

Gravel Pit Biogas Ltd – Sandhutton, York YO41 1LN

Appeal Ref: APP/Y2736/A/14/2226293 - Condition 12 – Digestate Management Plan Revision 1.

Revised Feedstock Impact. – Additional 6,500t of Grass Silage

The proposed increase of 6,500t per annum in grass silage will have little effect on the quantities of digestate produced by the AD plant. The initial proposal required the addition of greater quantities of recirculated liquid digestate / water. Much of this will be replaced by the additional volumes of grass silage which in itself is made up from approximately 75% water at a Dry Matter (DM) content of 25%. The additional volume of Dry Matter at approximately 1,625t per annum (6,500t @ 25%) will further be broken down during the digestion process when the biogas is released. The additional material will pass through the separator, described in further detail below, where approximately 75% (1,220t per annum) will go to the storage lagoon and 25% (400t per annum) will be a dry fraction to be stored in the silage clamps prior to application to the land .

The additional 1,220t liquid fraction is approximately 95% liquid and equivalent to approximately 1,220m³ by volume. This additional material will effectively reduce the storage capacity of the 18,000m³ lagoon by 2 weeks from 26 weeks or 6 months to 24 weeks or 5.5 months, which is still within the storage requirements recommended by the Environment Agency.

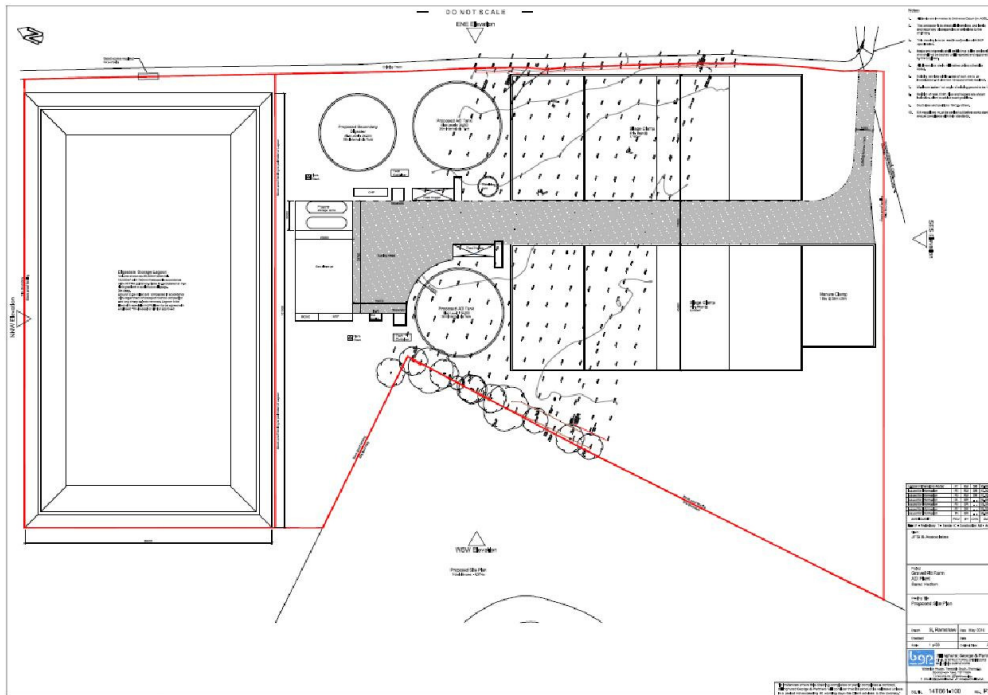
Following the process outlined below the Digestate Management Plan will demonstrate on an on-going annual basis, the ability to spread all of the digestate produced from the AD facility on the land holding at Gravel Pit Farm.

Storage of Digestate

The digestate generated from the AD process will pass through a screw press separator. This process involves the screw mechanically pressing the digestate through a cylindrical screen. Liquid is mechanically pressed leaving a solid dry fraction, typically 25% DM that resembles a compost type structure with the liquid fraction typically around 5% Dry Matter.

Advantages of separation allow the liquid fraction to be stored easily in a lagoon with any floating layer being minimised, the separation process having removed the majority of the dry matter. This liquid fraction is also recirculated back through the process to maintain the required dry matter levels within the tanks. The dry fraction is captured within a concrete silo beneath the separator, from where it will be regularly moved by the operator, to the clamps for storage prior to spreading to land as a soil conditioner.

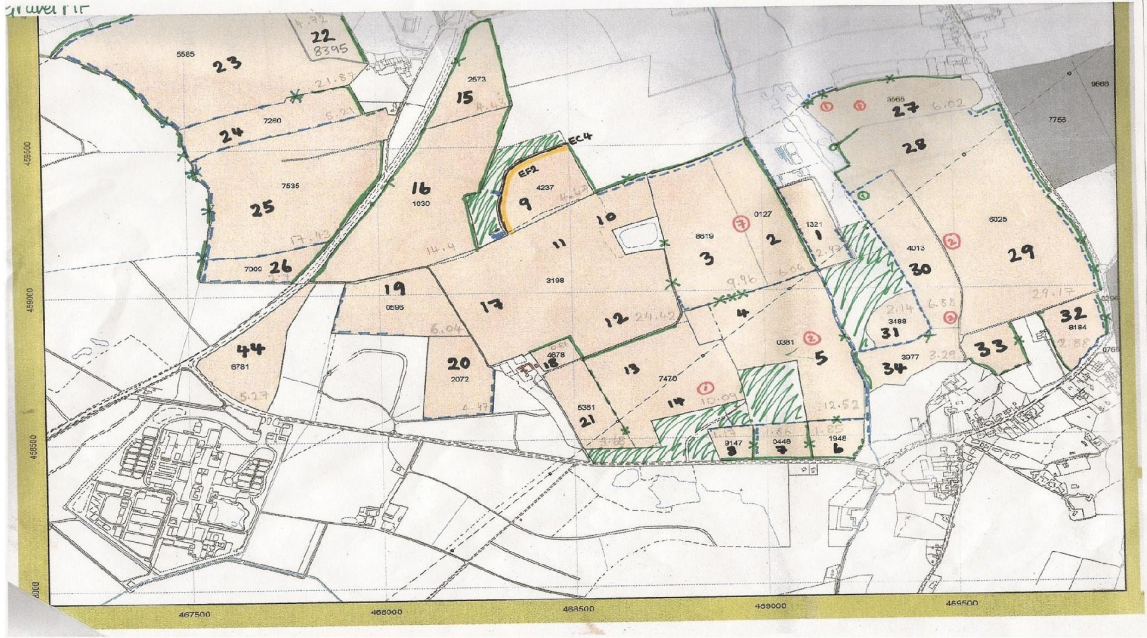
The lagoon shown on planning drawing 14T661-100 Rev P7 is sized to hold 18,000m³ with 750mm additional freeboard (26,000m³ gross) as required by the Environment Agency, providing 5½ months storage for the liquid fraction.



Planning Drawing 14T661-100 Rev P7

Gravel Pit – Environment Agency Field Map and Spreading Plan.

The plan below is the Environment Agency Field Map for Gravel Pit Farm. It shows the field numbers, ditches, buffer strips and spreading restrictions imposed by the Environment Agency. These fields will be used to spread the digestate arising from the AD plant. The quantities spread and the locations will vary annually depending on the crop rotation and the rainfall levels experienced during the year.



The Gravel Pit Field Map

Digestate Quantities

The AD plant will generate approximately 37,625t of digestate annually. This digestate will be spread entirely on the Gravel Pit holding shown above, in the necessary quantities required by the crops being planted and within the restrictions imposed and monitored by the Environment Agency. Each crop has different nutrient requirements as is documented in the DEFRA publication RB209. Rainfall levels, soil type and previous cropping all influence the levels of nutrients required. From the analysis available from similar plants (see example below) all the digestate produced by the AD facility is comfortably accommodated by the land holding at Gravel Pit Farm.

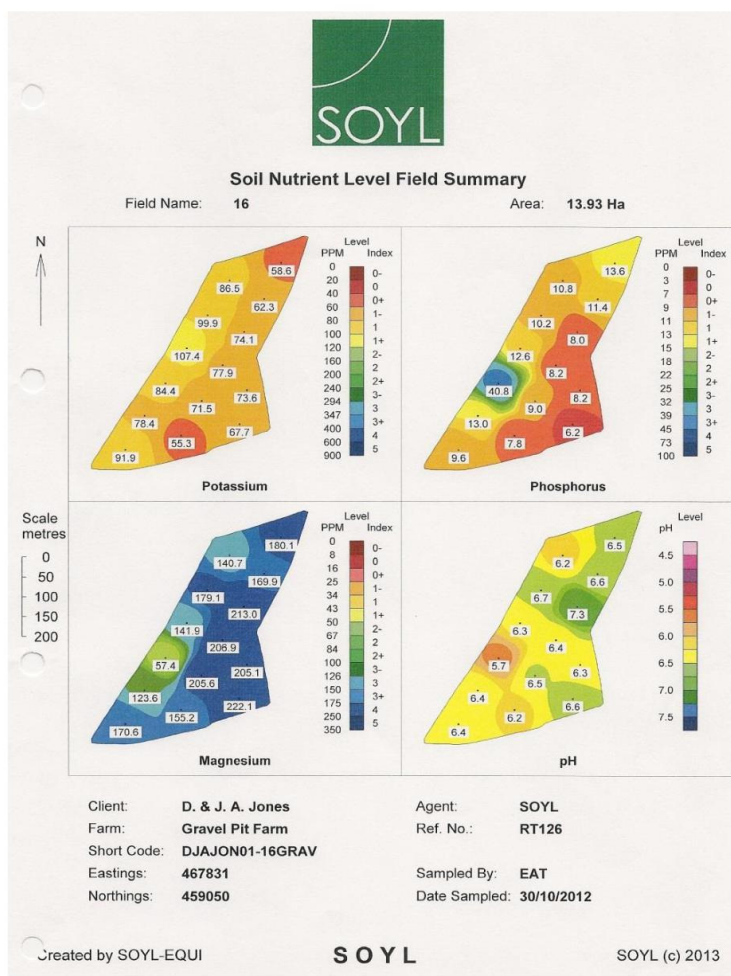
Indicatively the maximum level of Nitrogen (250kg/ha) that could be spread at Gravel Pit Farm which is approximately 323Ha, equates to 80.75t ($323\text{ha} \times 250\text{kg} = 80,750\text{kg}$ or 80.75t). At the levels of Nitrogen per tonne of liquid digestate derived from the analysis below (taken from a farm that uses very similar feedstocks), to achieve the maximum 250kg/ha of Nitrogen, 312.5t of liquid digestate could be applied to every hectare. This is termed the Equivalent Field Application Rate.

Using the analysis example below, the maximum tonnage that could be applied at Gravel Pit Farm would equate to 100,938t ($323\text{ha} \times 312.5\text{t per Ha}$).

Soil Sampling

As part of the Nutrient Management Plan employed at Gravel Pit Farm, soil tests are carried out every 3 years with samples as needed sent through an agronomist and the SOYL analysis for phos and potassium is undertaken every 5 years. Testing Nitrogen levels in soil is difficult to do in a laboratory and therefore the 'field assessment method' is commonly used and accepted. This is where rainfall, soil type and previous cropping are used to estimate what Nitrogen is left in the soil and therefore what needs to be added to support plant growth. PLANET a software package developed by ADAS and recognised by the Environment Agency and DEFRA as one of the best ways to keep records and make recommendations is used to calculate Nitrogen requirements as it contains all the historic aforementioned information.

In addition SOYL testing is carried out regularly to check the actual levels of other nutrients in the soil. Results are again input into PLANET which helps with recommendations for future years.



An historic SOYL analysis report for Gravel Pit Farm.

Digestate Sampling and Analysis

Regular digestate sampling will be carried out in January and June of each year by an independent laboratory to determine the nutrient content. In conjunction with the Nutrient Management Plan prepared by the farm, this analysis will be used to determine the quantities of digestate required to provide the necessary nutrients to the crop in the ground, without compromising the maximum levels governed by the Environment Agency.



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HOME FARM
NEWLY WISKE
NORTHALLENTON

DIGESTATE

DIGESTATE (Metric Units)

Sample Reference : LIQUID DIGESTATE

Sample Matrix : DIGESTATE

The sample submitted was of adequate size to complete all analysis requested.

The sample will be kept under refrigeration for at least 3 weeks.

Laboratory References

Report Number 65497
Sample Number 32686

Date Received 08-APR-2015

Date Reported 14-APR-2015

ANALYTICAL RESULTS *on 'as received' basis.*

Determinand on a fresh weight basis	Units	Result	Amount per fresh tonne or m3	Amount applied at an equivalent total Nitrogen application of 250 kg N/ha	Units
pH [1:6]		3.70			
Oven Dry Solids	%	12.3	123.00	38438	kg DM
Total Nitrogen	% w/w	0.080	0.80	250	kg N
Ammonium Nitrogen	mg/kg	116	0.12	36.25	kg NH4-N
Nitrate Nitrogen	mg/kg	<10	< 0.01		kg NO3-N
Total Phosphorus (P)	mg/kg	2283	5.23	1633.77	kg P2O5
Total Potassium (K)	mg/kg	4344	5.21	1629.00	kg K2O
Total Magnesium (Mg)	mg/kg	136	0.23	70.55	kg MgO
Total Sulphur (S)	mg/kg	4198	10.49	3279.69	kg SO3
Total Copper (Cu)	mg/kg	<0.2	< 0.01		kg Cu
Total Zinc (Zn)	mg/kg	26.4	0.03	8.25	kg Zn
Total Sodium (Na)	mg/kg	6518	8.79	% 2745.71	kg Na2O
Total Calcium (Ca)	mg/kg	657	0.66	205.31	kg Ca
Equivalent field application rate		—	1.00	312.50	tonnes or m3 / ha

The above equivalent field application rate for total nitrogen of 250 kg/ha has been provided purely for guidance purposes only. Organic manures should be used in accordance with the Defra Code of Good Agricultural Practice and where required within the specific regulatory guidance for the spreading of that material to land. To get the most benefit from your organic manures it is recommended that you follow the principles as set out in Defra's Fertiliser Manual (RB209) or as directed by a FACTS qualified adviser.

Released by Andy Chase

Date 14/04/15

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A typical digestate analysis report.

Adherence to Nitrate Vulnerable Zones (NVZ).

Gravel Pit Farm currently lies within a Nitrate Vulnerable Zone which has dictated the soil management of the farm from the beginning of the tenure by D & JA Jones. Gravel Pit Farm has its own in house FACTS qualified advisor, Joanne Jones to manage the Nutrient Management Plan of the farm via PLANET. As well as the commercial advantages of carefully managing fertiliser, compliance with the Environment Agency regulations is an absolute necessity to ensure the subsidies received by the farm are maintained.

The NVZ legislation covers all Nitrogen (N) applied to land of which there are several regulations, the main ones being:

- The livestock manure N Farm Limit (Farm Limit).
- Limits on N applied from organic manures / slurry etc. (Field Limit).
- The 'N' max – the maximum level of Nitrogen which can be applied to each crop.

All the farm records are kept on PLANET which stores the following information (not exhaustive):

- Field numbers and names.
- Areas of each field including the area which can have fertiliser / FYM etc. spread on it and those areas which are to avoid.
- Cropping information.
- Which fields are within NVZ's.
- Previous years cropping information.
- Crop recommended levels of Nitrogen, Phosphorus, Potassium and Sulphur.
- Planned fertiliser applications which are then combined with actual fertiliser applications.
- Planned manure / digestate applications which are then combined with actual manure / digestate applications.
- Numbers of livestock to ensure that one of the critical NVZ rules is complied with.
- Records of types and concentrations of fertilisers used.

This information is used in conjunction with the Environment Agency Field Map (see earlier) which shows location of ditches, buffer strips and manure heaps to use as a reference point when fertiliser / manure spreading. This is also necessary to comply with farm assurance schemes of which the farm is a member.

Current Methodology

- In autumn and spring each year decisions are made as to which crops are planted in which fields. This information is input into PLANET.
- In January/February each year fertiliser applications are planned for both winter and spring planted crops. This is input into PLANET against the field numbers and PLANET calculates the nutrient requirements. These requirements are then checked against RB209.
- As the software contains previous years information and nutrient applications, the recommendations which it generates takes into account any nutrients which are still left in the soil.
- The programme also contains all the NVZ rules and so when planning applications, the data input is constantly checked to ensure compliance with the regulations.
- In June each year planned applications of nutrients are confirmed as having been applied and this is used to help next year's recommendations.

Both the EA and DEFRA can conduct inspections of the farm records at any time and penalties can be levied against the farm for failure to comply with the necessary regulations.

Proposed Methodology

In addition to the current Environment Agency compliant methodology explained above, the following additional steps will be implemented.

Just as the nutrient levels in farm yard manure can vary dependent upon the diet fed to the, nutrient levels in the digestate can vary slightly due to the variability of the feedstock. Digestate analysis will be carried out bi-

annually by an independent laboratory. Analysis will be carried out in January of each year when the fertiliser applications are planned and June when the planned applications are confirmed on PLANET. This June analysis will act as a check on the nutrient levels from the January analysis. This analysis information will be uploaded onto PLANET for use in planning future spreading and nutrient requirements.

Digestate Management Plan

On an annual basis the Local Planning Authority can be provided the following information if required. This information will also be input into the PLANET software for review by the Environment Agency and DEFRA;

- Digestate analysis from an independent laboratory. The first analysis is expected 3 months after initial operation of the plant. This analysis will then take place in January and June each year to inform the planned digestate applications and to act as a check for the actual digestate applications.
- In February of each year the planned digestate applications (quantities and locations.)
- In February of each year soil analysis data for the fields tested in the previous year.
- In June each year confirmation of the nutrients applied.