able. The imported biomass mixed with pig manure will then be agitated and pumped into the mix tanks.

There will be 3 further vertical liquid material tanks **(PK03, 04, 05 – Drawing No 029)** located adjacent to the premix tanks which will enable the facility to accept biomass such as glycerine, soya and alcohols. These materials will be delivered in road tankers which will be received by the same route as semi-solid biomass, and will be pumped directly to the storage tanks via flexible pipe-work from the road vehicle coupled to permanent pipe-work associated with the tanks.

The vehicle importing the biomass, once emptied, will be washed with an approved detergent or steam, while at the reception tank using a high pressure washer. This will generate 1.7 tonnes /Day which will be diverted to the adjacent mixing tank. The vehicle would then return over the weighbridge to leave the facility, with the required documentation in compliance with Animal By-Product and Environmental Legislation. The reception area within the Biogas Facility will be segregated from the process and maturation area of the facility by an enclosing fence as shown in **Drawing 003** – *Overall Site Plan*.

The reception tank and vehicle unloading point will all be incorporated in a Portal Frame Building; the vast majority of the vehicles importing biomass to the facility will be capable of discharging its load within the building. In very exceptional circumstances the delivery vehicle may not be capable of tipping inside the building; in this circumstance a second tipping apron will allow the rear of the vehicle inside of the building for discharging. The Apron is sloped into the reception tank as shown on **Drawing No 018, 019 and 030** ***Attachment 2*****.**

The biomass from both sources is mixed in the reception tank so that the material is in a pump-able condition in the reception tank for transfer to the mix tank.

The mix tank **(TK01 - Drawing No 029)** is a 1,500m^3 insulated covered tank with a heating coil system so that the material mix is homogenised. This has a number of benefits,

it prevents shock loading on the digester from feed-stock; some gas will be produced in this tank in the mixing process by faster breaking down biomasses which will be collected for use in the CHP unit. The homogenised biomass is transferred on a batch basis to the Pasteuriser every 3-4 hours transferring approximately 20tonnes per batch to a 40tonnes batch heating tank **(HK01 - Drawing No 029).**

3.4.2 Pasteurisation

The pasteuriser controller calls up for a batch of digestate to be pumped into the pasteuriser **(PK03 – Drawing No 029).** The high level probe on the pasteuriser tank sends a signal that the required batch contents have been supplied and stops the pump supplying further digestate. The agitator within the pasteuriser tank keeps the digested biomass in constant motion in the pasteuriser tank; the temperature probes within the tank continuously monitor the temperature of the biomass within the pasteuriser. Once the temperature probes within the pasteuriser indicate that all 3 temperature probes are at 70 degrees or greater, the time-temperature recording for the batch begins. The agitation of the biomass within the tank achieves a homogenous heating of the biomass within the pasteuriser.
When the controller has received a signal that the temperature has been maintained for an hour, the batch of pasteurised digestate is transferred to the buffer tank **(PK04 – Drawing No 029)**.The content of the buffer tank is pumped through a heat exchanger simultaneously with the next batch of digestate being called up for the pasteurisation tank. This creates a heat transfer from the pasteurised batch to the next batch for pasteurising being pumped to the pasteurising tank, this reduces the amount of heat required to be applied in the pasteurising tank and also cools the pasteurised product going for treatment.

The pipe routing arrangement from the pasteuriser to the digester is an un-avoidable system where all biomass must go through the pasteuriser.

The air that is displaced while transferring biomass from the pasteuriser **(PK03 – Drawing No 029)** to the buffer tank **(PK04 – Drawing No 029)** or from the secondary digester to the pasteuriser, is vented to the engine CHP unit (combined heat and power system) where it produces electricity and heat from the biogas. The temperature probes are sufficiently long; therefore they will not be in contact with the body of the pasteurising unit.

The energy production from this proposed plant is detailed in the following table. The electricity produced will be sold to the grid. The excess heat will be sold to the proposed adjacent glass house. This proposed development has incorporated the most modern efficient and robust technologies to maximise green energy production. It is the intention of the promoters that this facility will set the standard for any future similar developments in this country.

Table 4: Energy Production

Biomass	Input amount in (t)	TS (t)	VS (t)	Production CH4 m3	raw Biogas	Output TS (t)
Total production in digester	48,500	6,743	5,739	2,478,661	3,786,318	3,482
In %		14%	12%		65%	7%
Added in storage	10%			247,866	378,632	
In total output	45,239			2,726,527	4,164,950	
Energy						
Input energy	27,101,682	kWh at	9.94	kWh/m3 CH4		
equal to	3,094	kW at	8,760	hours production		
Electricity						
Total production	9,783,707	kWh at	38%	Efficiency		
Average load	1,117	kW	and	5%	service time	
Heat						
Total production	11,382,706	kWh at	42%	Efficiency		
Process demand	3,948,385	kWh at	70	Deg C heating		
For utilisation	7,434,321	kWh	(849kW)			

An application is prepared for the ESB Networks to carry out a grid connection/capacity study to allow the facility to connect to the National Grid. This is expected to be processed in the next 3 months.

3.4.3 Primary Digestion

The Primary Digester **(DK01)** is the centre of the biogas producing process. The Digester tank proposed for Timoleague Agri Gen Ltd. is a 3,500m^3 steel, vertical, digester tank with 150mm insulation and PVC coated cladding surrounding the tank. The digester will operate at between 50 and 55 degrees Celsius - Thermophilic process. The external dimensions of the tank will be 15.0m diameter and 18.7m high. Internally the tank has a central roof mounted vertical shaft agitator. The tank will have 17 flanges of various sizes for the agitator, access, level, temperature and pressure probes. **Drawing No 013** has the schedule of the size, use and location of the apertures. The digester tank will have internal heating coils. It is intended to heat the biomass to the required temperature in the Batch heating chamber **(HK01 – Drawing No 029)** and the Pasteuriser **(PK03 – Drawing No 029)** prior to discharge into the digester **(DK01 – Drawing No 029).** The calculated retention time for

yielding gas is 20 days. A batch quantity will have to discharge from the primary digester **(PK02 – Drawing No 029)** to the secondary digester **(DK02 – Drawing No 029)**, to create the capacity within the primary digester for the new batch in the pre-heating tank to be pumped in.

The gas recovered from primary and secondary digester, is passed through and series of condensate wells. The content of these wells is the condensate from the gas. This is collected and piped to the reception tank, so that this condensate is also pasteurised.

3.4.4 Secondary Digestion

The Secondary Digester **(DK02 – Drawing No 029)** is a 4,300m^3 sectional circular insulated concrete tank, 30m diameter and 6m high, with a flexible roof to contain the gas ***(Drawing No 015 – Attachment 2).*** The tank will have a horizontally mounted agitator to maintain the biomass in suspension. Like the primary digester, the intended gas retention time is also approximately 20 days.

3.4.5 Separation

During Post Pasteurisation, the digestate is passed through a decanter separator where the solid fraction is separated from the liquid fraction. The liquid fraction is then stored in a geo-membrane lined covered storage basin for delivery to customer farms. The options for the fibrous portion are currently being investigated by NRGE Ltd. through a feasibility study. A final decision will be made when all possibilities have been assessed to determine which the best practice for this proposed facility is and which has the best potential to generate income.

3.4.6 Final Storage

Final Storage for the liquid fraction of digestate is in the proposed 3 no 4,300m^3 Geo-membrane Lined Storage Basins, details of which are shown in *Drawing 016* in ***Attachment 2.*** Since digested slurry must be properly stored and land applied afterwards, its management requires storage tanks to be loaded and unloaded with digested effluent. Thus, a traditional gas tight cover would not be sufficient as air must enter the tank in order to avoid the cover collapsing. The floating cover is floated over the digested liquid fraction surface so that it can move upwards and downwards jointly with the liquid level during loading and unloading operations.

All basins will be fitted with an abstraction point where liquid digestate can be collected for delivery to customer farmers.

The solid fraction of the digestate will be stored in the 3 no Fibre stores, details of which are shown in *Drawing 017* in ***Attachment 2.***

In addition a supplementary separate storage system is planned by a customer farmer on his own property to provide additional 2,500 m^3 of off-site storage to the 18,000 m^3 on-site storage. This combined storage capacity is in excess of 6 months storage for the entire process. ***Attachment 17*** shows the Record for available digestate storage capacity.

3.4.7 Biogas

Biogas production takes place in both of the Digester Tanks at the optimum temperatures and an oxygen free environment. In the vertical Primary Digester the operating temperature is 50 - 55^{o}C. The gas produced occupies the void at the top of the digester tank which has a fixed steel rigid roof; the accumulated gas is piped to the CHP unit and /or boiler.

In the horizontal secondary digester the operating temperature is 38^{o}C. This is a steel sectional tank with a double membrane cover; an air blower maintains a constant pressure of 0.5 Bar between the 2 sheets of the membrane. The gas collection route pipe-work is connected to both digester tanks to maintain a minimum pressure throughout the tanks. This pushes the accumulated biogas to the CHP Unit (The blower is similar to those used by Bouncing Castles).

Conversion of gas to Electricity and Heat is done in a Combined Heat and Power Unit (CHP). This consists of an internal combustion engine coupled to an alternator. The biogas is delivered to the engine using air pressure generated by the double membrane cover on the Secondary Digester. The engine is a spark ignition engine which turns the crankshaft and the alternator to generate electricity which also produces heat around the engine's combustion chambers; water used to cool the engine provides the heat for the digestion process and for space heating.

Gas production is calculated to approximately the capacity of the CHP Unit, in this case approximately 1.1MW of electricity and 1.25MW of heat. The electricity will be exported off-site to a dedicated grid connection, this connection will be a 10/20kv 3 phase line which consists of series of single poles with 3 cables approximately 40mm diameter similar to any existing rural 10/20kv line. It is intended to generate electricity for export to the national grid on a continuous basis with 500 hours down time (5% per year estimated).

Heat produced by the CHP Unit will be utilised to provide process heating for biogas production and exported to the adjoining Glass-House facility (Planning Reference 13/90) using insulated water-pipes to heat exchange at the glass house complex.

3.4.8 Leak Detection System

All tanks including the geo-membrane lined basins and the fibre stores will be fitted with a leak detection system, which will measure any leak between the inner and outer shells of the containers. A visual and audible alarm will activate if any leak is detected.

This system will comply with the Department of Agriculture, Food and the Marine Specification S126 of November 2002 – *Minimum Specification for Geo-membrane Lined Slurry/Effluent Stores and Ancillary Works* through the following:

Construction
A Department of Agricultural, Food and the Marine (DAFM) approved Lining Installation Contractor shall be assigned to carry out all construction works in relation to the proposed 3no Geo-membrane Lined Basins for Timoleague Agri Gen Ltd. As per the Department of Agricultural, Food and the Marine specification S126 of November 2002: *Minimum Specification for Geo-membrane Lined Slurry/Effluent Stores and Ancillary Works*, any other works which need to be carried out will be done so by the approved Lining Contractor or under the Lining Contractor's instructions. Details of leak detection pipe are on Drawing No 016 in ***Attachment 2*** and a typical storage basin installation is illustrated on the photographs in ***Attachment 25***

Certification
The DAFM approved Lining Installation Contractor will issue 3 separate certificates of Ground Preparation and Leak Tightness for Geo-membrane Lined Slurry/Effluent Stores when they are satisfied that the excavation, preparation and construction of the 3 no Geo-membrane lined basins at the site, meet the requirements of the DAFM S126: *Minimum Specification for Geo-membrane Lined Slurry/Effluent Stores and Ancillary Works.*

Leak Detection System
Furthermore, this Certificate of Ground Preparation and Leak Tightness for Geo-membrane Lined Slurry/Effluent Stores will also confirm that the DAFM approved Lining Installation Contractor has tested the integrity of the basin in relation to unwanted leaks and holes, and is satisfied that the 3 no Geo-membrane lined basins are leak tight meeting the requirements of S126: *Minimum Specification for Geo-membrane Lined Slurry/Effluent Stores and Ancillary Works.*

3.5 Types and Quantities of Waste, Emissions, products and by-products

In addition to the pig manure produced on Martin O' Donovan's Pig Farm, it is proposed to import additional organic waste streams (i.e. Dairy Floating Sludge, Paunch Bovine, Paunch Pigs, Flotation Sludge, Fat Trap Waste, Fish Waste, Fruit Residuals, Vegetable Residuals, Draff via Beer production, Seaweed, Feed Mill Residuals and Bread), from local identified sources. It is planned to bring the total volume of organic material to be treated at the proposed Anaerobic Digester to 48,500 tonnes.

A estimate calculation of the volumes along with the nutrient content of both the liquid and fibrous digestate that will be produced on site as shown in ***Table 5***. The liquid digestate will be recovered on lands whose owners who are currently customers for pig manure.

Table 5: Digestate Production

DIGESTATE CALCULATIONS FOR TIMOLEAGUE AGRIGEN			
TYPE	**Volume tonnes**	**KGS N/tonnes**	**KGS P/tonnes**
PIG MANURE	23000	4.2	0.8
DAIRY SLUDGE	11000	5.5	3.7
PAUNCH BOVINE	5000	5	1
PAUNCH PIGS	300	5	1
FLOTATION SLUDGE	1200	5.3	3.9
FAT TRAP WASTE	600	5	1
FISH WASTE	300	5.5	1.5
FRUIT RESIDUALS	300	4.3	1
VEGETABLE RESIDUALS	750	4.3	1
DRAFF VIA BEER PRODUCTION	750	4	0.05
SEAWEED	5000	5	0.4
FEED MILL RESIDUALS	200	4	0.05
BREAD	100	5	1
TOTALS	**48500.00**	**4.7**	**1.5**
VOLUME REDUCTION DUE TO GAS EXTRACTION @ 10%	**4850.00**		
ACTUAL VULUME DIGESTATE PRE SEPERATION	**43650.00**	**5.2**	**1.7**
PROPOSED SEPERATION PROCESS TO REMOVE MIN 70% P & 15% N WITH FIBRE			
TYPE	**ESTIMATED VOLUME tonnes**	**KGS N/tonnes**	**KGS P/tonnes**
PRESEPERATION	**43650.00**	**5.2**	**1.7**
LIQUID DIGESTATE	**39285.00**	**4.94**	**0.6**
FIBEROUS DIGESTATE	**4365.00**	**7.8**	**11.8**

LIQUID DIGESTATE FOR LAND APPLICATION AS FERTILISER		**TOTAL KGS**
VOLUME tonnes	**39285.00**	
KGS P/tonnes	**0.6**	**21998.3**
KGS N/tonnes	**4.9**	**194161.3**

FIBEROUS DIGESTATE FOR USE OFF SITE		**TOTAL KGS**
VOLUME tonnes	**4365.00**	
KGS P/tonnes	**11.8**	**51329.3**
KGS N/tonnes	**7.8**	**34263.8**

The Biogas Process captures the latent energy from organic biomass in as anaerobic environment, where the energy is recovered as biogas which is used as the source of fuel in a CHP Unit to produce electricity and heat. The biomass products to be processed are expected to be:

Table 6: Products to be processed

Material	Qty	Units	Means of Handling
Imported Biomass	48500	tonnes	Digestion
Exported Liquid Digestate	41100	tonnes	Land Spreading
Exported Solid Digestate	4570	tonnes	Land Spreading
Electricity	9,783,707 kWh		To the Grid
Heat	11,382,706kWh		Process/Glass houses
Domestic Waste Canteen Waste	0.5	tonnes	Waste Contractor
Waste Water			Pasteurised and processed through the biogas plant

3.5.1 Waste Acceptance and Characterisation Procedure

Objectives

- Ensure waste processed on site is suitable for digesting and characterised correctly. Waste unsuitable for the Anaerobic Digestion process is identified, isolated and controlled.

Responsibility

- Facility Manager
- Weighbridge Operators

Procedure

- Before new waste is proposed to enter the site, preclearance is sought from the customer which must include, description, origin of the waste and analysis (if requested). The Environmental/Technical manager will determine the EWC code for the waste and its Animal by-Product status. An internal ABP classification form is filled out to classify the waste.

- Any additional information (e.g. analysis) is retained along with the classification form for reference purposes.
- Once preclearance is given, waste is allowed enter the site and is weighed in at the weighbridge.
- All receptacles (trailers/tankers etc) entering the site must be covered and sealed. Tucks are directed to the waste acceptance area. An operator then signals to the driver when it is clear to tip waste. The load is visually inspected to ensure that it is consistent with the details provided in the waste classification form and, assuming is consistent, is cleared to process.
- If the waste is not cleared to process because of suspected non-conformity with the waste classification form, the plant manager is informed immediately. Following an immediate assessment of the suspected non-conforming load, the plant manager will either pass the load for processing or direct the load to be reloaded and removed from the site.

  All plant and machinery that come in contact with the waste will be thoroughly cleaned.

- Where a load is confirmed to be non-conforming, the non conformance and the corrective action record sheet (RS MC07) is filled in and all details and actions taken recorded in same.
- Once acceptance is completed, the weighbridge operator directs the driver to the weighbridge. The truck is weighed and a detailed receipt is given to the driver.

3.6 Air Emissions

A number of key targets were set at the design stage for this particular project. A general target was set to ensure reduction of emissions generally from animal slurry spreading activities in the general area. One of the main objectives of this application is to aid the overall reduction of emissions from Mr. O' Donovan's Pig Farm Unit. This issue was discussed in a report prepared by Odournet UK Ltd, in 2001 titled "**Odour Impacts and Odour Emission Control Measures for Intensive Agriculture - Part A Odour annoyance assessment and criteria for intensive livestock production in Ireland"**, which was commissioned by the Environmental Protection Agency, wherein *section 9.6* page 64 it states " *that a reduction in odour emission is not likely to be greater than 50% and more likely to be in the order of 25-30%"* by reducing crude protein levels in the diets. Emissions from open slurry storage tanks are also discussed in *section 9.9.1* page 70 wherein it states that "*ammonia emission reductions of 70-80% have been reported*" by covering open tanks. Removal of pig manure from this Facility at present is by tanker armoured suction hose inserted into the tank with minimal odour release.

This development proposes that all pig manure from the adjacent Pig Farm Unit and piped to the AD facility, will be utilised to produce gas via the Anaerobic Digester, and

transferred to adjacent covered storage tanks, after separation of solids, from where the odourless digestate will be exported to customer farms as liquid fertiliser. Odours that can arise during land-spreading of the pig manure, belly grass, and/or dairy sludge, will be eliminated by this technology. This proposed pipe-line will be dealt with separately to the planning application for the Biogas facility.

Gas flare will be incorporated in the facility as a precautionary measure. However, in normal practice, excess gas can be utilised by the CHP Unit and the boiler which can operate concurrently if there is excess gas available; the excess heat would be dissipated by heat exchangers.

3.7 Pig Manure Use Proposals

The current level of pig manure being produced on Mr O Donovan's pig farm annually is 14,600 tonnes and, it is proposed to supply all this pig manure as fuel to the Anaerobic Digester, for gas production. After digestion, the solids will be separated containing approx 70-80% of the P content. This material will be suitable for supply to a nursery, garden centre, or alternatively to fertilise an agricultural crop with a high P demand (e.g. Beet or maize). The remaining digestate will be exported to customer farmers operating in the hinterland, who are currently customers for pig manure, in accordance with Nitrate Directive Regulations (S.I. No 610 of 2010). Martin O' Donovan currently has planning permission to expand his sow number from 1,150 to 1,750 which will increase his slurry production by 8,317 tonnes to 23,000 tonnes for which this proposed facility is designed.

In the interim, the short-fall of this pig manure volume does not affect the over-all project design or structure. It is Martin O' Donovan's intention that the construction of these additional pig houses will not commence until quarter three of 2013.

Odours that arise currently during application of pig manure, belly grass, and/or dairy sludge, will be reduced by 80% approx by this proposal.

3.7.1 Domestic Sewage

Canteen and W/C facilities provided at the Biogas Plant will be connected to the reception system for the Biogas Plant and the waste stream will be pasteurised and treated with the other biomass streams in the Biogas Plant and will not require a percolation system.

3.7.2 Maintenance waste

Bulbs (infra-red/florescent) - The quantity of used Bulbs and tubes on the Facility will be small and these will be accumulated and stored on the facility until the annual visit Chemcar to the area.

Electric motors/fans- Metals - Metals accumulated in the compound Area for reuse or to have sufficient quantities for a Metals collection contractor.

A *Waste Management Plan* is included in ***Attachment 12***; this plan contains all details of the relevant details of the Permitted contractors designated for specific waste streams.

3.7.3 Digestate storage

The required digestate storage capacity is calculated based on BATNEEC Guidance Note for the Pig Production Sector (Revision 1 - February 1998). This requires a minimum of six months retention of manure.

The Biogas Facility has 17,800m^3 of post digestion storage with 220 m^3 and 1,500 m^3 of pre-digestion storage. An additional storage facility is being provided on a customer farm property for 2,500m^3 of liquid digestate. This will provide a total of 22,020m^3 of storage, which is the equivalent of 29 weeks of storage capacity.

3.8 Requests to use Pig Manure Digestate as Fertiliser

Traditionally, Mr. Martin O' Donovan has supplied the pig manure arising from his pig farm to neighbouring farms in a fertiliser substitution system. Grass and tillage are the predominant crops in South West Cork. In the main the slurry is spread in early spring replacing inorganic nitrogen and phosphorous fertilisers. Silage re-growth areas receive a top dressing in the June/ July period. The autumn application is generally combined with the farmers own bovine slurry. All applications are carried out in accordance with crop nutrient requirements as defined by the Nitrates Directive Regulations (S.I. 610 of 2010).

Timoleague Agri Gen will supply digestate to customer farmers in the area, upon request, and all deliveries will be documented on site. All customer farms are now required to comply with the Nitrate Directive regulations (S.I. No. 610 of 2010), and will thereby have to record these manure imports on site. Attachment 18 – Register of waste material capacity exported.

3.9 Plant & Equipment Available

Traditionally, the method of slurry spreading for land application has been by vacuum tanker, low trajectory splash plate, In recent times, a number of farmers have utilised land-spreading equipment minimise nutrient emission lost and odour generation. It is intended that the use of such equipment will be expanded further for application of the liquid digestate from the proposed Anaerobic Digester.

3.10 Land-spreading agreements

This Facility will supply digestate to customer farmers in the area, upon request, and all deliveries will be documented on site. A copy of this register format is included in ***Attachment 15***, and same will be available on site for inspection by Cork County Council, Department of Agriculture, Food and the Marine and the Environmental Protection Agency. All customer farms are now required to comply with the Nitrate Directive regulations (S.I. No. 610 of 2010), and will thereby have to record these digestate imports on site.

3.11 Services

The services that will be required on site are:

Power

The Parasitic electrical load on the Biogas Plant is estimated at 211 KVA. A 1.2MW CHP unit will be installed as part of the Biogas Facility, exporting electricity and providing heat and CO_2 to the proposed glass house facility on an adjacent site. (Planning Ref no: 1390)

Water

Water for the farm is already supplied by means of a private well located on the farm (location shown on *Drawing 007* – ***Attachment 1***). The total water consumption on the farm complex for the Biogas Plant and vehicle washing is expected to be approximately 28 m^3 per week.

We estimate the Biogas Plant water consumption to be as per the table below:

Table 7: Biogas Plant Water Consumption

Usage	No of Events/week	Estimate of time/event (mins)	Water consumption Rate (l/min)	Weekly Water Consumption (litres)
Vehicle/Container Washing	24	30	20	14400
Yard Washing	6	60	20	7200
Site Facilities				4050
Ancillary				1350
				27000

3.12 Maximum Soil Contaminant Concentration

The liquid digestate that will be applied as fertiliser to customer farmer's lands will not add any contaminant to the lands whereupon it is used. The chief elements in the digestate comprise chiefly of carbon, oxygen, hydrogen and nitrogen with lesser amounts of phosphorus, sulphur and copper. At an application rate of 15 m^3/hectares, the application rate of 0.45kg/hectare is less than 3% of that permitted in EC Directive 86/278 on the application of sewage sludge to agricultural land.

4. DESCRIPTION OF ALTERNATIVES CONSIDERED

4.1 Alternatives sites considered

As part of the scoping exercise carried out by NRGE Ltd. for the proposed development, a number of alternatives sites were considered during pre-design stage to ensure that the options that were of interest were evaluated, particularly issues such as site/route suitability. The areas considered by the applicant for the proposed Biogas Plant, included, but were not limited to the following;

A site in the adjoining towns-land of Cooligboy, north of Barryshall owned by the applicant was initially considered as the location of the proposed Biogas Plant. However, on examination of the road networks adjacent to the site, it was established that to expand these road networks would require additional capital expenditure through the purchase of land. The current site is a more viable option as there is adequate owned land for the expansion of the route network. Over the years this farm has developed to its current size. An alternative site would not be financially viable.

While the rest of the landholding was looked at for its suitability, no suitable alternative sites were available.

4.2 Alternatives Site Layout & Design

Alternative site layouts and designs were considered, but the current design was decided upon based on incorporation of the most modern engineering developments, which help minimise impacts such as noise emissions, odour emissions, and visual impacts.

5. DESCRIPTION OF EXISTING ENVIRONMENT

5.1 Location

The site location map (Ordnance Survey map sheet No CK 123 & CK 136 County Cork) is included in ***Attachment 1***, and the drawings and site plans for this development are included in ***Attachment 2***. The proposed site is located on a mixed farm operated by Mr. Colin Bateman; that over the years has been developed to ensure a sustainable future for generations to come. The farm has had beef, sheep, has grown grain, maize and sugar beet over the years. The farm has been expanded over the years through lease and land purchase to 300 acres. It is now a successful mixed farm with cattle, and sheep. Regarding crops concentration on the farm, a move towards growing grain and high yielding forage maize crops, again flexing to meet local market needs, has happened. The farm currently has 1 full time and 1 part time employee.

5.2 Deliveries to Customer Farms of liquid digestate to be used as a fertiliser

The application of the resultant liquid digestate to farmland is now regulated under S.I. 610 of 2010 and distribution of digestate from the site will comply with those Regulations. The Applicant is entitled to give digestate to any local farmer who wants it and is obliged to record all despatches from the holding; farmers acquiring manure are obliged to record all consignments acquired and to use it in compliance with the Regulations.

The pig slurry currently being generated on the associate pig farm operated by Mr. Martin O' Donovan is currently distributed to local farmers in response to their demand and for their use on their farmland. The applicant is entitled to supply it to his customer farmers who want it and are not prohibited from using it. The use of animal manure to fertilise farmland is subject to statutory control under S.I. 610 of 2010.

Upon completion of this proposed development, Digestate from the site would be supplied to these same customer farms, in response to orders and in compliance with law. The calculation of expected digestate production is shown in ***Attachment 10,*** and of the liquid digestate storage capacity which is calculated on the *Farm Structures Table* in ***Attachment 3.***

5.3 Generalised Description of the Existing Environment

5.3.1 Land Use and Cropping History

The lands whereupon it is proposed to recover digestate, consist mainly of tillage crops and grassland for grazing / silage production. Farm management standards on all these farms are good.

5.3.2 Water Quality Analysis

Teagasc has been monitoring the surface water runoff flows and quality from this valley in recent years; at a point upstream of this proposed development. It is intended to continue to monitor these results in future to determine and monitor any future impacts resulting from this proposed development. A summary report of the results and results of the local monitoring to date is included in a report in ***Attachment 4***. Upon completion of this proposed development it is intended to engage with this programme to monitor any impacts from the displacement of applications to land of pig manure, and other organic materials, in this catchment area, with the digestate fertiliser from the anaerobic digester process.

The site for the proposed Biogas Plant located in the South-Western comer of County Cork has Courtmacsherry Estuary Special Area of Conservation/Courtmacsherry Special Protection Area 450 meters to the West.

Courtmacsherry Estuary is part of the South Western River Basin District. Water quality status in this Estuary is determined to be 'probably not at risk'.

Elemental phosphorous is the nutrient associated with surface water pollution. The implementation of the Phosphorus Regulations (S.I. No.258 of 1998) in July 1998 has for the first time established statutory Environmental Quality Standards for Phosphorus. The water quality targets set by the government are ambitious and will require a wide range of abatement measures, focusing on the main sources of pollution sewage, industry and agriculture, further enhanced by European Communities (Good Agricultural Practice for Protection of Waters) Regulations (S.I. 378 of 2006) and European Communities (Good Agricultural Practice for Protection of Waters) Regulations (S.I. 610 of 2010).

5.3.3 Air Quality

The proposed development will be in an entirely agricultural hinterland where typical farm odours are to be found and expected. These odours arise from farmyards and lands during the day to day operations such as silage feeding, slurry agitation and land spreading

The construction of the proposed Anaerobic Digester will greatly enhance the environmental standards of the area including the improvement of air quality through the reduction of odour from traditional land-spreading and through reduced emissions of ammonia and oxides of nitrogen.

5.3.4 Noise Levels

A simple definition of noise is "unwanted sound". Noise levels are measured in decibels and a weighting factor (A) is applied to approximate the frequency response to the human

ear. This weighted decibel scale, dB (A) correlates well with human sensations of loudness, disturbance and annoyance.

Noise emissions from this facility will not be audible, outside of the site boundary. Noise levels are generally low and typical of a quiet rural area during daytime. A noise assessment has been carried out on the Facility by Mr. John McEniry BE and a report does not indicate any projected excessive noise from the Facility outside of those within the boundary limits generally imposed on industrial facilities. The Noise Assessment Report is included as ***Attachment 5***. Noise monitoring locations N1 and N2 are indicated in ***Attachment 23***.

5.3.5 Traffic Levels

The traffic on the L-4021-0, that will service the proposed Anaerobic Digester Plant, is mainly domestic and agricultural i.e. livestock Lorries, bulk milk tankers, silage and harvesting machinery.

Traffic is generated by the development under the following headings:

1. Staff transport
   There will be 4 movements to and from work daily, totalling 24 movements over the working week.
2. Service staff, sales, inspectors, etc.
   There will be an average of 4-6 car visits per week for service men, salesmen, and inspectors from all regulatory authorities to this Facility
3. Delivery of digestate to customer farmers.
   Delivery of liquid digestate to customer farmers per annum will require 1,633 annual movements by lorry (20/27 tonnes) and 4,200 annual movements by tractor/vacuum tank (15 tonnes) over the spreading period from 12th January to 15th October.
4. Approximately 48,500 tonnes of biomass will be treated on site annually. 23,000 tonnes of pig manure will be piped directly to the facility (Planning for this proposed pipe-line will be dealt with separately to the application for the Biogas Plant), 20 tonnes of imported organic material will be delivered to the plant by HGV amounting to 49 weekly movements and 2,499 annual movements.

5.3.6 Flora and Fauna

The proposed development is to be carried out on a green field site. An Appropriate Assessment Screening report has been prepared for this site and surrounding lands. See ***Attachment 6*** for a full copy of this report.

6. DESCRIPTION OF IMPACTS AND MITIGATION MEASURES

6.1 Human Beings

The Facility has the potential to employ 2 full time staff and 1 part-time position. This staff would reside locally with a significant positive economic impact on the area. The unit will also indirectly lead to another 40-50 jobs in the waste and biomass collection sectors. A sister project consisting of a glasshouse facility (Planning Ref: 1390) has the potential to provide a further 20-40 employment positions.

The nearest dwelling is 150m from the proposed development which is Mr. Colin Bateman's dwelling and farmyard. The development does not have a detrimental effect on the living standards of these residents or Barryshall House. A visual Impact Report is attached in ***Attachment 22***. The traffic increases associated with the development are minor.

6.2 Flora and Fauna

The Flora and Fauna associated with this site and surrounding lands has developed in line with the agricultural activities carried out there. There are no specific habitats, flora or fauna on this site that require specific protection. Flora and Fauna is described in the report attached in ***Attachment 6***.

6.3 Soils & Geology

Bedrock

The site lies within an area of devonian old red sandstones (DORS). The bedrock geology in the catchment is in the main cross bedded sandstone with a minor portion of muddy stone.
The old red sandstone describes a suite of sedimentary rocks deposited in a variety of environments during the devonian but extending back into the late Silurian and on into the earliest part of the carboniferous. The body of rock, or facies, is dominated by alluvial sediments and conglomerates at its base, and progresses to a combination of dunes, lakes and river sediments.

The familiar red colour of these rocks arises from the presence of iron oxide but not all the old red sandstone is red or sandstone — the sequence also includes conglomerates, mudstones, siltstones and thin limestone and colours can range from grey and green through red to purple.

Subsoil

The main subsoil in the catchment is Till derived from mixed Devonian and Carboniferous rocks. Till is a group of sediments that range between a high clay content group to a clast supported stony group. They are the sediments of glacial action. They are subdivided by particle size into six categories; clayey till, silty till, sandy till, gravelly till, stony till and till with gravel.

Groundwater vulnerability is an intrinsic characteristic of an aquifer which is determined by factors such as the type of subsoil and the depth of overburden. Other features such as turloughs, springs, caves, swallow holes and rock outcrops can affect the pollution risk to the aquifer.

<u>On-site impacts during Demolition/Construction Stage</u>

- Removal of vegetation, landscaping
- Use of heavy equipment resulting in soil compaction
- Accidental spills and leaks

<u>Mitigation Measures</u>

- Development works proposed for the site will not radically change the existing topography of the site.
- It is expected that all of the excavated topsoil and subsoil will be reused in landscaping throughout the site. The impact on soils locally as a result of the development will not be significant.
- If a spillage of contaminated material (such as oil or fuel) should occur during the construction stage at the site the potential exists for pollution of the soils in the area to occur.
    - Machinery will be checked regularly for leaks.
      In the case of an accidental spillage occurring, the developer will notify the Environmental Protection Agency, Cork County Council, The Department of Agriculture and Food, and any other regulatory officials and will take the necessary measures to clean up such a spillage. An Emergency Response Procedure has been put in place to deal for such a situation. This procedure is included in ***Attachment 11*** and in the event of any Emergency situation developing on site which may create an environmental risk.
- Regarding soil compaction: heavy machinery will be limited to access roads and the area in which the construction works will be carried out.

On-site during Operational Stage

- pollution of surface soil
- pollution of underground soil

There are many different ways that soil can become polluted, such as:

- Discharge of Manure/ Digestate into the soil
- Percolation of soiled/dirty water into the soil
- Rupture of geo-membrane storage tanks
- Accidental spills

Mitigation Measures

The problem with manure/digestate spills and leaks, as with air and water pollution is that it is not concentrated at a specific area in the soil that can be cleaned to prevent further impacts on the environment. Applying manure/digestate to the soil has positive impacts on the soil. However, side effects such as the addition of heavy metals, organ-chlorines and too many salts on the soil can be categorised as soil pollution.

It is the intention of Timoleague Agri Gen Ltd. to ensure that all best managerial measures are carried out; to ensure that leak detection points are monitored on a regular basis ensuring the integrity of the tanks and to ensure that surface water monitoring points are monitored.

It is also the intention of the unit to notify the Environmental Protection Agency, Cork County Council and the Department of Agriculture, Food and the Marine immediately following any accidental spillages.

Off-Site During Operational Stage

The application of digestate to soils can potentially cause negative impacts, where digestate spreading takes place when ground conditions are unsuitable.

Mitigation Measures

- Land suitability is carefully assessed before land is used for land-spreading digestate.
  Selecting soils with continuous soil cover for the application of digestate prevents leaching to bed rock.
- Adequate storage is in place to ensure that digestate is not applied during winter months.
- *Land Spreading of Animal Manures, Farm Wastes and Non-Agricultural Organic Wastes Part 1 - Manure (and other organic wastes) management guidelines for intensive agricultural enterprises* produced by Teagasc will be implemented.
- Timing digestate applications for the growing season maximizes the uptake by crops. It is important therefore to have appropriate storage.
- Avoid travelling on wet soils to avoid damage to soil structure.

6.4 Water

On Site during Construction Stage

Construction Activities pose a risk to watercourses. The main sources of contamination from construction activities include:

Silt: elevated silt loading in surface water discharge may result from construction activities, elevated silt levels leads to long term damage to aquatic ecosystem, clogging the gills of fish and smothering spawning ground. Chemical contaminants bind to organic particles and attach to silt which can lead to increased bio-availability of the contaminant. Silt also stunts aquatic plant growth, limiting the dissolved oxygen supply and reducing the aquatic ecosystem quality. Silt accumulations can also lead to flooding if it deposits, reducing the carrying capacity of the system and potentially causing blockages.

The vast majority of the proposed development consists of the construction of tanks which will be below the existing ground level. These effectively form attenuation ponds for peculation through the sides and the base because there is a requirement for space surrounding the perimeter of the houses and tanks to erect shutter pans etc. for the construction. Therefore, the areas between the existing ground and the tank construction form an effective sump to prevent silted water from reaching the watercourse.

Hydrocarbons: accidental spillages from construction plant and fuel or oil storage depots can cause faecal coli-form contamination due to poor containment and treatment of on-site washing and toilet facilities.

The extent of risk that these impacts have is determined by the proximity of the construction activity to the watercourse, as there is a sufficient distance to the watercourse and the sensitivity of the watercourse.

Installation of oil interceptors and the spill contamination facilities will not pose a risk to the local watercourse as there is a sufficient distance between the outfall and the larger surface water features.

Proposed Mitigation

Prepare an Emergency plan detailing the procedures to be undertaken in the event of a chemical, fuel or other hazardous waste spill, a fire or non compliance incident which any permit of license issues.

Ensure all staff is trained in the implementation of the Emergency Response Plan (***Attachment 11***) and the use of any spill control equipment as required.

Prepare a method statement for the control treatment and disposal of potentially contaminated surface water.

Pollution of aquatic systems during the construction phase will be reduced by the implementation of the following mitigation measures:

- Use of settling ponds, silt traps and bunds and by avoiding constructing burms near watercourses where possible
- When pumping of water is carried out, filters will be used on the suction side also to discharge through a sediment trap.
- Training of site managers, foremen and workforce, including all subcontractors, in the pollution risks and the preventative measures
- Where possible prevent water from entering excavations. Use cut-off ditches to prevent entry of surface water and well point dewatering or cut-off walls for ground water. Use the corner of the excavation as a pump sump and avoid disturbing that corner. Do not allow personnel or plant to disturb water in the excavation.
- Minimise the amount of exposed ground and stockpiles. Stockpiles can be seeded or covered and silt fences constructed from a suitable geo-textile may be useful.
- Wheel washes and plant washing facilities should be securely constructed with no overflow and the effluent should be contained for proper treatment and disposal.
- These should be regularly brushed or scraped and kept free from dust and mud deposits. In dry weather dust suppression measures may be required.
- The risk of spilling of fuel is at its greatest during refuelling of plant.

  Where possible:

  - Refuel mobile plant in a designated area, preferably on an impermeable surface and away from any drains or watercourses.
  - Keep a spill kit available.
  - Never leave a vehicle unattended during refuelling or force open a delivery valve.
  - Check hoses and valves regularly for signs of wear and ensure that they are turned off and securely locked when not in use.
  - Diesel pumps and similar equipment should be placed on drip trays to collect minor spillages. These should be checked regularly and any accumulated oil removed for disposal.

- Concrete is highly alkaline and corrosive and can have a devastating impact on watercourses. It is essential to take particular care with all works involving concrete and cement especially if working near a river, stream or surface water drain. Suitable provision should be made for the washing out of concrete mixing plant or ready mix concrete lorries. Such washings must not be allowed to flow into any drain or watercourse.

On Site During Operational Stage

The main potential threat to ground water in the vicinity of the proposed development is due to the storage of a relatively large volume of liquid digestate on site in the proposed 3 no Geo-membrane Lined Basins. In order to ensure that the proposed development does not impact on the groundwater in the hinterland the following measures will be implemented.

(i) All tanks are constructed to Department of Agriculture, Food and Rural Development Standards for construction of farm buildings.

(ii) The provision of a substantial amount of excess digestate storage capacity, well above the 6 month minimum requirement will ensure that organic fertiliser is managed to the highest possible standard on site. The table included at 3.5 calculated the volume of Manure and biomass processed per annum at 39285m^3. There will be storage available for 20,020 m^3 is more than 6 months storage.

This proposed development will further reduce the potential impacts at this site, due to the following mitigation measure,

(i) A leak detection system will be provided under all new structures and facilities in this proposed development. A regular inspection will be carried out of monitoring points, and records of these inspections will be maintained on site.

Customer Farmlands

Digestate can cause serious water pollution if discharged directly to groundwater or surface waters. The digestate will be spread in accordance with the Nitrate Directive Regulations (S.I. No. 610 of 2010) reduces the risk of groundwater contamination. To reduce the risk to groundwater, all pre-treated materials on site will be stored in tanks, built to Dept of Agriculture specifications. All digestate on site will be stored in covered storage tanks, constructed according to Dept. of Agriculture specifications.

There has been no historical contamination of groundwater at this site. This development will minimise the potential impacts at this site, due to the following mitigation measures,

(a) subject to sub-article (5), 200m of the abstraction point of any surface watercourse, borehole, spring or well used for the abstraction of water for human consumption in a water scheme supplying 100m^3 or more of water per day or serving 500 or more persons,
(b) subject to sub-article (5), 100m of the abstraction point (other than an abstraction point specified at paragraph (a)) of any surface watercourse, borehole, spring or well used for the abstraction of water for human

consumption in a water scheme supplying $10m^3$ or more of water per day or serving 50 or more persons,

(c) subject to sub-article (5), 25m of any borehole, spring or well used for the abstraction of water for human consumption other than a borehole, spring or well specified at paragraph (a) or (b),

(d) 20m of a lake shoreline,

(e) 15m of exposed cavernous or karstified limestone features (such as swallow-holes and collapse features), or

(f) subject to sub-articles (8) and (9), 5m of a surface watercourse (other than a lake or a surface watercourse specified at paragraph (a) or (b)).

(g) The application of digestate from the proposed Facility, which will replace the current practice of application of raw pig manure, will greatly reduce the risk of nitrate-nitrogen contamination of groundwater, due to the alteration of nitrogen which occurs in the process, rendering it more suitable for Plant uptake.

(h) AD increases the proportion of nutrients immediately available for uptake by Plants, due to the mineralization of nutrients during the digestion process.

6.5 Air

There are two aspects to the development relating to air quality: on-site issues and off-site land spreading.

On-Site during Construction

Odours arising from construction activities are minimal. However, the following mitigation measures will be implemented to ensure that odour nuisance is not caused.

Mitigation Measures

- A trained and responsible manager will be on site during normal working hours to maintain logbook and site inspections.
- There will be no bonfires allowed.
- All vehicles to switch off engines – no idling vehicles.
- Vehicles are to be kept in god working order and serviced regularly to minimise emissions and odours.
- Proper use and maintenance of plant and equipment.
- Ensure all on-site fuel tanks are checked regularly for leaks.
- Regular housekeeping of the temporary canteen/WC areas will be carried out.
- Removal of domestic waste from the construction compound will be carried out by a permitted waste contractor.
- Any temporary W/C utilities used on site during the construction phase will be maintained by an approved and permitted contractor.

On-site during Operation

The anaerobic digestion process involves the digestion of waste by bacteria and has the potential to cause odour. The process in which the raw materials are handled has the potential to cause odour related issues if not carefully managed. Odour from the organic materials is due to poignant biomasses in open storage, mitigated by maintaining all biomass in enclosed containers or structures.
There are no odour sensitive locations within 200m of the proposed Facility other than the Applicants dwelling. The surrounding undulating topography helps to mitigate the odour potential.

Mitigation Measures

The potential for odour emissions shall be maintained by a series of design features, work practices and mitigation measures.

- All deliveries of biomass to the facility and digested biomass from the facility will be in covered containers for solid and semi solid materials. An inspection programme will be implemented to ensure all trailer coverings are in place.
- Liquid biomass deliveries will be by tanker, similarly with liquid digestate exported from the facility.
- External doors of the reception building will be fitted with air curtains to maintain negative pressure within the building and only opened for vehicle movements.
- Handling within the facility is by pump and pipe-work to transfer all materials once it has been discharged into the reception tank which is located within reception building.
- The digester tanks are sealed airless tanks.
- Regular housekeeping of all work surface, floors and yards.
- Liquid digestate will be the only material stored in the proposed geo-membrane lined basins. Leaving the basins open would go to promote the production of odours. Therefore, to meet the need to control odours, Timoleague Agri Gen Ltd. have decided to cover these basins with a floating cover.
- As protection against odour nuisance on site during ordinary operation including delivery and tipping of biomass into the reception area, an exhaust system will be established from the proposed reception building to two bio filters located outside the building. The purpose of the exhaust system is to ensure that significant escape of odour from the building does not occur. The system will be designed to ensure the required number of air changes per hour is achieved. In order to maintain negative pressure within the building all exits will be closed during tipping of biomass into the reception area. All material delivered to the site can be tipped inside the proposed building under negative air pressure which will reduce emissions to air.

Customer Farmlands

The odour impact of land application of liquid digestate in comparison to pig manure will be reduced by 80% approx, based on studies undertaken in Denmark on the actual application of liquid digestate replacing pig manure applications. The net result of this proposed development will be a major reduction of the current level of emissions from the associated pig farm, in the order of at least 50%, and the resultant land application operations, in the order of 80%. The proposed customers lands whereupon it is proposed to use pig manure digestate are entirely located in a farming area where the air quality is determined by odours emitted from manure, animals and foodstuffs (e.g. Silage). Nevertheless, every effort is being made to reduce offensive odours to insignificant levels. The following mitigation measures will be in place,

- All manure digestate will be spread from tankers fitted with a low trajectory splash plate or band spreader to minimise aerosol formation and dispersion.
- Customer farmers will be advised not to apply digestate nearer than 100 meters of any dwelling house save with the express approval of the inhabitants in writing.
- No spreading of digestate will be permitted in windy weather close by dwelling houses or main roads.
- The proposed development of the Anaerobic Digester and the application of digestate rather than pig manure will significantly reduce impacts on air quality.

6.6 Climatic Factors

Mean annual precipitation for South West Cork, as recorded by Met Eireann is about l227.9mm, with an October monthly high of 138.2mm to a low for April of 76.5mm. The adequacy of storage of 29 weeks will ensure that digestate is spread only at times that are acceptable.

The proposed development will create an increase in traffic thereby increasing pollutant emissions from traffic. However, the Biogas produced is a renewable energy source and whether used as a transport fuel or to produce electricity, it displaces fossil fuel energy. Consequently, there is an overall reduction in emissions of greenhouse and acidifying gases from the overall development. Furthermore, CO_2 released as a result of the AD process will be utilised in the adjacent proposed Glasshouse Project rather than been released into the atmosphere.

6.7 Landscape

Visual impacts are a sub set of landscape impacts. They relate solely to changes in available views of the landscape and the effects of those changes on people.
The significance of landscape and visual impact is a function of the sensitivity of the affected landscape and visual receptors and the magnitude of change that they will experience.

The Biogas Plant

The potential visual impact of the development of this Biogas Plant could be described as perceptional vulnerability. It attempts to measure the advantage or disadvantage provided by the landscape for observation thus how critical is the view. Visual vulnerability of the landscape regarding this extension can be considered as:

- Highly vulnerable - if the development is on open countryside or in an amenity/recreational area or above the existing ground level.
- Vulnerable - if it is in an area where the development is only partially screened by trees and hedgerows.
- Not vulnerable - when at ground level away from public amenity areas and screened by trees and hedgerows.

Conclusion: The visual vulnerability rating for this development is regarded as not vulnerable.

The site is located in an area with a natural undulating landscape. Some of the structures on the Biogas Plant will be up to 18.7m tall. These are difficult to mitigate. Careful consideration will be given to the final colour of the high structures to minimise the visual impact (See ***Attachment 20***: *Photomontage of the proposed Anaerobic Digester Facility*).

6.7.1 Effects on Landscape Character

External Finishes

The external walls of the buildings are coloured to blend with the surrounding landscape as much as possible.

Building Heights

The buildings are designed to keep ridge heights to the lowest possible level. This is achieved by minimizing roof slopes and ground-floor to eaves levels.

Roofs and Feed Silos

The colour of the roof cladding and side cladding is dark grey or green. It is planned to tone all silos to muted greys or dark green.

Screening

In order to determine whether the proposed Anaerobic Digester would have significant landscape character effects within the local area, it is necessary to establish:

a) Whether it would be as dominant within an area as to give rise to a new landscape type.
b) Where the development is noticeable, but not a characterising element of the landscape; therefore will have no impact on landscape character.

(c) At locations where the development would be a noticeable but not a characterising element of the landscape, there may be a change in the view, i.e. a visual effect when looking out from an area, but the not the landscape.

The site has no visual impact on road users on the L-4021-0 Local Road.

6.7.2 Landscape Impacts

Landscape impacts likely to arise from the construction and operational stages of the proposed development are:

1. Stripping of topsoil and subsoil.
2. Construction of screening bunds from soils and overburden.
3. Construction of an integrated constructed wetland.

6.7.3 Landscape Receptor Sensitivity

Landscape receptors are areas of landscape, categories of vegetation, wildlife habitat or landform that would experience effects arising from the development. The sensitivity of receptors is a measure of the ability of each to accommodate change without undue detriment to its size, character or significance within its local context. Sensitivity can be determined by assessing the following:

- The importance of a landscape element or feature within the site.
- The importance of the landscape of the site within the local area.
- Its status in terms of landscape designations.
- Its wildlife or heritage value. Its scenic qualities and the presence or absence of detractors.

- Its uniqueness and “replace-ability”.

The sensitivity of landscape receptors affected by the development is discussed below:

- The proposed site is of low to medium sensitivity.

The proposed development of an integrated constructed wetland, adjacent to this proposed development, will enhance the biodiversity of the site, provide an essential service in the management of water quality, and help regulate water flow and thence prevent or ameliorate flooding.

6.8 Materials Assets

The Heritage Service was visited and the consultation revealed that the customer farms are not within sensitive areas for conservation i.e. S.P.A's, S.A.

Buffer zones are applied to the features listed below. Substitution of pig slurry for inorganic, commercial fertiliser will have no impact on earthen work features such as forts. Please refer to ***Attachment 7*** for the assessment.

6.9 Traffic

The entrance to the proposed Biogas Plant will be located on the L-4021-0 local road and will have adequate sightlines. A traffic survey was carried out on the 24th September 2012, the results of which are shown in ***Table 5*** below.

The proposed development consists of the development of a Biogas Plant to process the pig manure with additional biomass into an environmentally friendly biogas and digestate. Imported Biomass for the proposed Digester Plant will be in the order of 49 weekly movements (***Table 6***). The additional materials proposed are currently land-spread in its undigested form which has lead to odours during land application.

Table 8: Current Traffic Levels

Time	Vehicles coming from Timoleague				Vehicles going to Timoleague		
	Cars	Commercial	Construction/ Agricultural		Cars	Commercial	Construction/Agricultural
08:00-09:00	33	9	3		28	6	1
09:00-10:00	23	11	8		31	16	4
10:00-11:00	21	16	8		23	11	2
11:00-12:00	21	13	6		27	10	4
12:00-13:00	23	18	3		28	8	4
13:00-14:00	28	14	5		31	12	7
14:00-15:00	20	13	1		24	21	3
15:00-16:00	28	18	0		44	15	0
16:00-17:00	34	21	4		51	16	1
17:00-18:00	40	25	4		48	17	1

The following table ***(Table 6)*** shows the proposed total weekly and annual movements along with the associated tonnage for vehicles to and from the facility. Shown also is the proposed traffic movements for the adjacent Glasshouse Facility. Typical daily movements will amount to 93 movements from the Biogas facility, (i.e. 111 movements in total).

Table 9: Traffic Movements with the proposed Additional Biomass

Project	No	Vehicle Type Car/Lorry Ect	Details	Capacity	Weekly Movements (in/out)	Typical Daily Max. Movements	Annual Movements	Annual Tonnage
Biogas	1	Car	Staff to Work		24	4	1248	
	2	Lorry	Deliveries of Biomass	20 tonne	49	12	2499	25000
	3	Lorry/Tractor	Deliveries of Pig manure	20/27 tonnes	66	16	1704	23000
	4	Lorry	Solid Digestate	20/27 tonnes	14	3	363	4900
	5	Lorry	Liquid Digestate*	20/27 tonnes	63	16	1633	22050
	6	Tractor/Vacuum Tank	Liquid Digestate*	15 Tonnes	161	40	4200	22050
	7	Car	Service Staff, Sales Reps, Inspectors		6	2	300	
			Total Traffic Movements			**93**		
Glass Houses	8	Car	Staff to Work		60	10	3120	
	9	Car	Service Staff, Sales Reps, Inspectors		6	5	300	
	10	Van	Produce deliveries from the facility	3500Kg Loads	6	2	300	1092
	11	Lorry	Media to the facility	20/27 tonnes	2	1	100	1100
			Total Traffic Movements			**18**		

The volume of traffic to occur on site during the construction phase will be similar to the current levels as set out in the tables above. The site lines at the entrance of this Facility is indicated on Drawing No 09 in ***Attachment 2*** and details of the junction with L-4021-0, both are more than adequate (See report included in ***Attachment 13***).

A topographical survey was carried out by Mr. M. McEniry on the existing road from the proposed entrance to the Biogas Plant to Ballinadrollm Bridge. The stretch of road varies in width from 6.1 to 6.5 and 300mm wide verges with 1.5 to 2.0m high stone walls on both sides.

These stone walls have heritage merit and it is considered that their demolition would be unwelcome.

6.10 Noise

Noise levels are measured in decibels and a weighting factor (A) is applied to approximate the frequency response of the human ear. This weighted decibel scale, dB (A) correlates well with human sensations of loudness, disturbance and annoyance. Background noise level in rural areas of Ireland is in the 45-50 dB (A) range.

Noise levels at other times are insignificant. Environmental noise resulting from activities at the site should not exceed 55 dB (A) Leq during daytime (08.00 to 22.00hrs) and 45 dB (A) Leq during night-time (22.00 to 08.00hrs). Due to its remote location and the low population density in the area, this Facility will not create a disturbance to anyone. All traffic into and out from the Facility will occur during normal working hours. (See report included in ***Attachment 5***).

On-site during construction

Noise impacts from construction may vary greatly depending on the duration of the project. Noise will occur due to the construction of access roads, contractor's compound, the excavation of foundations, the construction of hard-standing areas and from the erection of the tanks and associated buildings themselves.

Noise from the delivery vehicles and concrete mixer trucks, will occur on local roads and on the access road. The construction traffic is likely to increase the existing traffic noise level at this location However, this will be a slight increase and the impact will be minimal. The noise levels generated by construction equipment will vary greatly depending on factors such as the type of equipment, the specific model, the operation being preformed, and the condition of the equipment. The equivalent sound level (Leq) of the construction activity also depends on the amount of time that the equipment is operated over the time period of construction.

Mitigation Measures
During the construction phase, the potential noise impact during daytime is slight due to the site location of the development. No special mitigation measures are likely to be required during the construction phase. The "best practical means" to minimise noise on site during the construction phase will be used and contractors will adopt the recommendations of BS 5228 Noise Control on Construction and Demolition Sites where practicable. However, the following will help control noise nuisance:

- Screening provided by the existing vegetation surrounding the site will mitigate any noise.

- Sensitivity to noise increases during the night-time hours. Therefore, all work will be carried out between the normal working hours of 08:00 – 18:00.
- Operating earth-moving equipment on the construction site as far away from vibration sensitive sites as possible.
- Selecting plant and equipment with low potential for the generation of noise.
- Proper use and maintenance of plant and equipment.
- Locating pumps and generators in positions that cause the least noise disturbance.
- Where there is a choice of delivery routes (for LGVs, HGVs), it would be chosen to avoid noise sensitive locations as far as practicable.
- Access roads will be maintained to control noise emitted from moving vehicles i.e. banging caused by empty trucks.
- Appropriate speed limits will be applied to access roads i.e. 20km.
- All vehicles servicing the site will be properly maintained especially exhaust systems.

On-site during operation

A typical anaerobic digestion plant will operate on a 24 hours, 7 days of the week, basis. Such operational hours/days have the potential to cause unacceptable impact on sensitive receptors such as residential properties particularly at night or early morning.

The major source of noise will be from lorry movements both entering and leaving the site and unloading of feedstock and removal of digestate.

The mechanical noise from the anaerobic digestion process will normally be limited to that of electric motors driving pumps and ventilation systems and, if properly maintained and sound proofed, should not normally cause a noise complaint.

Mitigation Measures
The following measures will reduce any potential noise impact;

- All operations will be undertaken within closed buildings.
- Buildings are designed to reduce internal noise transmission.
- The site is designed with acoustic barriers such as bunding, planting and fencing.
- The digester tanks will be fully covered omitting noise leakage from propellers/mixers inside the digesters.
- All plant is designed with noise reduction measures such as external motors housed in sound proofed covers. The CHP Unit is a Modular Containerised Unit will have acoustic insulation to significantly reduce the noise emitted from the CHP Unit from 106dB to 50dB adjacent to the unit.
- External doors to operational areas will only be opened for vehicle movements.

- Access roads will be maintained to control noise emitted from moving vehicles i.e. banging caused by empty trucks.
- Appropriate speed limits will be applied to access roads i.e. 20km.
- All vehicles servicing the site will be properly maintained especially including exhaust systems; a compulsory component of a Certificate of Road Worthiness, for the vehicle to operate on Public Roads.

6.11 Cultural Heritage

6.11.1 Methodology

This report is intended as the cultural heritage chapter of an EIS to accompany a planning application for an anaerobic digester at Barryshall, Timoleague, Co. Cork. The report was prepared by Michael Sweeney of NRGE Ltd on behalf of his client Timoleague Agri Gen Ltd. The proposal is on the site of an existing farm and in the vicinity of several recorded monuments. The report is based on a desk study and field inspection of the study area. The EPA guidelines on the compilation of Environmental Impact Assessments (2002) have been consulted. The chapter consists of a baseline study of the archaeological and architectural heritage of the study area, followed by an outline of potential impacts, predicted impacts and proposed mitigation measures. The following legislative frameworks have offered guidance;

National Monuments Act, 1930, as amended in 1954, 1987, 1994 and 2004 Heritage Act, 1995

The Architectural Heritage (National Inventory) and Historic Monuments Miscellaneous Provisions) Act, 1999

Local Government (Planning and Development) Act, 2000

Architectural Heritage Protection Guidelines for Planning Authorities

Department of the Environment, Heritage and Local Government (2004)

Action on Architecture 2002-2005 Government Policy on Architecture

Adv*ice Notes on Current Practice in the Preparation of Environmental Impact Statements*, (Environmental Protection Agency, 2003)

Guidelines on the information to be contained in Environmental Impact Statements, (Environmental Protection Agency, 2002)

Council of Europe Convention on the Protection of the Architectural Heritage of Europe (the 'Granada Convention 1984') ratified by Ireland in 1997

European Council Directive on Environmental Impact Assessment (85/337/EEC), 1985 and Amending Directive (97/11/EC), 1997

Charter for the Conservation and Restoration of Monuments and Sites (Venice 1964).

Convention for the Protection of World Cultural and National Heritage (1972)

Environmental Protection Agency (Licensing) Regulations, 1994 to 2010

6.11.1.1 Paper Survey

The desk study included a search of the following archaeological and architectural heritage sources;

- Recorded Monuments - All recorded monuments in the state have been given a unique number. The monuments are indicated on the archaeological constraint maps (based on the six inch series and recorded on a county basis) and listed in the accompanying index. The sites are afforded legal protection under the National Monuments Acts and Amendments 1930-2004.

- RMP Files - A file on each monument is kept by the National Monuments Service in their offices at The Irish Life Centre, Abbey Street, Dublin. The file contains any relevant details about the site. The file for each monument within the study area was inspected.

- Cartographic Sources - A number of early maps of County Cork including the first editions of the ordnance survey 6 inch and 25 inch series were examined.

- Cork County Council - There are several local authority initiatives designed to protect built heritage. The Record of Protected Structures appears as an appendix to the County Development Plan.

- NIAH - The National Inventory of Architectural Heritage survey of County Cork is a representative sample of buildings and structures of heritage value.

- Research - Relevant books, journals and other historical reference works were examined for any relevant information on the area.

6.11.1.2 Field Survey

A field survey of the study area was carried out which involved visiting the following locations;

- Site of proposed development: The existing house and farm and the location of the proposed anaerobic digester as well as the location of a possible future proposed glasshouse were inspected.

- Recorded Monuments: There are a number of monuments on the RMP in the vicinity of the proposal including some on lands in the client's interest. These latter include; CO136-016 - Country house, CO136-017001 - Standing stone – pair, CO136-017002- Anomalous stone group, CO136-018 - Ringfort – rath and CO136-019- Midden. All of these sites were visited and inspected as part of the field work.

- Haul route: There are no road realignments proposed in transporting material to the site.

6.11.2 Cultural Heritage in the Existing Environment

6.11.2.1 Archaeological and Historical Background

Barryshall is a townland of 579 acres in the barony of Ibane and Barryroe in the parish of Timoleague in West Cork. The name Timoleague derives from *Ti Mologa* and there is a tradition of a monastic site founded there by an early Christian saint associated with Iona and Clonmacnoise. The friary was founded in 1312 by the McCarthys, supposedly on the site of the earlier ecclesiastical centre and dedicated to St. Mologa. The friary has served as the burial ground for McCarthy Reaghs, DeCourceys. O'Heas and O'Cullens. The friary changed hands many times during the Tudorbethan reconquest and the war of the three kings and was burned and repaired several times. There is a McCarthy castle thought to date to the 12th century at the mouth of the Courtmacsherry estuary which survived to four storeys until the last century but is now much reduced.

There is evidence of prehistoric activity in Barryshall in the form of two pairs of standing stones to the NE of the house. On the early maps these are labelled 'Gallauns', which was the colloquial term for any standing stone or pillar. They were thought to be markers, commemorating a battle or person of some status but were also thought to be the focus of ancient ritual activity (O'Hallaran 1916). Stone rows comprise a row of three or more standing stones, intervisible and in a straight line (Waddel 1998). Two main types have been recognised - a Cork and Kerry group, in which the row comprises up to six stones, typically about 2m in height, with their long axes usually set in line, and a mid-Ulster group, where the row comprises numerous stones, usually not exceeding 1m in height, often found in association with cairns and stone circles. They are considered to have been aligned on various solar and lunar events and date to the Bronze Age (c. 2400-500 BC). There is subgroup of stone rows comprising two stones, typically about 2m in height, generally set with their long axes in line. There are over 100 examples of this monument type in Cork and Kerry. These have been placed in a period between 1700 BC and 800 BC. Two of the standing stones in the study area (CO136-017001) are considered to belong to this group but there is also an opinion that taken with the nearby stones (CO136-017002) they form an alignment if not a row *per se* (Whiteside 1937).

Fulachta fiadh also belong to the Bronze Age although there are some examples from the medieval from whence the name is coined. They are a common monument type and present in the field as typically kidney or horse-shoe shaped mounds. The mounds are composed of the discarded remains of heat shattered stone used to heat water in a trough. The troughs were dug into the ground and sometimes lined with wood. They can vary in quality from simple pits to large troughs lined with oak planks complete with jointing. The mainstream interpretation of their function is as a cooking place but other theories include, bathing, brewing and felt making. There is a fulacht fiadh (CO136-021) 700m SW of the proposal.

Ringforts are the most widely distributed and common monuments in the country. They consist of circular areas, defined by banks and external ditches, and excavation often reveals the remains of dwelling houses and outbuildings for extended families. O'Riordain (1979) described the ringfort as '*a space most frequently circular, surrounded by a bank and fosse or simply by a rampart of stone*'. Excavations have revealed that the ringfort was typically an Early Christian (*c*. 500 AD to 1100) settlement type although some have shown to predate and postdate this period (Sweetman and O'Brien 1997, 24). According to Stout (1997) ringforts were not built to repel prolonged sieges, or designed to annex territories and populations but rather to repel the lightning cattle raids, which were endemic during the Early Christian period in Ireland. In areas where there is little field stone, the banks are generally of earth, while in stony areas, the banks may be of stone, with either stone-cut ditches, or no ditch at all. They can be referred to as *caiseal*, *cathair*, *dún*, *lios* and *rath*. *Rath* is the term applied to those with earthen banks while *cashel* is referred to those constructed with stone banks. They tend to have a dispersed distribution, although some are occasionally located in pairs, or even joined together. There are ringforts 500m NNE (CO136-018), 850m SW (CO136-015) and 1km NW (CO136-007) of the proposal.

A holy well (CO136-008) lies 850m north of the proposed development site boundary. The tradition of venerating springs or pools has its origins in pre-Christian Ireland. These pagan sites were later Christianized and became holy wells (Farrelly and O'Brien 2002, 273). Pilgrimages to wells would follow a certain pattern: the pilgrim would approach the well, kneel and say some prayers, then go clock-wise around the well reciting more prayers. The wells were usually visited on the feast day of the local patron saint (ibid.). Some holy wells are attributed with curative properties. In 1704 an Act of Parliament was passed which forbade the practise of visiting holy wells with a penalty of whipping or a fine of ten shillings (Logan 1980, 16)

There is a Cistercian Abbey 750m south of the proposal. This is a religious house as listed in A. Gwynn and R.N. Hadcock 'Medieval Religious Houses Ireland' (1970). These date to the later medieval period (12th-16th centuries AD). The first Cistercian abbey in Ireland was founded in 1142 at Mellifont in Oriel by St. Malachy, having come from Clairvaux in France under the influence of the order's founder St. Bernard and by direction of pope Innocent II. The abbey at Timoleague was endowed by Dermot MacCormac MacMarthy in 1172.

There is a former corn mill 800m east of the proposal which Samuel Lewis describes as a flour-mill, "belonging to Messrs. Swete and Co., where 6000 barrels of wheat are annually ground, principally for supplying the neighbouring towns." (Topographical Dictionary 1837).

6.11.2.2 Recorded Monuments

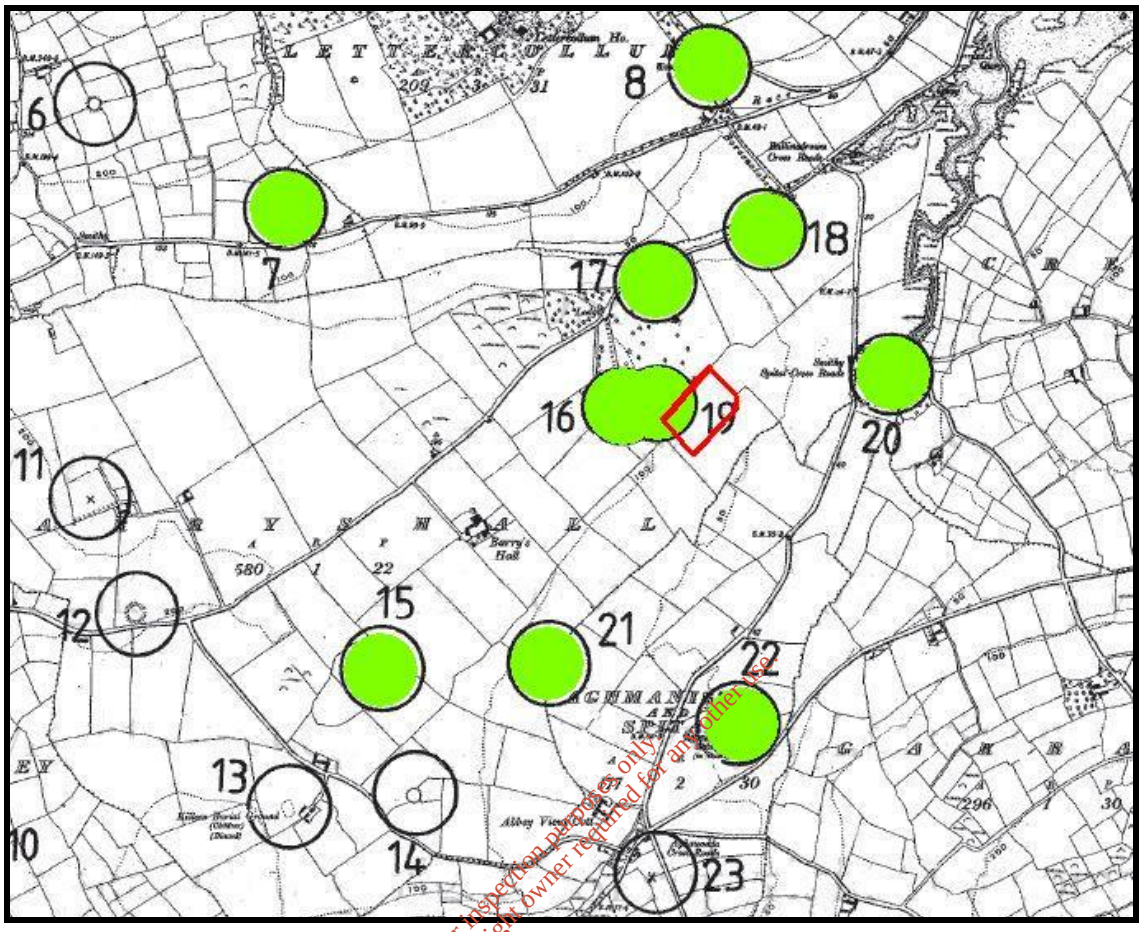

Figure 1 RMP constraint map (extract from Cork O.S sheet 13) with the site of the proposed anaerobic digester in red. Recorded monuments within 1km of the proposal are highlighted in green. Details in ***Attachment 7***.

6.11.2.2.1 Monuments within the site boundary

There are no recorded monuments within the site boundary.

6.11.2.2.2 Monuments within 1km of site boundary

There are 10 recorded monuments within 1km of the proposal; CO136-007 Ringfort - rath, CO136-008 Ritual site (Holy Well), CO136-015 Ringfort - rath, CO136-016 Country house, CO136-017001 - Standing stone - pair, CO136-017002 - Anomalous stone group, CO136-018 Ringfort - rath, CO136-019 Midden, CO136-020 Mill - corn, CO136-021 Fulacht fia, CO136-022 Religious house - Cistercian monks.

6.11.2.3 Topographical Files

The topographical files were searched for the following town-lands in the vicinity of the proposal:
Abbeymahon, Aghafore, Aghaminster and Spital, Ardmore, Ballinaroher, Ballincourcey, Ballynamona, Barryshall, Carhoo, Castle Lower, Cloghgriffin, Creggane, Curraheen, Currahavern East, Currahavern West, Garrane, Grange Beg, Grange More, Lettercollum, Maulmacredmond, Timoleague.

One result was found for Timoleague:

NMI Reg. No.: 1881:20
Simple Name: Amulet
Component: Silver
ID: 85634
Findplace: Unknown
Permanent habitation: KS. IR. SAF

Detail: This is a silver and glass 'connach' amulet studded with various coloured imitation stones. It was purchased from a John Lindsay who said it was originally found in a cemetery in 1843. It is curvilinear resembling in form larvae known as '*connach*' or murrain caterpillars traditionally connected in Ireland with the care the murrain in cattle. The amulet is 4 and ¼ inches long and weighs 1oz.

A detailed report is included in ***Attachment 7***, which was prepared by Dominic Delaney & Associates.

6.12 Impact on Barryshall House

As previously stated in *section 6.1 Human Beings*, Barryshall house is 150m away from the proposed Biogas Facility site. Barryshall House (CO136-016) was originally built in 1550 and rebuilt in 1745. It was described by Lewis in 1837 as "*the residence of J. Lucas, Esq., a large mansion, erected by one of the Barry family about a century since, and surrounded by a considerable plantation*."

The main potential impact of the proposed biogas facility on Barryshall House would be limited to a visual impact.

Location wise, the proposed site is approximately 150m South-East of the house with more than 50 mature trees planted around the house as identified on *Drawing No 031* attached to the *Visual Impact Assessment Report*, along with their species and approximate height tabulated (***Attachment 22***).

The general topography of the area slopes South-eastward and the ground level of the proposed biogas complex will be approximately 3m lower than the House. The maximum height of the biogas structures will be 18.7m tall (primary digester) which is below the height of the trees surrounding the House (the trees vary from 15 to 25m tall and are at a higher ground level 3m approx).

In order to protect the heritage value of the house, it is the intention of Timoleague Agri Gen Ltd. not to remove any vegetation which would result in any visual impact on the house.

6.13 Dust

Dust can potentially be a significant issue because of its possible effects on human health and also the nuisance that it can cause. Dust is defined as particulate matter less than 63 microns in diameter. Particles with a diameter less than 10 microns (known as PM10) have the potential to travel the furthest distance.

On-site during Construction

Construction activities have the potential to generate dust emissions. The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with ambient conditions including rainfall, wind speed and wind direction.

The potential for impact from dusts depend on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. Most of the dust would be deposited close to the potential source and any impacts from dust deposition would typically be within several hundred metres or so of the construction area.

Mitigation Measures

- The site access road onto the public road will be regularly cleaned and maintained as appropriate.
- The site will be regularly dampened during dry and/or windy conditions if required.
- Vehicles delivering materials to site will be enclosed or covered witj tarpaulins, where necessary.
- A wheel-wash will be provided on the construction site if needed.
- Material handling systems and stockpiling of materials on site will be arranged to minimise exposure to wind.
- During movement of soil/fill material both on and off-site, trucks will be covered with tarpaulins, where required.

The above procedures will be monitored by the Site Construction Manager. The dust minimisation plan will be reviewed at regular intervals during the construction phase by the Site Construction Manager and Timoleague Agri Gen Ltd. to ensure the effectiveness of the

procedures in place and to maintain the goal of minimisation of dust nuisance through the use of best practice procedures.

On-site during Operation

The careful design and operation of an anaerobic digestion facility can prevent significant dust impacts arising. One of the principle mechanisms for reducing the generation of dust is to operate within a negative pressure building. This means that air is drawn into the building, especially into areas where the waste is handled, which minimises the risk of dust problems. Dust can also be generated by vehicles along the access roads and the impervious yards adjoining the buildings. The following mitigation measures will be implemented to ensure that dust impacts are kept to a minimal.

Mitigation Measures

- Vehicles are to be kept in good working order and serviced regularly to minimise emissions.
- Vehicles travelling on access roads will not exceed the designated speeding limit i.e. 20km.
- The site access road onto the public road will be regularly cleaned and maintained as appropriate.
- Vehicles delivering materials to site will be enclosed or covered with tarpaulins, where necessary.
- The vehicle importing the biomass, once emptied, will be washed with an approved detergent or steam, while at the reception tank, using a high pressure washer.

7. INTER-RELATIONSHIP BETWEEN FACTORS

Table 10: Inter-relationships between factors

	Human Beings	Flora & Fauna	Soils & Geology	Water	Air	Noise	Climate	Landscape	Traffic	Cultural Heritage
Human Beings				√	√	√	√	√	√	
Flora &Fauna				√				√		
Soils & Geology				√				√		√
Water										
Air							√		√	
Noise									√	
Climate										
Landscape										
Traffic										
Cultural Heritage										

7.1 Inter-Relationship between Human Beings and Water

The Prevention of water polluting from fertilisers and certain activities is discussed in detail in *section 6.4* of the EIS.

The underlying aquifer is a groundwater resource and is known to be used by other well users in the area. The proposed development will result in an increase in the abstraction rate from the existing well on the adjacent farm (location *Drawing 007*, ***Attachment 1***). However, the total proposed daily abstraction rate will be relative low; circa 7.6m^3 per day, as against the current rate of 3 m^3 per day, an increase of 4.6m^3 per day. Therefore it is not anticipated that there will be any significant impact on local or regional groundwater levels or groundwater quality, as a result of increased abstraction rate. The proposed development will not result in any new potential surface water or groundwater impacts. Surface water and roof-water will be diverted to an existing stream west of the site boundary via a stormwater monitoring point SW1 (See location on the *Overall site plan* 003 in ***Attachment 2***). The storm water will be monitored prior to it entering the existing watercourse.

Groundwater

Pig Manure/Digestate can cause serious water pollution if discharged directly to groundwater or surface waters. The manure digestate will be spread in accordance with the Nitrate Directive Regulations (S.I. No. 610 of 2010); this coupled with the alteration of nitrogen in the digestion process means the proposed development reduces the risk of groundwater contamination.

There is also potential of pollution of the underlying aquifer from the proposed development primarily from accidental spillages/leaks from on-site storage tanks. Assuming the implementation of proposed mitigation measures the risk of pollution of the underlying groundwater resource and hence, the impact on other groundwater users in the area is deemed to be low.

7.2 Inter-Relationship between Human Beings and Air

An issue raised after consultation with local stakeholders was the effect this facility would have on the quality of air. There are two aspects to the development relating to air quality: on site issues and off site land-spreading.

On-site

The process has to be carried out in an oxygen free environment; therefore, the digester tanks are completely sealed thus reducing the likelihood of nuisance odours escaping. The storage lagoons will also be covered.

Any odours that might occur from the delivery of the sourced biomass will not be a nuisance outside of the boundary of the facility.

Off-site

The odour impact of land application of is mitigated by adherence to Teagasc Code of Good Practice, SI 378 of 2006 and SI 101 of 2009 and S.I. No 610 of 2010 maintaining a good working relationship with neighbours. The application of organic fertiliser in accordance with SI 378 of 2006 and SI 610 of 2010 will ensure that excessive application of digestate manure is avoided, the use of low trajectory splash plates/band spreading and/or injection, and the proper and even allocation of organic fertilisers, all customer farmers receiving organic fertiliser from the facility are advised not be applied to lands adjacent to neighbouring dwellings/potential odour sensitive locations, A recommended set back distance of 100 meters from an isolated dwelling and for 200 meters from a potential odour sensitive area/group of dwellings will be recommended.

7.3 Inter-Relationship between Human Beings and Noise

The major noises associated with a Facility of this nature will be the delivery of organic material to the reception tank and collection of the liquid digestate from the geo-membrane lined manure storage basins, a secondary source of noise is vehicles accessing and leaving the Facility. These traffic movements will occur between normal business hours of 8.00 and 18.00.

Vehicles delivering to and collecting from the Facility are maintained to the highest standard.

Noise arising from the operation of the facility will come from the generator and the Combined Heat and Power Unit (CHP). The CHP Unit will operate within a sound proof enclosure, specifically constructed for this purpose. The generator and all other components of the facility are housed in sound proofed buildings helping to control nuisance noise. Apart from these, noise emitted by the plant is insignificant outside the facility boundary.

Noise was another major issue that the local population in Timoleague were concerned about and they were reassured that the facility would emit minimal nuisance noise that would interfere with their daily lives.

7.4 Inter-Relationship between Human Beings and Climate

Agriculture is the dominant source of both methane and nitrous oxide emissions in Ireland Non-ruminants, pigs contribute to a lesser extent than ruminants. Increasing sizes of Tractor – Tanker sizes used to transport manure from the farm to customer farmers optimises the fuel consumption per m^3 delivered.

The proposed development will involve an increase in traffic in the area. This is due to the increase in Imported Biomass for the proposed Digester Plant which will be in the order of 49 loads of Feedstock per week. The additional digestate produced to be exported off site would be in the order of 14 loads per week. Exported liquid digestate will be in the order

of: lorry exported liquid digestate amounting to 1,633 annual movements and tractor/vacuum tank liquid digestate amounting to 4,200 annual movements. This additional traffic will increase the greenhouse gas emissions on site. However recognition must be taken of the fact that 50% of these traffic movements occur in the general area currently, and will continue to do so irrespective of the construction of this proposed development, in the form of current deliveries of pig slurry, belly grass, dairy sludge and other organic materials to farms in the general area for use as agricultural fertiliser.

The Biogas produced is a renewable energy source and whether used as a transport fuel or to produce electricity, it displaces fossil fuel energy. Consequently, there is an overall reduction in emissions of greenhouse and acidifying gases, both of which Ireland has international commitments to reduce. The CO_2 produced as a result of the AD process will potentially be used in the proposed adjacent Glasshouse Project also helping to control harmful greenhouse gases.

7.5 Inter-Relationship between Human Beings and Landscape

The Facility is located in a natural undulating landscape; the external finishes on the structures are green cladding which blends with the surrounding landscape and can be compared to any agricultural structure. The houses are low profile buildings with minimal pitch roofs to limit the visual impact. The tallest structure will be the Main Digester which will be 18.7m in height.

A landscaping report has been included in ***Attachment 14*** of the EIS. It proposes to create a burm around the perimeter of the site with specimen trees placed on top. Details of number of species of trees to be planted are documented in the Landscaping Report. The mature trees and the historic wall located to the north of the site will be retained.

It will not be possible to completely hide the development from view as the tallest structure on site is the primary Digester which is 18.7m in height.

The depth and area extent over which excavations (subsoil/bedrock removal) as required are relatively small in the context of the wider landscape. It is not anticipated that the proposed excavations will have any significant impact on the landscape.

Mitigation Measures

External Finishes

All selected colour/colours of the proposed Facility will be chosen so that the buildings blend in with the surrounding landscape as much as possible. It is proposed to discuss and agree with Cork County Council a suitable scheme prior to commencement.

7.6 Inter-Relationship between Human Beings and Traffic

The inter-relationship between humans and traffic is detailed in *section 6.9*. A topographical survey was carried out by Mr. M. McEniry on the existing road from the proposed Biogas Facility entrance to the Ballinadrollm Bridge located North of the proposed entrance. This stretch of road varied from 6.1 to 6.5 with 300mm wide verges with stone walls on both sides.
It is considered that the existing road network is capable of taking the traffic volumes generated from the Anaerobic Digester Facility. These stone walls have heritage merited and it is considered that their demolition would be unwelcomed in the locality.

7.7 Inter-Relationship between Flora and Fauna and Water

A flora and fauna report was prepared for the proposed development and is included in ***Attachment 6***.

The spreading of digestate has the potential to impact on water quality. It is essential that the recommendations for land-spreading outlined in *section 6.4* of the EIS are followed to minimise the risk to any watercourse

7.8 Inter-Relationship between Flora and Fauna and Landscape

The development does not result in the loss of surface vegetation through the stripping of soils. The soils were used to create a burm around the perimeter of the site which over time has been colonised creating areas of habitat and promoting biodiversity. The site is in a topographical depression and is partially screened by the surrounding landscape.

7.9 Inter-Relationship between Soils and Geology and Water

The site lies within an area of Devonian Old Red Sandstones. The bedrock geology in the catchment is cross bedded sandstone and minor mudstone. There are no adverse or unacceptable impacts on the geological environment as a result the development.

7.10 Inter-Relationship between Soils and Geology and Landscape

The works involved the removal of soil in preparation for the construction of the buildings. The overburden will be used to construct a burm on which have re-colonised which help mitigate the visual impact of the development and provides a habitat for flora & fauna.

7.11 Inter-Relationship between Soils and Geology and Cultural Heritage

There are no archaeological sites within the vicinity of the development.

7.12 Inter-Relationship between Air and Climate

The traffic associated with the proposed development is discussed in *Section 6.9*. The farm buildings are insulated to a high standard reducing the requirement for heating and fossil fuel consumption.

CO_2 produced as a result of the after the Anaerobic process has taken place will be used in the adjacent Glasshouse Project contributing to Ireland's control of greenhouse gases.

7.13 Inter-Relationship between Air and Traffic

The maximum impacts on ambient air quality will be experienced within about 10m of the roadside where the vehicles are passing. The impacts at distances further removed from the roadside will be insignificant since the pollutants will be rapidly and effectively dispersed as the distance from the roadside increases.

7.14 Inter-Relationship between Traffic and Noise

Delivery trucks, tractors and cars and these will not have a significant impact beyond the site boundary of the proposed Facility. The proposed development will not be a source of noise nuisance to neighbouring dwellings, the nearest dwelling belonging to Mr. Colin Bateman, a director on this development. Road-going vehicles are maintained to the highest standard with exhausts regularly attended to.

	Category	Potential Environmental Issues / Effects	Potential Impacts - Site	Potential Impacts - Customer Farms	Duration	Mitigation	Residual Impact
Human Beings	Agriculture and Land	Hydrocarbon - Mineral Fertiliser Substitution	Neutral	Positive	Long term	Organic fertiliser to replace Hydrocarbon - Mineral Fertiliser. Increase profitability by cost reduction in fertiliser	None
	Neighbours	Application of Digestate	Neutral	Positive	Long term	Lower odour impacts from land-spreading than from undigested organic fertilisers	Slight
	Climate	Contribution of Greenhouse gases	Positive	Positive	Long term	Conversion of Methane to electrical/heat energy with reduction in GHG, Use of harmful CO_2 gases within the Glasshouse Project produced as a result of the AD process.	Positive
	Traffic	Contribution of Greenhouse gases	Negative	Negative	Long term	Minimise traffic volume by optimising load sizes.	Slight
	Noise	Biomass deliveries and digestate removal	Negative	Neutral	Long term	Biomass deliveries and digestate removal during working hours.	Slight

	Air	Generation of Odours	Neutral	Positive	Long term	Exhaust system built into reception building, replacing pig manure with digestate significantly reduces odour impact.	Positive
	Category	**Potential Environmental Issues / Effects**	**Potential Impacts - Site**	**Potential Impacts - Customer Farms**	**Duration**	**Mitigation**	**Residual Impact**
	Water	Risk of Contamination	Neutral	Negative	Long term	On site storage tanks bunded, underground tank with leak detection system. Code of good practice applied SI 378 Customer Farms, Buffer Zones, and Fertiliser Planning.	Slight
Natural Environment	Flora and Fauna	Habitat Loss	Neutral	Neutral	Long term	Existing site of no significant ecological importance. The development of the proposed integrated constructed wetlands will enhance the natural environment	None
		Eutrophication	Neutral	Neutral	Long term	On site storage tanks bunded, underground tank constructed to Dept of Agriculture Specification. Code of good practice applied SI 378 Customer Farms, Buffer Zones, and Fertiliser Planning.	Slight

	Landscape	Visual Impact	Negative	Neutral	Long term	The Facility located in Topographical depression, Buildings with minimal ridge height, Walls of buildings plastered to blend to the surroundings.	Slight
	Archaeology	Disturbance of archaeological finds	Neutral	Neutral	Long term	Site not located near any archaeological sites.	Slight

8. MONITORING

8.1 Drainage from the Site

A drainage ditch flows from the site boundary to the Courtmacsherry Bay.

Uncontaminated roof water from the proposed facility is collected via the proposed storm-water collection system as identified as SW1 on the *Overall Site Plan 003* included in ***Attachment 2***, where it then flows into the adjacent watercourse to the Courtmacsherry Bay. The storm-water collection system in the Biogas Plant will be routed to a single monitoring point. A sample will be taken from this watercourse annually and analysed for COD at an independent laboratory. All soiled water from the site is diverted to the storage tanks. The storm water from the operation yard and access road in front of the reception building will be collected and diverted into an integrated constructed wetland (ICW), which will constitute 4 No ponds. The discharge from the last pond will be diverted into the adjacent watercourse, via a monitoring point. A visual inspection of these monitoring points will be made and recorded weekly. A copy of the storm-water visual inspection register is included in ***Attachment 16.***

The facility will require a Waste Licence under Part V of the Waste Management Act 1996, as amended. This licence will be issued and monitored by the Environmental Protection Agency. All emissions from the facility (including storm water discharges) will be controlled and monitored by condition of the waste licence if granted.

8.2 Groundwater and Surface Water

The water supplying for the current farm Facility is provided by a private well located on the farm shown on *Drawing 007 (**Attachment 1**)*.

8.3 Digestate

The digestate storage capacity on site will be monitored and recorded monthly, and a record of this register will be kept on site for inspection by Cork County Council the DOAFM and the EPA and any other regulatory officials at any reasonable time. A leak detection system will be installed on the site, details of which are included in ***Attachement 19***.

8.4 Other Wastes

A register of all other wastes will be maintained on site, recording the date, volume and destination. A copy of these registers will be available on site for inspection by Cork County Council, the DOAFM and the EPA, and any other regulatory officials at any reasonable time.

8.5 Accidental Spillages

Pig manure and imported biomass are the only material of concern, as feed and oil storage tanks on site will be locally bunded. Since tankers must be pressurised for delivery of liquid digestate, the risk of any sizeable leakage or spillage is minimal. In the case of an accidental spillage occurring, the developer will notify Cork County Council & the EPA, and any other regulatory officials and will take the necessary measures to clean up such a spillage. An Emergency Response Procedure has been put in place to deal with such a situation. This procedure is included in ***Attachment 11***. All tankers will be kept clean.

The primary method of containment of uncontrolled discharge is to eliminate them occurring in the first place by:

- Having robust procedures for transferring material to tanks within the facility from road vehicles.
- Ensuring that the delivery vehicles are within impervious kerbed areas before discharging their loads, insuring that the reception tanks have high level alarms.
- Filling of road vehicles from the geo-membrane storage lagoon will be via filling stand pipes located adjacent to the fibre stores at floor level of the fibre stores 20.5m FFL which is approximately the level of the crest of the storage basins, with a kerbed collection apron surrounding the stand pipe which drains to a collection chamber.

Control of a catastrophic failure of an over-ground tank would be contained by:

- The location of the geo-membrane lined storage basins to the Southeast of the facility was chosen on the lowest part of the complex. The finished floor level of the over-ground tanks and the reception building is 22.5m; with the secondary digester floor level 20.5. The crest level of the storage basin embankment at a similar level (20.5m FFL), see Drawing No 016, to provide containment if there was a catastrophic failure of a process vessel. Even with each of the basins full, there is 500mm freeboard between the top foil and the crest of the basin.

8.6 Control of Rodents

Staff members successfully carry out the control of rodents on the site. Management insures that this work is carried out professionally and that proper records are maintained.

9. ENVIRONMENTAL MANGEMENT PROGRAMME

9.1 Introduction

The applicant will implement and maintain a comprehensive monitoring programme on-site to provide maximum protection for the environment. This plan will involve maintaining an organic fertiliser register and visual inspection of all storm water outlets and leak detection monitoring points.

9.2 Management of Co-Product Use

The area available for use of liquid digestate is much greater than that required. Liquid digestate will be applied at the rates provided for in the Nitrate Directive Regulations (S.I. no. 610 of 2010). A delivery register will be maintained on site showing the date, amount of liquid digestate delivered the owner and herd number of the farmer and the volume of N and P delivered. This register will be available for inspection by Cork County Council, and any other regulatory official's at all reasonable times.

9.3 Periods and Rates of Use of Liquid Digestate

This issue is regulated by the Nitrate Directive Regulations (S.I. No. 610 of 2010), which provides for application of manure in this area between 15 January to 15 October, in accordance with a fertiliser plan. Timoleague Agri Gen Ltd is committed to ensuring that the use of liquid digestate from this Facility, is carried out in accordance with these regulations, and will advise all customer farmers to comply.

9.4 De-Commissioning/Life Span of Development

All facilities of this type require a major capital investment every 15-20 years to keep them efficient and pleasant places to work. So long as this investment is made there is no reason that a facility of this type could not operate for up to 40 years. However, if for economic reasons or technical reasons this does not occur decommissioning will take place. All pig manure and organic matter will be thoroughly removed from the site. All equipment and materials of value will be salvaged. Unused feedstock and fuel will be returned to suppliers. It is then proposed that the facility be left standing after making it safe and secure. It is highly unlikely that this scenario would ever develop due to the high initial capital investment in the unit.

10. MEASURES ENVISAGED IN ORDER TO AVOID, REDUCE AND IF POSSIBLE, REMEDY SIGNIFICANT ADVERSE EFFECTS.

The measures considered necessary are:

(i) A secure fence around the site and effective landscaping, natural colonisation of earth embankments where necessary, to screen the installation from obtrusive view from the public road and to blend it into the rural landscape.

(ii) Provision of a storm water drainage system to properly collect and discharge to field drainage all clean rainwater from roofs and clean surfaces via monitoring point SW1 as identified in the *Overall Site Plan* 003, included in ***Attachment 2***.

(iii) Construction of an integrated constructed wetland to treat storm water collected from access road and yard area in front of reception building.

(iv) Provision of soiled water drains to properly collect any effluent or soiled water and diverts it to the premixing tank.

(v) The collection and the removal from the site of all liquid digestate to be used by local farmers and fertiliser on their farmlands.

(vi) The collection and the removal from the site of hazardous waste materials (spent fluorescent lighting tubes, empty aerosol containers) generated on the site. Such wastes removed from the site are to be removed only to sites authorised or agreed as appropriate for the disposal or recovery of the waste concerned.

(vii) Monitor and maintain records of all monitoring of storm water discharged from the site.

(viii) Record and maintain required records of all consignments of waste despatched from the site.

(ix) Maintain all operation facilities in and adjacent to the Anaerobic Digester, intake area, and the reception building in a clean and tidy manner.

Implementation of the above will ensure that significant effects on the environment will be avoided and the risk of incidents of environment significant will be near zero.