In partnership with

wamitab

The Chartered Institution of Wastes Management

This certificate is jointly awarded by CIWM and WAMITAB and provides evidence to meet the Operator Competence requirements of the Environmental Permitting Regulations 2010 in accordance with the CIWM/WAMITAB Operator Competence Scheme.

Certificate Number: 1614

This is to certify that

David Baldwin

attended and satisfactorily completed the

Environmental Permitting Operators Certificate (EPOC)

held on **13th – 14th April 2016**

Chief Executive

D Baldwin - Statement of Technical Competence

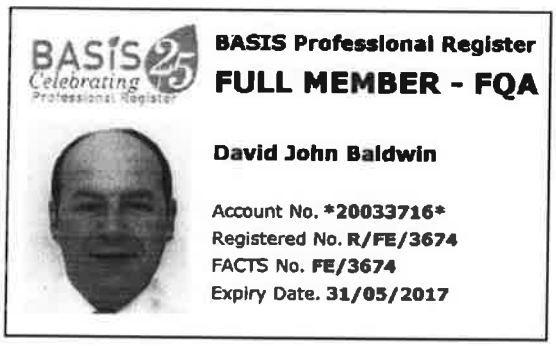
The Technical report for Good Agricultural Practice, fertiliser use and risk assessment has been undertaken by David Baldwin of Recogen Ltd. David has worked with ADAS the UK leading consultancy in Agriculture for 25 years, was then identified as an ADAS National Expert in Waste Management, and was formerly based at the ADAS Farm Waste Unit at Silsoe for 4 years as National Specialist providing technical expertise and training on agricultural and municipal waste management.

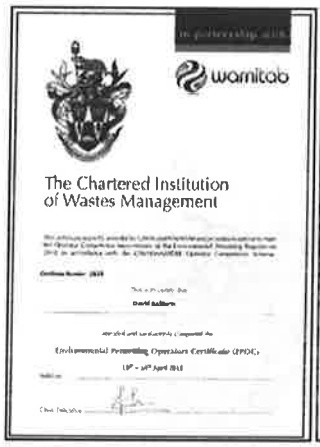
David has completed training and passed examinations for the FACTS Certification at Harper Adams University College. David has certificates for EPOC, IOSH, HACCP, and WAMITAB.

His FACTS Registered Certificate number is **FE 3674.** Scan of Certificate (Card) is shown below.

He has provided BASIS and NRoSO registered training for courses, workshops and seminars to farmers, consultants and agrochemical suppliers.

Recogen Ltd. is registered with Business Link and is a framework supplier of technical expertise and consultancy for organic waste treatment and recycling to WRAP. Recogen Ltd. Are members of the CIWM, REA Ltd and the ADBA.





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Statement of Agricultural Benefit

Document Ref.	**SAB-ESSITY-12022019**
This Statement of Agricultural Benefit has been prepared specifically for a Deployment to Environmental Permit (SR2010 No 4) Reference, EPR/SP3699VF, held by Paul Sweeney Agronomy Ltd to apply waste to agricultural land by:	
Mr C Thomas, Home Farm, Oakenholt Lane, Oakenholt, Flint CH7 6DF	
Waste Material	Recycled Paper Sludge
Waste Source	Essity UK Ltd. Oakenholt Paper Mill
Application Site	Home Farm, Oakenholt, Flint CH7 6DF
Grid Reference	SJ2568, SJ2670, SJ2669
Field Numbers	4827, 3320, 1820, 9298, 0229, 4449, 3450, 1625, 1743, 3921

Summary of Proposal	
EWC Waste Code	03-03-05
Quantity (tonnes)	1300 T 'dry' sludge and / or 1300 T 'wet' sludge
Field area (Hectares) (spreading on)	38.0 (36.0)
Application rate (t/Ha)	Dry Sludge, 36 t/ha
Application period	Mar 2019 – Feb 2020
Soil types	Sandy Loam & Clay Loam
Following crops	Mixed arable: barley, fodder beet, maize
NVZ Compliance	None of the land is within an NVZ.
Principal benefits	Available plant nutrients to crops (NPKS). Addition of bulky organic matter to soil, raising soil organic matter.
Potential contaminants assessed	Soils assessed for 11 PTE's, 2018 & 2016 Waste assessed for 11 PTE's in Jan 2019
Repeat Deployment	This application is a repeat of Deployment No. PAN-002333 for the same fields. Data & cropping amended accordingly.

Endorsement

The compiler, being a suitably qualified and competent person, endorses this Statement that application of this waste material as here described:

a. will result in genuine and lasting benefit to agricultural land
b. is beneficial to the immediate and succeeding crops grown
c. does not pose any significant risk to the future quality or productivity of the soil
d. does not pose any significant risk within the agricultural environment

Signed ..... **Paul Sweeney** **Date** 12/2/19

Contents

1. Executive Summary

The waste under application will be applied to agricultural land by the owner / farmer, Mr C Thomas of Home Farm Oakenholt. The land is in arable cultivation, generally rotating cereal and break crops as has been the established practice for in excess of 10 years. This land is productive Sandy Loam & Clay Loam soil. However, it is vulnerable to reductions in soil organic matter by the routine oxidation following cultivations. The loss of soil organic matter is conservatively estimated at 1% pa. Crops will benefit by the addition of available plant nutrients which will replace manufactured mineral fertilisers.

Maintaining or increasing soil organic matter is important and is now incorporated into policy at both EU and National level. The (currently suspended) EU Directive on Soil Protection highlighted the depletion of soil organic matter and supported the addition of exogenous organic matter (EOM) in building organic matter on vulnerable soils. Soil organic matter is a headline indicator in Defra's SFFS (Sustainable Food & Farming Strategy) and is specifically targeted in the Cross Compliance measures for soil conservation. In order to maintain on-going fertility and productivity, soil amendments which improve organic matter are therefore both required and justified.

Benefits demonstrated from the addition of certain plant nutrients, principally N, P & K are small but still significant. An addition of organic nitrogen will also benefit crops in the longer term. Additions of other plant nutrients, S, Mg, Ca, Na will all become available to crop plants with time. These benefits are in addition to the benefit of NPK nutrients and organic matter.

Data is presented showing the analysis of the waste, the soils and the relative additions of all the major and minor elements of significance. The waste is known to contain low levels of contaminants (PTE), as does the soil to which it will be applied. This offers security that soil contamination levels will not rise significantly as a result of the proposed application. Analysis shows that the soil PTE levels are within recommended maxima and there in no risk that these will be exceeded in the foreseeable future. Application of this waste material will make no significant or measurable difference to soil PTE residues.

There is no risk that application of this waste presents any significant risk to soil health & fertility nor to the agricultural produce being grown on it. The resident farmer, Mr Chris Thomas, intends maintaining the land in agricultural production and, with it, to continue to maintain the soil acidity level at an acceptable value by the addition of lime as required, always above a minimum of pH 5.5.

The principal benefit to agriculture from this application of waste is the addition plant nutrients (NPK) as well as of bulky organic material. This will contribute to the soil organic matter and help conserve this soil as agriculturally productive in the long term. It will help preserve this soil as stable, productive and fertile. It will also help reduce the risk of surface erosion by run-off, to which all of the fields are vulnerable.

Risks to persons using public footpaths on or adjacent to the spreading sites are mitigated by leaving a 10 m no-spread zone. No works will be carried out in fields while any members of the public are present. Risks to the adjacent wildlife site and ancient woodland - field P are mitigated by extending the no-spread zone to 20 m.

2. Introduction

The approach taken in compiling this Statement of Agricultural Benefit has been to demonstrate what is considered to be the obvious and compelling benefits, namely the addition of plant available nutrients, N, P & K as well as organic matter in order to substitute for the long term loss from the soil.

The benefits associated with the addition of paper sludge waste is that it substitutes for the soil amendments that a farmer would otherwise purchase and specifically apply according to soil and crop requirements.

3. The Compiler of this statement.

Paul M Sweeney, trading as Paul Sweeney Agronomy Ltd
Professional qualifications: BSc (Hons) Agriculture (1985), BASIS & FACTS qualified by examination (1986 & 1991), member of the BASIS Professional Register (RE1513 / FE109), BASIS soil & water specialist (2008)

Experienced since 1985 as an independent agronomist and soil nutrition specialist.
Working in private practice for commercial farmers and contracting to Natural England / Defra (Cross Compliance & Catchment Sensitive Farming etc).

Retained by ESSITY UK on behalf of Mr C Thomas at Home Farm Oakenholt as an independent agronomist and professional adviser. Paul Sweeney will provide monitoring and oversight to the farmer during and after the period of this Deployment and waste application.

4. Protocols & Regulations

The Environmental Permitting Regulations (2010) provide for the beneficial recovery of certain wastes to agriculture.

In addition, the following regulations, codes of practice & guidance will be observed:

1. NVZ Regulations (2008 & as amended) as they apply to designated areas
2. Sludge (use in agriculture) Regulations 1989 (for PTE's)
3. Groundwater Regulations 1998
4. Defra Code of Good Agricultural Practice (COGAP) Revised 2009
5. Paper Federation GB, Code of Practice for Landspreading Paper Mill Sludge

5. Benefit to Agriculture

The term 'benefit to agriculture' is here interpreted within the meaning and spirit of the EP Regs. This working definition, developed by the compiler, is taken to mean the following:
Application of the waste material to land:

a. will result in genuine and lasting benefit to agricultural land
The benefit to agriculture will be both short and long term, that the land and soil will be improved in relation to its chemical, physical and microbiological properties in relation to its potential for growing crops and grass or supporting livestock. This may involve enriching its plant nutrient status through addition of recognised plant nutrients necessary for healthy and productive crops, principally being N, P, K, S, Ca, Mg, Na and other minor nutrients essential for crop and animal health. This may also include improvements to soil acidity, soil organic matter status and in soil physical properties such as water infiltration, drainage and ease of mechanical cultivation. This includes reducing the risk of soil erosion, stabilising structural integrity to safeguard against surface runoff and wind loss.

b. is beneficial to the immediate and succeeding crops grown
The benefit to succeeding crops both immediate and later will be apparent in terms of their reliance on soil for water, nutrients, support and freedom from damaging contaminants and pathogens. This extends to the physical growth characteristics of succeeding crops which will not be impaired as a result of waste application, nor will the physical process of applying the waste to the soil result in damage to its physical properties which may impair growth.

c. does not pose any significant risk to the future quality or productivity of the soil
That the waste application is benign in its risks of contamination or physical impairment of soil quality such that all future agricultural use may be at least as productive as would be the case had the waste not been applied. Specifically, there should be minimal risk that any Potentially Toxic Elements (PTE's) which may accumulate in the soil should not exceed recognised maximum concentrations, these being monitored and data stored for future use.

d. does not pose any significant risk within the agricultural environment
That the general agricultural environment in terms of soil quality and health, air, water quality and biodiversity should not be impaired as a result of waste application, both immediately and in the future. That there is no increased risk of surface or groundwater contamination and that the biodiversity of the site is maintained as a result of application. That application will not adversely affect any features important to landscape such as hedges, trees, ponds and watercourses. That application will not be made to or impair any areas of particularly high biodiversity value or any uncultivated areas, whether or not they are subject to statutory protection.

6. Profile of the Agricultural operator

In addition to the benefit to agriculture, the compiler believes that the agricultural operator (the farmer, as a business its officers & staff) should recognise and exploit the benefit to agriculture of the waste. The operator should be a genuine commercial farming operation whose principal activity and income is principally based on agricultural production rather than the recovery of waste. Whilst recognising that financial payments may be made to receive & apply the waste, the levels of these should not be excessive so as to affect the judgement of the operator in conducting his farming business. The operator must, as far as possible, view the agronomic benefits as greater than any financial benefit.

7. Advice to the Agricultural operator

Paul Sweeney Agronomy Ltd will provide to the agricultural operator independent professional advice on the correct utilisation of the waste in an agricultural context. The objective is to ensure that the operator is able to extract the greatest agronomic benefit from the waste. This may include advice on Cross Compliance, soil management & cultivations, crop suitability, varieties, seed rates, sowing method, fertiliser and manure use, crop protection and pesticide applications as appropriate. The agricultural operator is expected to follow this professional advice.

8. Description of the waste, Paper Sludge

The waste generally consists of organic matter from recycled paper waste

None of the sources or processes involves any food, meat or waste of animal origin.
Analysis records organic carbon at 40%, indicating organic matter in the region of >95%

Various raw material sources are used to produce tissue paper in the Essity UK Ltd (part of SCA) plant at Oakenholt, Flint.

The waste pulp is the combined output of the plant. The waste is virtually all cellulose, hemicellulose and lignin which cannot be incorporated in the paper production. It is separated out, de-watered and consigned to waste. Dry matter content is generally around 11 - 20%, meaning that the material is easily handled and contained.

The waste generally consists organic matter. Analysis records average organic matter of 98%.

On occasion, plant breakdown at the Essity Oakenholt Mill means that the dewatering process cannot operate satisfactorily and waste that is principally water is produced, with dry matter at approx 0.7%. In this situation, fields have been allocated (D & E) which can suitably receive this low dry matter waste at a higher rate, reflecting the high water content. When such an event occurs, analysis of the low dry matter waste will be provided along with calculations to show the relative application rates of plant nutrients and PTE's. The use of this waste is generally only for a short period of plant outage and may not take place at all if the plant operates satisfactorily during the period. Specific analysis of the low dry matter waste is provided, as well as the relevant calculations of nutrient and PTE contents.

Appendix 1 summarises the chemical analysis for both types of waste.

Appendix 2 summarises the field schedule and demonstrates for each field the soil analysis including 11 PTE's and the effect of the waste application.

9. Context of Soil Organic Matter

The importance of soil organic matter is incontestable. A compilation of selected official and scientific publications (below) demonstrate the importance of soil organic matter and the issues surrounding its decline. Soil organic matter is declining in virtually all the UK soils in cultivation and this is reflected on this site in particular. Loss rates of soil organic matter are categorised in various studies at approx 1% pa. though rates on organic soils may actually be higher.

There is a universal recognition that maintaining and or increasing soil organic matter is beneficial to agriculture and the environment. These factors are now included in official guidance to farmers and are a vital part of 'Cross Compliance'. UK soils are losing organic matter at a considerable rate and policies are now in place to arrest and reverse this decline. The addition of bulky organic materials is an important part of this policy and guidance. At EC level, the recently proposed 'Thematic Strategy for Soil Protection' (currently suspended) reinforced the role of soil organic matter and supported recycling of exogenous organic matter (derived from non-agricultural sources) to agricultural land (with appropriate control & monitoring) for the benefit of increasing soil organic matter. The proposed EC Soil Protection Directive, (Brussels, 22.9.2006 COM(2006) 232 final 2006/0086) included these measures. This proposed measure has currently been suspended.

Soil Organic Matter is a headline indicator of soil quality in Defra's Sustainable Food & Farming Strategy (SFFS) and considerable research effort is currently underway to establish quantitative targets for soil organic matter. The currently-stated target of June 2006 aims to 'halt the decline of soil organic matter caused by agricultural practices in vulnerable soils by 2025'.

Within the EC & Defra's Cross Compliance standards for 'Good Agricultural & Environmental Condition', maintaining or improving soil organic matter status is a critical factor. The guidance to farmers makes clear that the addition of bulky organic materials is recognised as universally beneficial to all agricultural soils and especially so to those in arable cultivation.

The report of the technical working group established under the Thematic Strategy for Soil Protection, relating to organic matter & biodiversity, specifically refer to the use of exogenous organic matter and recommend that its use 'should be viewed as a positive activity that is to be recommended in production systems where good practices, soil and EOM quality issues are fully observed and accounted for'.

Most soils are an assembly of mineral particles (sand, silt & clay) combined with organic matter which mostly consists of decaying plant matter, dormant or largely inert organic matter and soil microbes (bacteria & fungi etc). This soil (at Home Farm Oakenholt) ranges from sandy loam through to clay loam typical of many. Soil organic matter and the microbial activity within it is critical to the agricultural quality of the soil. High quality and 'healthy' soils have adequate organic matter and a high degree of microbial activity. Intensive cropping tends to lead to a reduction in soil organic matter, mainly through oxidation following cultivations. Depletion of soil organic matter is a serious long term issue for the quality and health of most agricultural soils and in particular at Home Farm Oakenholt.

Maintaining or increasing organic matter is essential for improving soil quality, particularly its structural stability. Soils with adequate organic matter have a high structural integrity and are generally more resistant to physical erosion. Soils with depleted organic matter often become unstable and prone to erosion. Therefore a means of supplementing this loss by the addition of exogenous material is beneficial.

Increased levels of organic matter are a benefit to both the moisture retention properties of the soil and the chemistry of plant nutrients. Increased retention of soil moisture increases the reserves available to crops in times of drought. It will also ensure that microbial activity is maintained for longer periods during the growing season. Moist soils are also less vulnerable to oxidation of organic matter and are thus more stable in a cultivation regime. Increasing soil organic matter will specifically reduce the risk of wind blow, which is a serious agricultural and environmental issue.

Soils with high organic matter and microbial activity retain their nutrients more readily and enable crop plants to interact with nutrient pools. This maximises nutrient efficiency, increasing both soil retention and crop uptake while closing loss-pathways (of denitrification and leaching). The environmental benefit of this is reduced loss of nutrients from the soil.

Providing the application of exogenous organic matter is controlled to ensure beneficial use rather than sham disposal, the practice should be encouraged. Preparation of data to support the benefits is vital for the process of fully accounting for good practices referred to above. Equally, data to demonstrate that any potential disbenefits are of such low significance as to be discounted is also vital. The process of this report is therefore integral to such proper accounting and demonstrating the benefits and allaying any fears over potential disbenefits.

The process of approving a Deployment under the Environmental Permitting Regs requires that an agricultural benefit can be demonstrated. The timescale for the benefit should be relevant within the agricultural context but there is no specific requirement for it to be immediate. Where the benefit relates to a long term improvement as in the case of soil organic matter, the benefit should qualify within that time frame. Soil organic matter is such a long term issue and the benefit needs to be seen in this context.

While lime and soil nutrient benefits may relate to the immediate one or two crops, soil organic matter has the potential to provide benefits over a much greater timescale. In terms of relative importance, soil organic matter is considerably greater than the benefits from lime or nutrients because the benefit relates to the long term agricultural value of the soil. Lime and nutrients are transient benefits, organic matter is enduring and strategic.

Official & Scientific publications are included at Appendix 7

10. Agricultural Value of the Waste

10a. Soil at Home Farm Oakenholt

The soil at Home Farm Oakenholt is a mixture of mineral sandy loams through to clay loams. Waste will be applied to 10 fields in total extending to 38 Ha. These soils are in mixed arable cultivation with grass leys and are considered to be highly productive and fertile. The fields to be treated are in a mixed arable rotation growing mainly cereals and fodder beet and are rotated on occasion by grass leys.

This site in particular has been used for many years to produce cereals and other broadacre arable crops (barley, beet, potatoes, maize etc). In 2018, the land has been cropped with cereals, turnips, cereals and beet and the cropping cycle in 2019 is intended to be wheat,barley, maize and (fodder) beet. It is considered to be important to maintain these soils in a state of good productive condition in the long term. This soil is maintained in this productive state using drainage and cultivation by the owner, Mr Chris Thomas.

10b. Effects on soil organic matter

The waste consists of >95% organic matter, meaning that the application will supply 4.0 t/ha organic matter. This can therefore be expected to increase soil organic matter initially by 0.2%.

Applying additional organic matter can be expected to slow the decline in soil organic matter on these soils. Assuming a long term retention rate of 50% of the organic matter applied, this application will have the effect of raising the soil organic matter from its current level by an additional 0.1%, which is a significant value. Maintaining or increasing soil organic matter improves the microbial activity of the soil, improves the cycling and mineralisation of soil nutrients and benefits crops through increasing soil moisture retention and hence drought-tolerance.

In arable cultivation, loss of organic matter will be expected to be a minimum of 1% pa, and possibly as high as 2%. Applying additional organic matter can be expected to slow the decline in soil organic matter. This assessment is based on a loss rate of 1% and is consistent with published data for agricultural soils in England. In reality, it may be conservative.

10c. Paper Sludge as a source of Organic Matter

This waste consists of paper sludge waste which has undergone chemical and thermomechanical processing to a stable end-point. This material is a valuable additional source of organic matter within the soil and can be expected to contribute to a healthy and dynamic soil in terms of organic matter and microbial activity.

Application of this waste to land can be expected to enhance the soil organic matter pool and to improve the level of soil microbial activity. The benefits to agriculture will involve greater cycling of nutrients, increased nutrient retention, improved water holding capacity and reduced vulnerability to physical erosion. This soil can be expected to maintain its agricultural integrity and productivity significantly longer as a result of the proposed application.

The rate of microbial degradation is difficult to assess but is not critical to the agricultural value of utilising this waste. It appears likely that this material will degrade at a moderate rate because it is partially degraded prior to application. Substituting organic matter lost to the atmosphere is a benefit because it will slow the rate at which soil organic matter is depleted. Slowing the rate of depletion will help ensure that this soil remains agriculturally productive in the long term.

10d. Nitrogen

Application of this waste will be determined to supply a maximum of 124 kg/ha total nitrogen, which is 50% the field limit for NVZ (though the land is not actually within an NVZ) and recommended under COGAP (both 250 kg/ha). The benefit of this to crop growth is likely to be modest because of the nature of the release properties of this nitrogen. This is dependent on the organic matter and carbon cycle of the soil.

The ability of the waste to either release or 'soak up' (net-consumption) nitrogen depends on the ratio of Carbon to Nitrogen (C:N ratio). This waste has a C:N ratio of around 11:1 – which means that, as the soil microbes degrade it further, minimal nitrogen will become available to the soil nutrient pool and hence to crop plants. In the short-term, this waste will be 'nitrogen-neutral' to the soil & crop environment, not consuming excess soil-available nitrogen. In the longer term, this waste will release perhaps half of the total N contained but this cannot be given a short-term value for agricultural purposes.

Overall, the waste will make a small contribution to plant-available soil nitrogen supply in the medium term. The nitrogen benefit is therefore very modest.

10e. Other Plant Nutrients

The other main plant nutrients as Phosphorus (P), Potassium (K), Sulphur (S), Calcium (Ca) and Magnesium (Mg) are all useful to the total nutrient pool. The most important plant nutrient, nitrogen, is peculiar in its operation and has been dealt with separately above.

Microbial degradation will result in the release of nutrients and this should be regarded as an important benefit. The scale of the nutrient additions is, in agricultural terms, modest. Much of the nutrient application is likely to become directly available to crop plants in the medium term. This helps ensure vigorous microbial activity within the soil which has indirect benefits to crops in any case. The nutrient availability is likely to be of significance over an extended time period.

Phosphorus.
Most of the P will be organic and it is estimated that approx 50% will be available to crops in the medium term. This application of the waste will supply a total of approx. 50 kg/ha P_2O_5. Assuming 50% of this were made available over 5 years, this would equate to 25 kg/ha P_2O_5. This may be expected to make little difference to the soil index but would be beneficial to the crop P requirement. (Financial value approx. £ 22 / ha)

Potassium.
Release rate of potassium is likely be greater to that of phosphorus. This application may supply only 7 kg/ha K_2O. Perhaps 80% of this may become available over 5 years, equalling 5.6 kg/ha. This may be expected to make no difference to the soil index or soil K supply.

Magnesium
Magnesium content may supply a total of 19 kg/ha MgO. This would probably be of little benefit to cereal crops but may have some use for potatoes. (Financial benefit not determined)

Sulphur
The waste may also supply approx. 28 kg/ha SO_3 which is now recognised as an important plant nutrient. Like nitrogen, much of it will be held in organic forms and released on microbial degradation. Some fraction of plant-available sulphur may result from this application, but it is not considered worthwhile trying to value this.

Calcium
The waste may also supply approx. 22 kg/ha Ca which is an important cation. This will benefit crops and may indeed substitute for other cations such as potassium.

11. Limitations

11a. General limitations

Waste may only be applied where an agricultural benefit can be demonstrated. In addition, at the field level, restrictions exist for proximity to watercourses and any other sensitive features. The limit for watercourses is 10 metres. Within an NVZ, the limit for boreholes is 50 metres (none exist on this site). These limitations will be observed in drawing up the application plan. The land under application is NOT within the NVZ and so is not subject to NVZ restrictions.

COGAP Soil Code (revised 2009) recommends that a strict maxima of 250 t/ha should be observed on all soils. The proposed application rate ('dry' sludge) is 36 t/ha in one application, totalling 124 kg/ha N. This ('dry') type of waste will probably be the only type applied.

In the event of plant breakdown at the paper mill, it is sometimes necessary to spread liquid paper waste which has not had the benefit of de-watering (the machine for this being sometimes out of action). In these circumstances, the dry solids content of the waste will fall from 11% to 0.68%. Analysis of such waste has been provided and – in these circumstances – a maximum application rate of 250 t/ha will always be observed. This can be expected to supply a maximum rate of N as 100 kg/ha..
In the case of 'wet' sludge to fields D & E, application would be limited to 250 t/ha and this would supply 100 kg/ha total N - and associated nutrients at a similar level to the 'dry' sludge (see detailed data in Appendix 1) . For practical reasons, in the case where this 'wet' sludge is used, the application rate will likely be considerably lower than this maximum value.

A site-specific risk assessment for storage and spreading is provided.
This will determine relative risk and proximity to receptors and sensitive habitats. This will be incorporated in the application plan.

11b. Nitrogen

The most-limiting element in the waste is the total nitrogen content. The advised limit in COGAP is 250 kg/ha in a 12 month period and is also the field-limit for manure or waste application in Nitrate Vulnerable Zones, NVZ, (though they do not actually apply here).

The rate applied by this application is determined to total 124 kg/ha total N on the basis of the analysis of the waste (2.99% N in DM). Therefore, not only will the 250 kg/ha limit be observed but the application will be only 50% of the advised maxima.

The reality is that much of the nitrogen in this waste is bound up in the organic matter and is not immediately available to crop plants. Nitrogen will only become available through microbial degradation of the waste, which will take 3 – 5 years to reach equilibrium.

11c. Potentially Toxic Elements (PTE's)

All biological material contains the natural background levels of micronutrients and trace elements.
Many of these trace elements can also be considered toxic contaminants and the application levels need to be monitored. Controls for these elements mirror the controls for waste such as sewage sludge and are enshrined in various legislation, and specifically COGAP (Code of Good Agricultural Practice for the Protection).
Appendix 1 details PTE loads in the waste 'wet' & 'dry' materials and the soil data at Appendix 2 demonstrates PTE load & capacity based on the 'dry' sludge waste.
Fields D&E show loading for both waste types, depending on which may actually be used.

Excerpt: "Towards Sustainable Agriculture, A Pilot Set of Indicators", MAFF , 1999/2000

Resource use 27. Accumulation of heavy metals in agricultural topsoils

Heavy metals such as copper, zinc and molybdenum are essential trace elements for plants and animals. However, high soil concentrations of metals such as copper and zinc can damage soil fertility. Additionally, cadmium and lead can have adverse effects on human and animal health if they are allowed to accumulate in the food chain. The occurrence of high concentrations of heavy metals in agricultural soils is very localised. Metals in the soil originate from the parent material (underlying geology), mine wastes, atmospheric deposition from a range of sources, animal manures, sewage sludge and other wastes and agricultural chemicals. The residence time of most heavy metals is very long. They tend to be immobilised in the soil and are often unavailable for uptake. Some can be removed through plant uptake and, to a lesser extent, leaching.

An assessment shown in **Appendix 1** calculates the quantity of Potentially Toxic Elements (PTE's).

Both waste & soils have been assessed for all 11 PTE's; 7 statutory and 4 advisory.
The conclusion is that the levels supplied are safely within the limits imposed by COGAP. Because of the nature of the organic matter in the waste, the soil / plant availability of such elements is likely to be very low compared to rapidly degradable waste such as sewage sludge.

The total application rate of the most-limiting element, Molybdenum, equates to 5.3% of the annual maximum (10-year average) recommended under Cogap. At this rate, 19 repeat applications / year could be made year-on-year over 10 years without breaching the maximum limit.

The total application rate of the least-limiting elements, Selenium and Mercury, equates to only 0.41% of the annual maximum (10-year average) recommended under Cogap. At this rate, almost limitless repeat applications / year could be made year-on-year over 10 years without breaching the maximum limit.

Soil residues are well within the guideline maxima for all elements. At these levels, there is no significant risk of contamination of agricultural produce. Further, application of waste cannot be anticipated to result in increased PTE levels either through direct contact or root uptake.

Application to this soil of the amounts of PTE calculated in the Appendices will have minimal effect on the residual soil levels and pose no risk to groundwater, surface waters or agricultural products. This application can therefore be deemed safe.

12. Determining Application Rate

a. Application Rate

Application rate should be determined by reference to both the agricultural benefit and the maximum limiting element.

In terms of agricultural benefit, the value of the material is in terms of soil organic matter and the only limit is physical incorporation. However, within the normal parameters, this poses no limitation and so the rate can be maximised to the chemical limitation.

Chemical limitation should be bound by both agricultural nutrients and PTE's. Relevant regulations should be observed and values shown to comply.

Detailed data showing the calculation is at Appendix 1.

The level of PTE's in the waste is minimal and offers no limitation.
In addition soil PTE levels are all well within permissible limits and pose no limitation.

The most limiting element is Nitrogen. COGAP recommends a maximum application rate for total nitrogen as 250 kg N /ha /year, the same limit applying within NVZ's.

Thus, based on this limitation, the maximum application rate can be determined at 83 tonnes / ha to the NVZ limit (based on the analytically determined N content of this waste source,
i.e. 2.99 %N in DM, DM content = 11.5 % DS = 0.344% N in fresh material).
to supply total N of 250 kg/ha N

Because the waste supply is modest relative to land available, it is proposed to only apply 50% the maximum level that would be permissible under COGAP / NVZ, i.e not more than 125 kg/ha total N (shown on Appendix 1).

To match the land area available to the quantity of waste, this Deployment is therefore based on:

Total land area = 38.0Ha Net area to spread = 36.0 Ha
Land available for spreading = 36.0 Ha x 36 tonnes/ha application rate = 1,296 tonnes ('dry' sludge)

This Deployment is made on the basis of 1,300 tonnes representing:
36 Ha @ 36 t/ha = 1,300 tonnes, total dry sludge

This rate has been used in all the calculations for nutrients in the Appendices.
The rate is considered safe both in agricultural terms and from the perspective of nutrient supply and PTE's.

One application is planned to each field under this exemption, as land becomes available either pre-sowing or post-harvest, commencing March 2019.

** In the event of plant breakdown, it is sometimes necessary to spread liquid paper waste which has not had the benefit of de-watering (the machine for this being sometimes out of action). In these circumstances, the dry solids content of the waste will fall from 11% to 0.68%. Analysis of such waste has been provided and – in these circumstances – a maximum application rate of 250 t/ha will be observed. This can be expected to supply a maximum rate of N as 100 kg/ha*

In this event, liquid waste will be analysed at time of spreading to determine N content.

b. Application Method

Application method is by the following means:

1. "Dry' sludge - will be surface spread to land using a rear-discharge manure spreader. Prior to spreading, a field risk assessment will be undertaken to ensure that ground conditions are suitable.
   Calibration will be determined by test-weighing loads and correcting forward speed to deliver the desired application rate.

2. 'Wet' sludge will be surface spread to land using a rear-discharge vacuum tanker fitted with low-trajectory spreader plate (inverted).
   Prior to spreading, a field risk assessment will be undertaken to ensure that ground conditions are suitable.
   Calibration will be determined by test-weighing loads and correcting forward speed to deliver the desired application rate.

c. Provision for breakdown of equipment

In the event that the equipment used for spreading this material to land, the operator (farmer Mr C Thomas) has alternative machinery available to him or for hire locally.
Machinery breakdown will therefore not compromise these activities.

INTERPRETATION OF CHEMICAL ANALYSIS OF WASTE TO LAND APPLICATION — PAUL SWEENEY AGRONOMY LTD

ANALYSIS OF MATERIAL FOR SPREADING TO ESSITY OAKENHOLT — ESSITY OAKENHOLT- PAPER PULP

Sample — GENERATED 12/02/2019
ESSITY-WET-2019-JAN — PRINTED 21/02/2019
Sludge sample WET-17-01-2018

Rate	250	tonnes applied / hectare fresh
Rate	2	tonnes applied / hectare Dry Wt.

WET SLUDGE JANUARY 2019

		CONCENTRATION		Amount per tonne	Amount per Ha	
General Properties & Plant Nutrients						
Dry Solids	DS	0.68 %		6.8 kg	1700 kg	
Total Carbon	C	0.2 %		2 kg	500 kg	
Total Nitrogen	N	2.222 %	DS BASIS	22.22 kg		
Total Nitrogen	N	0.040 %	WET	0.40 kg	100 kg	(250 = COGAP / NVZ LIMIT)
C : N Ratio		11 :1				
Ammonium N	N	50.000 mg/kg		50 grammes	12.5 kg	
Phosphate	P205	50 mg/kg		50 grammes	12.5 kg	
Potash	K2O	43 mg/kg		43 grammes	10.8 kg	
Sulphur	SO3	117 mg/kg		117 grammes	29.3 kg	
Magnesium	MgO	47 mg/kg		47 grammes	11.8 kg	
Calcium	Ca	115 mg/kg		115 grammes	28.8 kg	
Sodium	Na	125 mg/kg		125 grammes	31.3 kg	

Data expressed on a Dry Weight basis unless otherwise stated.
Conversions for expression as agricultural nutrient declarations: P x 2.291= P2O5, K x 1.205=K2O, Mg x 1.658=MgO, S x 2.5=SO3

Appendix 1

WET SLUDGE AT 0.68% DRY SOLIDS

INTERPRETATION OF CHEMICAL ANALYSIS OF WASTE TO LAND APPLICATION — PAUL SWEENEY AGRONOMY LTD

ANALYSIS OF MATERIAL FOR SPREADING TO ESSITY OAKENHOLT — ESSITY OAKENHOLT- PAPER PULP

		CONCENTRATION	Amount per tonne	Amount per Ha	PTE Max annual permitted *	% of max *
Statutory & Advisory Elements (PTE's)						
$ Arsenic	As	0.500 mg/kg	0.500 grammes	0.001 kg	0.7	0.12%
Cadmium	Cd	0.010 mg/kg	0.010 grammes	0.000 kg	0.15	0.01%
$ Chromium	Cr	0.400 mg/kg	0.400 grammes	0.001 kg	15	0.00%
Copper	Cu	0.200 mg/kg	0.200 grammes	0.000 kg	7.5	0.00%
$ Fluoride	F	10.000 mg/kg	10.000 grammes	0.017 kg	20	0.09%
Lead	Pb	0.500 mg/kg	0.500 grammes	0.001 kg	15	0.01%
Mercury	Hg	0.050 mg/kg	0.050 grammes	0.000 kg	0.1	0.09%
$ Molybdenum	Mb	0.050 mg/kg	0.050 grammes	0.000 kg	0.2	0.04%
Nickel	Ni	0.200 mg/kg	0.200 grammes	0.000 kg	3	0.01%
$ Selenium	Se	0.020 mg/kg	0.020 grammes	0.000 kg	0.15	0.02%
Zinc	Zn	0.660 mg/kg	0.660 grammes	0.001 kg	15	0.007%

Maximum applications to exceed annual average PTE limit 824

Notes * maximum under COGAP & Sewage Sludge Regs

Maximum PTE applications derived from COGAP Soil & Sludge Regs, based on annual maxima averaged over 10 year period

$ *Voluntary. These parameters not subject to: a. (Sewage Sludge) Directive 86/278/EEC or b. The Sludge (Use in Agriculture) Regulations 1989*

Produced by *Paul Sweeney* *12 February 2019*

Appendix 1

INTERPRETATION OF CHEMICAL ANALYSIS OF WASTE TO LAND APPLICATION — PAUL SWEENEY AGRONOMY LTD

ANALYSIS OF MATERIAL FOR SPREADING TO ESSITY OAKENHOLT — ESSITY OAKENHOLT- PAPER PULP

Sample — GENERATED 12/02/2019
ESSITY-DRY-2019-JAN — PRINTED 21/02/2019
Sludge sample DRY-23/1/2019

Rate	36	tonnes applied / hectare fresh
Rate	4	tonnes applied / hectare Dry Wt.

APPLICATION, JAN 2019 SAMPLE

		CONCENTRATION		Amount per tonne	Amount per Ha	
General Properties & Plant Nutrients						
Dry Matter	DM	11.50 %		115 kg	4140 kg	
Total Carbon	C	40.2 %		402 kg	1664 kg	
Total Nitrogen	N	2.990 %	DRY	29.90 kg		
Total Nitrogen	N	0.344 %	WET	3.44 kg	124 kg	(250 = COGAP / NVZ LIMIT)
C : N Ratio		13 :1				
Ammonium N	N	801 mg/kg		801 grammes	3.3 kg	
Phosphate	P205	12195 mg/kg		12195 grammes	50.5 kg	
Potash	K2O	1714 mg/kg		1714 grammes	7.1 kg	
Sulphur	SO3	6903 mg/kg		6903 grammes	28.6 kg	
Magnesium	MgO	4672 mg/kg		4672 grammes	19.3 kg	
Calcium	Ca	5495 mg/kg		5495 grammes	22.7 kg	
Sodium	Na	1562 mg/kg		1562 grammes	6.5 kg	

Data expressed on a Dry Weight basis unless otherwise stated.

Conversions for expression as agricultural nutrient declarations: P x 2.291= P2O5, K x 1.205=K2O, Mg x 1.658=MgO, S x 2.5=SO3

INTERPRETATION OF CHEMICAL ANALYSIS OF WASTE TO LAND APPLICATION — PAUL SWEENEY AGRONOMY LTD

ANALYSIS OF MATERIAL FOR SPREADING TO ESSITY OAKENHOLT — ESSITY OAKENHOLT- PAPER PULP

		CONCENTRATION	Amount per tonne	Amount per Ha	PTE Max annual permitted *	% of max *
Statutory & Advisory Elements (PTE's)						
$ Arsenic	As	1.190 mg/kg	1.190 grammes	0.005 kg	0.7	0.70%
Cadmium	Cd	0.110 mg/kg	0.110 grammes	0.000 kg	0.15	0.30%
$ Chromium	Cr	38.700 mg/kg	38.700 grammes	0.160 kg	15	1.07%
Copper	Cu	17.700 mg/kg	17.700 grammes	0.073 kg	7.5	0.98%
$ Fluoride	F	22.200 mg/kg	22.200 grammes	0.092 kg	20	0.46%
Lead	Pb	5.810 mg/kg	5.810 grammes	0.024 kg	15	0.16%
Mercury	Hg	0.100 mg/kg	0.100 grammes	0.000 kg	0.1	0.41%
$ Molybdenum	Mb	2.560 mg/kg	2.560 grammes	0.011 kg	0.2	5.30%
Nickel	Ni	7.810 mg/kg	7.810 grammes	0.032 kg	3	1.08%
$ Selenium	Se	0.150 mg/kg	0.150 grammes	0.001 kg	0.15	0.41%
Zinc	Zn	115.000 mg/kg	115.000 grammes	0.476 kg	15	3.174%

Maximum applications to exceed annual average PTE limit 19

Notes * maximum under COGAP & Sewage Sludge Regs

Maximum PTE applications derived from COGAP Soil & Sludge Regs, based on annual maxima averaged over 10 year period

$ *Voluntary. These parameters not subject to: a. (Sewage Sludge) Directive 86/278/EEC or b. The Sludge (Use in Agriculture) Regulations 1989*

Produced by *Paul Sweeney* *12 February 2019*

FIELD SCHEDULE: CROPPING SUMMARY AND SOIL — PAUL SWEENEY AGRONOMY LTD

GENERATED 01 February 2018 — PRINTED 22 February 2019 — ESSITY UK - HOME FARM OAKENHOLT

Farm Location Leadbrook Hall, Oakenhalt, Flint

Waste Description SCA Oakenholt Paper Sludge - Dry — Based on Application Rate 36 Tonnes / Ha

Field Ref	Sheet No	Field No	Full Grid Ref	Area Ha	Test Date	Crop 2018	Crop 2019	Net Area Ha	Waste Qty Tonnes
D	SJ2669	4827	SJ26486927	2.10	21/04/2016	TURNIPS	BEET	2.00	72
E	SJ2669	3320	SJ26336920	3.83	21/04/2016	TURNIPS	BEET	3.70	133
Q	SJ2669	1820	SJ26186920	0.80	21/04/2016	TURNIPS	BEET	0.60	22
K	SJ2568	9298	SJ25926898	4.96	09/02/2018	BEET	BARLEY	4.80	173
L	SJ2669	0229	SJ26026929	3.96	09/02/2018	BEET	BARLEY	3.80	137
N	SJ2670	4449	SJ26447049	2.26	21/04/2016	BARLEY	BARLEY	2.00	72
O	SJ2670	3450	SJ26347050	3.91	21/04/2016	WHEAT	WHEAT	3.70	133
P	SJ2670	1625	SJ26167025	3.46	21/04/2016	BARLEY	BARLEY	3.20	115
J	SJ2669	1743	SJ26176943	4.06	09/02/2018	MAIZE	MAIZE	3.90	140
4	SJ2670	3921	SJ26397021	8.66	21/04/2016	BARLEY	BARLEY	8.30	299
TOTAL				38.00				36.00	1296.00

SUMMARY OF APPLICATIONS **DEPLOYMENT ISSUED.....** PAUL SWEENEY AGRONOMY LTD

GENERATED 12 February 2019 PRINTED 22 February 2019 ESSITY UK - HOME FARM OAKENHOLT

Field Schedule

Farm Location Leadbrook Hall, Oakenholt, Flint

Waste Description SCA Oakenholt Paper Sludge - Dry Based on Application Rate 36 Tonnes / Ha

Field Ref	Sheet No	Field No	TREATED AREA Area Ha	TREATED AREA Net Area Ha	TARGET Waste Qty Tonnes	ACTUAL Waste Qty Tonnes	DATE SPREAD	PLOUGH DATE
D	SJ2669	4827	2.10	2.00	72			
E	SJ2669	3320	3.83	3.70	133			
Q	SJ2669	1820	0.80	0.60	22			
K	SJ2568	9298	4.96	4.80	173			
L	SJ2669	0229	3.96	3.80	137			
N	SJ2670	4449	2.26	2.00	72			
O	SJ2670	3450	3.91	3.70	133			
P	SJ2670	1625	3.46	3.20	115			
J	SJ2669	1743	4.06	3.90	140			
4	SJ2670	3921	8.66	8.30	299			
TOTAL			38.00	36.00	1296.00			

FIELD SCHEDULE: CROPPING SUMMARY AND SOIL

PAUL SWEENEY AGRONOMY LTD

GENERATED 12 February 2019 PRINTED 22 February 2019 ESSITY UK - HOME FARM OAKENHOLT

Farm Location Leadbrook Hall, Oakenhalt, Flint

Waste Description SCA Oakenholt Paper Sludge - WET Based on Application Rate 250 Tonnes / Ha

Field Ref	Sheet No	Field No	Full Grid Ref	Area Ha	Test Date	Crop 2018	Crop 2019	Net Area Ha	Waste Qty Tonnes
D	SJ2669	4827	SJ26486927	2.10	21/04/2016	TURNIPS	BEET	2.00	500
E	SJ2669	3320	SJ26336920	3.83	21/04/2016	TURNIPS	BEET	3.70	925

SCHEDULE FOR FIELDS D & E, IN CASE 'WET' SLUDGE USED

TOTAL	5.93	5.70	1425.00

Field Schedule - PROVISION FOR 'WET' SLUDGE ON FIELDS D & E

INTERPRETATION OF SOIL ANALYSIS - SUITABILITY FOR WASTE APPLICATION **FIELD D** PAUL SWEENEY AGRONOMY LTD

GENERATED 12 February 2019 PRINTED 22 February 2019 ESSITY UK - HOME FARM OAKENHOLT

Reference

Laboratory	NRM Ltd	Field Location	SJ2684	Field Number	**4827**
Location	Leadbrook Hall, Oakenhalt, Flint	OS Ref.	SJ26078468	Field Name	D USING 'WET' SLUDGE
Sample Date	15 April 2016	NVZ	NO	Area Ha.	2.1
Results Date	21 April 2016	2018 Crop	TURNIPS	Subsoil	Clay
Sample Ref	SCA-LH-D-4827	2019 Crop	BEET	Topsoil	Clay Loam
		SNS Index	**1**	Organic matter	11.20%

Residual Nutrient Status	Unit	Value	Index	Interpretation	Comment
pH		7.9		Acceptable	Suitable for general arable crops
Available Phosphorus P	mg/kg	38	3	Medium	Suitable for general arable crops
Available Potassium K	mg/kg	154	2	Medium	Suitable for general arable crops
Available Magnesium Mg	mg/kg	43	1	Medium	Suitable for general arable crops

	Potentially Toxic Elements	Unit	Value	Limit #	Interpretation
$	Total Arsenic	mg/kg	10.60	50	Acceptable
	Total Cadmium	mg/kg	0.35	3	Acceptable
	Total Chromium	mg/kg	30.90	400	Acceptable
	Total Copper	mg/kg	53.80	200	Acceptable
$	Total Fluoride	mg/kg	1.00	500	Acceptable
	Total Lead	mg/kg	122.00	300	Acceptable
	Total Mercury	mg/kg	0.08	1	Acceptable
$	Total Molybdenum	mg/kg	1.20	4	Acceptable
	Total Nickel	mg/kg	16.90	50	Acceptable
$	Total Selenium	mg/kg	0.30	3	Acceptable
	Total Zinc	mg/kg	101.00	200	Acceptable

 # Limit under: 1. COGAP & 2. Code of practice for agriculture use of sewage sludge - at pH 5.0 and above

$ Voluntary. These parameters not subject to: 3. (Sewage Sludge) Directive 86/278/EEC or 4. The Sludge (Use in Agriculture) Regulations 1989

Produced by *Paul Sweeney* *12 February 2019*

Appendix 2 Field FIELD 4827 D USING 'WET' SL

INTERPRETATION OF CHEMICAL ANALYSIS OF SOIL & WASTE | FIELD No. **4827** | PAUL SWEENEY AGRONOMY LTD

SAMPLE	GENERATED	12/02/2019	Soil Depth cm	20	to cultivation depth
SOI SCA-LH-D-4827	PRINTED	22/02/2019	Calculated Soil Mass	2400	tonnes soil / hectare Dry Wt.

Soil Statutory Elements		THIS SOIL		COGAP LIMIT		CAPACITY	THIS WASTE APPLICATION			
PTE, Potentially Toxic Elements, data from Defra Code of Good Agricultural Practice (COGAP) and 1989 Sludge Regulations	Notes	Actual soil concentration	Total Amount Contained	PTE Max permitted at pH >5.0*	Total Amount Contained	Soil Actual as % of max*	Addition from waste	Load as % of actual	Load as % of maximum	Max No. of applications
		from lab analysis	per Ha. based on soil mass above	from COGAP soil code & sludge regs	based on soil mass above	present load as % of COGAP limit	based on analysis & Rate	waste load as % of actual soil load	waste load as % of maximum COGAP soil load	how many like this one to exceed the COGAP limit
	Units	mg/kg	= kg/Ha	mg/kg	= kg/Ha	%	kg	%	%	No
$ Arsenic	As	10.60	25.44	50	120.00	21%	0.001	0.00%	0.00%	######
Cadmium	Cd	0.35	0.84	3	7.20	12%	0.000	0.00%	0.00%	######
Chromium	Cr	30.90	74.16	400	960.00	8%	0.001	0.00%	0.00%	######
Copper	Cu	53.80	129.12	200	480.00	27%	0.000	0.00%	0.00%	######
$ Fluoride	F	1.00	2.40	500	1200.00	0%	0.017	0.71%	0.00%	70,447
Lead	Pb	122.00	292.80	300	720.00	41%	0.001	0.00%	0.00%	######
Mercury	Hg	0.08	0.19	1	2.40	8%	0.000	0.04%	0.00%	25,976
$ Molybdenum	Mb	1.20	2.88	4	9.60	30%	0.000	0.00%	0.00%	79,059
Nickel	Ni	16.90	40.56	50	120.00	34%	0.000	0.00%	0.00%	######
$ Selenium	Se	0.30	0.72	3	7.20	10%	0.000	0.00%	0.00%	######
Zinc	Zn	101.00	242.40	200	480.00	51%	0.001	0.00%	0.00%	######

This data table is designed for advisory purposes to show the relationship between Soil PTE's (actual & maximum) and the additional amounts supplied in waste.

$ *Voluntary. These parameters not subject to: (Sewage Sludge) Directive 86/278/EEC or The Sludge (Use in Agriculture) Regulations 1989*

Produced by *Paul Sweeney* *12 February 2019*

INTERPRETATION OF SOIL ANALYSIS - SUITABILITY FOR WASTE APPLICATION **FIELD E** PAUL SWEENEY AGRONOMY LTD

GENERATED 12 February 2019 PRINTED 22 February 2019 ESSITY UK - HOME FARM OAKENHOLT

Reference

Laboratory	NRM Ltd
Location	Home farm, Oakenholt
Sample Date	15 April 2016
Results Date	21 April 2016
Sample Ref	SCA-LH-E - 3320

Field Location	SJ2684
OS Ref.	SJ26078468
NVZ	NO
2018 Crop	TURNIPS
2019 Crop	BEET
SNS Index	**1**

Field Number	**3320**
Field Name	E USING 'WET' SLUDGE
Area Ha.	3.83
Subsoil	Clay
Topsoil	Clay Loam
Organic matter	11.50%

Residual Nutrient Status	Unit	Value	Index	Interpretation	Comment
pH		8.1		Acceptable	Suitable for general arable crops
Available Phosphorus P	mg/kg	20	2	Medium	Suitable for general arable crops
Available Potassium K	mg/kg	79	1	Low	Suitable for general arable crops
Available Magnesium Mg	mg/kg	48	1	Medium	Suitable for general arable crops

Potentially Toxic Elements	Unit	Value	Limit #	Interpretation
$ Total Arsenic	mg/kg	10.30	50	Acceptable
Total Cadmium	mg/kg	0.28	3	Acceptable
Total Chromium	mg/kg	28.50	400	Acceptable
Total Copper	mg/kg	39.50	200	Acceptable
$ Total Fluoride	mg/kg	1.00	500	Acceptable
Total Lead	mg/kg	74.30	300	Acceptable
Total Mercury	mg/kg	0.07	1	Acceptable
$ Total Molybdenum	mg/kg	1.00	4	Acceptable
Total Nickel	mg/kg	77.00	50	Acceptable
$ Total Selenium	mg/kg	0.28	3	Acceptable
Total Zinc	mg/kg	77.00	200	Acceptable

 # Limit under: 1. COGAP & 2. Code of practice for agriculture use of sewage sludge - at pH 5.0 and above

$ Voluntary. These parameters not subject to: 3. (Sewage Sludge) Directive 86/278/EEC or 4. The Sludge (Use in Agriculture) Regulations 1989

Produced by *Paul Sweeney* *12 February 2019*

Appendix 2 Field FIELI3320 E USING 'WET' SL

INTERPRETATION OF CHEMICAL ANALYSIS OF SOIL & WASTE — FIELD No. **3320** — PAUL SWEENEY AGRONOMY LTD

SAMPLE	GENERATED	12/02/2019	Soil Depth cm	20	to cultivation depth
SOI SCA-LH-E - 3320	PRINTED	22/02/2019	Calculated Soil Mass	2400	tonnes soil / hectare Dry Wt.

Soil Statutory Elements		THIS SOIL		COGAP LIMIT		CAPACITY	THIS WASTE APPLICATION			
PTE, Potentially Toxic Elements, data from Defra Code of Good Agricultural Practice (COGAP) and 1989 Sludge Regulations	Notes	Actual soil concentration	Total Amount Contained	PTE Max permitted at pH >5.0*	Total Amount Contained	Soil Actual as % of max*	Addition from waste	Load as % of actual	Load as % of maximum	Max No. of applications
		from lab analysis	per Ha. based on soil mass above	from COGAP soil code & sludge regs	based on soil mass above	present load as % of COGAP limit	based on analysis & Rate	waste load as % of actual soil load	waste load as % of maximum COGAP soil load	how many like this one to exceed the COGAP limit
	Units	mg/kg	= kg/Ha	mg/kg	= kg/Ha	%	kg	%	%	No
$ Arsenic	As	10.30	24.72	50	120.00	21%	0.001	0.00%	0.00%	######
Cadmium	Cd	0.28	0.67	3	7.20	9%	0.000	0.00%	0.00%	######
Chromium	Cr	28.50	68.40	400	960.00	7%	0.001	0.00%	0.00%	######
Copper	Cu	39.50	94.80	200	480.00	20%	0.000	0.00%	0.00%	######
$ Fluoride	F	1.00	2.40	500	1200.00	0%	0.017	0.71%	0.00%	70,447
Lead	Pb	74.30	178.32	300	720.00	25%	0.001	0.00%	0.00%	######
Mercury	Hg	0.07	0.17	1	2.40	7%	0.000	0.05%	0.00%	26,259
$ Molybdenum	Mb	1.00	2.40	4	9.60	25%	0.000	0.00%	0.00%	84,706
Nickel	Ni	77.00	184.80	50	120.00	154%	0.000	0.00%	0.00%	#######
$ Selenium	Se	0.28	0.67	3	7.20	9%	0.000	0.01%	0.00%	######
Zinc	Zn	77.00	184.80	200	480.00	39%	0.001	0.00%	0.00%	######

This data table is designed for advisory purposes to show the relationship between Soil PTE's (actual & maximum) and the additional amounts supplied in waste.

$ *Voluntary. These parameters not subject to: (Sewage Sludge) Directive 86/278/EEC or The Sludge (Use in Agriculture) Regulations 1989*

Produced by *Paul Sweeney* *12 February 2019*

INTERPRETATION OF SOIL ANALYSIS - SUITABILITY FOR WASTE APPLICATION **FIELD Q** PAUL SWEENEY AGRONOMY LTD

GENERATED 12 February 2019 PRINTED 22 February 2019 ESSITY UK - HOME FARM OAKENHOLT

Reference

Laboratory	NRM Ltd	Field Location	SJ2684	Field Number	**1820**
Location	Home farm, Oakenholt	OS Ref.	SJ26078468	Field Name	Q
Sample Date	15 April 2016	NVZ	NO	Area Ha.	0.8
Results Date	21 April 2016	2018 Crop	TURNIPS	Subsoil	Clay
Sample Ref	SCA-LH-Q - 1820	2019 Crop	BEET	Topsoil	Clay Loam
		SNS Index	**1**	Organic matter	13.30%

Residual Nutrient Status	Unit	Value	Index	Interpretation	Comment
pH		8.2		Acceptable	Suitable for general arable crops
Available Phosphorus P	mg/kg	17	2	Medium	Suitable for general arable crops
Available Potassium K	mg/kg	84	2	Medium	Suitable for general arable crops
Available Magnesium Mg	mg/kg	44	1	Low	Suitable for general arable crops

Potentially Toxic Elements	Unit	Value	Limit #	Interpretation
$ Total Arsenic	mg/kg	9.90	50	Acceptable
Total Cadmium	mg/kg	0.30	3	Acceptable
Total Chromium	mg/kg	38.00	400	Acceptable
Total Copper	mg/kg	36.30	200	Acceptable
$ Total Fluoride	mg/kg	1.00	500	Acceptable
Total Lead	mg/kg	98.60	300	Acceptable
Total Mercury	mg/kg	0.06	1	Acceptable
$ Total Molybdenum	mg/kg	1.00	4	Acceptable
Total Nickel	mg/kg	16.20	50	Acceptable
$ Total Selenium	mg/kg	0.27	3	Acceptable
Total Zinc	mg/kg	71.50	200	Acceptable

 # Limit under: 1. COGAP & 2. Code of practice for agriculture use of sewage sludge - at pH 5.0 and above

$ Voluntary. These parameters not subject to: 3. (Sewage Sludge) Directive 86/278/EEC or 4. The Sludge (Use in Agriculture) Regulations 1989

Produced by *Paul Sweeney* *12 February 2019*

Appendix 2 Field FIELI 1820 Q

INTERPRETATION OF CHEMICAL ANALYSIS OF SOIL & WASTE — FIELD No. **1820** — PAUL SWEENEY AGRONOMY LTD

SAMPLE	GENERATED	12/02/2019	Soil Depth cm	20	to cultivation depth
SOI #REF!	PRINTED	22/02/2019	Calculated Soil Mass	2400	tonnes soil / hectare Dry Wt.

Soil Statutory Elements		THIS SOIL		COGAP LIMIT		CAPACITY	THIS WASTE APPLICATION			
PTE, Potentially Toxic Elements, data from Defra Code of Good Agricultural Practice (COGAP) and 1989 Sludge Regulations	Notes	Actual soil concentration	Total Amount Contained	PTE Max permitted at pH >5.0*	Total Amount Contained	Soil Actual as % of max*	Addition from waste	Load as % of actual	Load as % of maximum	Max No. of applications
		from lab analysis	per Ha. based on soil mass above	from COGAP soil code & sludge regs	based on soil mass above	present load as % of COGAP limit	based on analysis & Rate	waste load as % of actual soil load	waste load as % of maximum COGAP soil load	how many like this one to exceed the COGAP limit
	Units	mg/kg	= kg/Ha	mg/kg	= kg/Ha	%	kg	%	%	No
$ Arsenic	As	9.90	23.76	50	120.00	20%	0.005	0.02%	0.00%	19,535
Cadmium	Cd	0.30	0.72	3	7.20	10%	0.000	0.06%	0.01%	14,229
Chromium	Cr	38.00	91.20	400	960.00	10%	0.160	0.18%	0.02%	5,423
Copper	Cu	36.30	87.12	200	480.00	18%	0.073	0.08%	0.02%	5,362
$ Fluoride	F	1.00	2.40	500	1200.00	0%	0.092	3.83%	0.01%	13,030
Lead	Pb	98.60	236.64	300	720.00	33%	0.024	0.01%	0.00%	20,095
Mercury	Hg	0.06	0.14	1	2.40	6%	0.000	0.29%	0.02%	5,449
$ Molybdenum	Mb	1.00	2.40	4	9.60	25%	0.011	0.44%	0.11%	679
Nickel	Ni	16.20	38.88	50	120.00	32%	0.032	0.08%	0.03%	2,509
$ Selenium	Se	0.27	0.65	3	7.20	9%	0.001	0.10%	0.01%	10,551
Zinc	Zn	71.50	171.60	200	480.00	36%	0.476	0.28%	0.10%	648

This data table is designed for advisory purposes to show the relationship between Soil PTE's (actual & maximum) and the additional amounts supplied in waste.

$ *Voluntary. These parameters not subject to: (Sewage Sludge) Directive 86/278/EEC or The Sludge (Use in Agriculture) Regulations 1989*

Produced by *Paul Sweeney* *12 February 2019*

Appendix 2 Field FIELD 4827 D

INTERPRETATION OF SOIL ANALYSIS - SUITABILITY FOR WASTE APPLICATION **FIELD D** PAUL SWEENEY AGRONOMY LTD

GENERATED 01 February 2018 PRINTED 22 February 2019 ESSITY UK - HOME FARM OAKENHOLT

Reference

Laboratory	NRM Ltd
Location	Home farm, Oakenholt
Sample Date	15 April 2016
Results Date	21 April 2016
Sample Ref	SCA-LH-D-4827

Field Location	SJ2684
OS Ref.	SJ26078468
NVZ	NO
2018 Crop	TURNIPS
2019 Crop	BEET
SNS Index	**1**

Field Number	**4827**
Field Name	D
Area Ha.	2.1
Subsoil	Clay
Topsoil	Clay Loam
Organic matter	11.20%

Residual Nutrient Status		Unit	Value	Index	Interpretation	Comment
pH			7.9		Acceptable	Suitable for general arable crops
Available Phosphorus	P	mg/kg	38	3	Medium	Suitable for general arable crops
Available Potassium	K	mg/kg	154	2	Medium	Suitable for general arable crops
Available Magnesium	Mg	mg/kg	43	1	Medium	Suitable for general arable crops

	Potentially Toxic Elements	Unit	Value	Limit #	Interpretation
$	Total Arsenic	mg/kg	10.60	50	Acceptable
	Total Cadmium	mg/kg	0.35	3	Acceptable
	Total Chromium	mg/kg	30.90	400	Acceptable
	Total Copper	mg/kg	53.80	200	Acceptable
$	Total Fluoride	mg/kg	1.00	500	Acceptable
	Total Lead	mg/kg	122.00	300	Acceptable
	Total Mercury	mg/kg	0.08	1	Acceptable
$	Total Molybdenum	mg/kg	1.20	4	Acceptable
	Total Nickel	mg/kg	16.90	50	Acceptable
$	Total Selenium	mg/kg	0.30	3	Acceptable
	Total Zinc	mg/kg	101.00	200	Acceptable

 # Limit under: 1. COGAP & 2. Code of practice for agriculture use of sewage sludge - at pH 5.0 and above

$ Voluntary. These parameters not subject to: 3. (Sewage Sludge) Directive 86/278/EEC or 4. The Sludge (Use in Agriculture) Regulations 1989

Produced by *Paul Sweeney* *01 February 2018*

INTERPRETATION OF CHEMICAL ANALYSIS OF SOIL & WASTE FIELD No. **4827** PAUL SWEENEY AGRONOMY LTD

SAMPLE	GENERATED 01/02/2018	Soil Depth cm 20	to cultivation depth
SOI SCA-LH-D-4827	PRINTED 22/02/2019	Calculated Soil Mass 2400	tonnes soil / hectare Dry Wt.

Soil Statutory Elements		THIS SOIL		COGAP LIMIT		CAPACITY	THIS WASTE APPLICATION			
PTE, Potentially Toxic Elements, data from Defra Code of Good Agricultural Practice (COGAP) and 1989 Sludge Regulations	Notes	Actual soil concentration from lab analysis	Total Amount Contained per Ha. based on soil mass above	PTE Max permitted at pH >5.0* from COGAP soil code & sludge regs	Total Amount Contained based on soil mass above	Soil Actual as % of max* present load as % of COGAP limit	Addition from waste based on analysis & Rate	Load as % of actual waste load as % of actual soil load	Load as % of maximum waste load as % of maximum COGAP soil load	Max No. of applications how many like this one to exceed the COGAP limit
	Units	mg/kg	= kg/Ha	mg/kg	= kg/Ha	%	kg	%	%	No
$ Arsenic	As	10.60	25.44	50	120.00	21%	0.005	0.02%	0.00%	19,194
Cadmium	Cd	0.35	0.84	3	7.20	12%	0.000	0.05%	0.01%	13,966
Chromium	Cr	30.90	74.16	400	960.00	8%	0.160	0.22%	0.02%	5,529
Copper	Cu	53.80	129.12	200	480.00	27%	0.073	0.06%	0.02%	4,788
$ Fluoride	F	1.00	2.40	500	1200.00	0%	0.092	3.83%	0.01%	13,030
Lead	Pb	122.00	292.80	300	720.00	41%	0.024	0.01%	0.00%	17,760
Mercury	Hg	0.08	0.19	1	2.40	8%	0.000	0.22%	0.02%	5,333
$ Molybdenum	Mb	1.20	2.88	4	9.60	30%	0.011	0.37%	0.11%	634
Nickel	Ni	16.90	40.56	50	120.00	34%	0.032	0.08%	0.03%	2,457
$ Selenium	Se	0.30	0.72	3	7.20	10%	0.001	0.09%	0.01%	10,435
Zinc	Zn	101.00	242.40	200	480.00	51%	0.476	0.20%	0.10%	499

This data table is designed for advisory purposes to show the relationship between Soil PTE's (actual & maximum) and the additional amounts supplied in waste.

$ Voluntary. These parameters not subject to: (Sewage Sludge) Directive 86/278/EEC or The Sludge (Use in Agriculture) Regulations 1989

Produced by *Paul Sweeney* *01 February 2018*

Appendix 2

Field FIELI 3320 E

INTERPRETATION OF SOIL ANALYSIS - SUITABILITY FOR WASTE APPLICATION **FIELD E** PAUL SWEENEY AGRONOMY LTD

GENERATED 01 February 2018 PRINTED 22 February 2019 ESSITY UK - HOME FARM OAKENHOLT

Reference

Laboratory	NRM Ltd	Field Location	SJ2684	Field Number	**3320**
Location	Home farm, Oakenholt	OS Ref.	SJ26078468	Field Name	E
Sample Date	15 April 2016	NVZ	NO	Area Ha.	3.83
Results Date	21 April 2016	2018 Crop	TURNIPS	Subsoil	Clay
Sample Ref	SCA-LH-E - 3320	2019 Crop	BEET	Topsoil	Clay Loam
		SNS Index	**1**	Organic matter	11.50%

Residual Nutrient Status	Unit	Value	Index	Interpretation	Comment
pH		8.1		Acceptable	Suitable for general arable crops
Available Phosphorus P	mg/kg	20	2	Medium	Suitable for general arable crops
Available Potassium K	mg/kg	79	1	Low	Suitable for general arable crops
Available Magnesium Mg	mg/kg	48	1	Medium	Suitable for general arable crops

Potentially Toxic Elements	Unit	Value	Limit #	Interpretation
$ Total Arsenic	mg/kg	10.30	50	Acceptable
Total Cadmium	mg/kg	0.28	3	Acceptable
Total Chromium	mg/kg	28.50	400	Acceptable
Total Copper	mg/kg	39.50	200	Acceptable
$ Total Fluoride	mg/kg	1.00	500	Acceptable
Total Lead	mg/kg	74.30	300	Acceptable
Total Mercury	mg/kg	0.07	1	Acceptable
$ Total Molybdenum	mg/kg	1.00	4	Acceptable
Total Nickel	mg/kg	77.00	50	Acceptable
$ Total Selenium	mg/kg	0.28	3	Acceptable
Total Zinc	mg/kg	77.00	200	Acceptable

 # Limit under: 1. COGAP & 2. Code of practice for agriculture use of sewage sludge - at pH 5.0 and above

$ Voluntary. These parameters not subject to: 3. (Sewage Sludge) Directive 86/278/EEC or 4. The Sludge (Use in Agriculture) Regulations 1989

Produced by *Paul Sweeney* *01 February 2018*

INTERPRETATION OF CHEMICAL ANALYSIS OF SOIL & WASTE — FIELD No. **3320** — PAUL SWEENEY AGRONOMY LTD

SAMPLE	GENERATED	01/02/2018	Soil Depth cm 20 to cultivation depth
SOI SCA-LH-E - 3320	PRINTED	22/02/2019	Calculated Soil Mass 2400 tonnes soil / hectare Dry Wt.

Soil Statutory Elements		THIS SOIL		COGAP LIMIT		CAPACITY	THIS WASTE APPLICATION			
PTE, Potentially Toxic Elements, data from Defra Code of Good Agricultural Practice (COGAP) and 1989 Sludge Regulations	Notes	Actual soil concentration	Total Amount Contained	PTE Max permitted at pH >5.0*	Total Amount Contained	Soil Actual as % of max*	Addition from waste	Load as % of actual	Load as % of maximum	Max No. of applications
		from lab analysis	per Ha. based on soil mass above	from COGAP soil code & sludge regs	based on soil mass above	present load as % of COGAP limit	based on analysis & Rate	waste load as % of actual soil load	waste load as % of maximum COGAP soil load	how many like this one to exceed the COGAP limit
	Units	mg/kg	= kg/Ha	mg/kg	= kg/Ha	%	kg	%	%	No
$ Arsenic	As	10.30	24.72	50	120.00	21%	0.005	0.02%	0.00%	19,340
Cadmium	Cd	0.28	0.67	3	7.20	9%	0.000	0.07%	0.01%	14,335
Chromium	Cr	28.50	68.40	400	960.00	7%	0.160	0.23%	0.02%	5,565
Copper	Cu	39.50	94.80	200	480.00	20%	0.073	0.08%	0.02%	5,257
$ Fluoride	F	1.00	2.40	500	1200.00	0%	0.092	3.83%	0.01%	13,030
Lead	Pb	74.30	178.32	300	720.00	25%	0.024	0.01%	0.00%	22,520
Mercury	Hg	0.07	0.17	1	2.40	7%	0.000	0.25%	0.02%	5,391
$ Molybdenum	Mb	1.00	2.40	4	9.60	25%	0.011	0.44%	0.11%	679
Nickel	Ni	77.00	184.80	50	120.00	154%	0.032	0.02%	0.03% -	2,004
$ Selenium	Se	0.28	0.67	3	7.20	9%	0.001	0.09%	0.01%	10,512
Zinc	Zn	77.00	184.80	200	480.00	39%	0.476	0.26%	0.10%	620

This data table is designed for advisory purposes to show the relationship between Soil PTE's (actual & maximum) and the additional amounts supplied in waste.

$ Voluntary. These parameters not subject to: (Sewage Sludge) Directive 86/278/EEC or The Sludge (Use in Agriculture) Regulations 1989

Produced by *Paul Sweeney* *01 February 2018*

Appendix 2

Field FIELI9298 K

INTERPRETATION OF SOIL ANALYSIS - SUITABILITY FOR WASTE APPLICATION **FIELD-K** PAUL SWEENEY AGRONOMY LTD

GENERATED 12 February 2019 PRINTED 22 February 2019 ESSITY UK - HOME FARM OAKENHOLT

Reference

Laboratory	NRM Ltd	Field Location	SJ2684	Field Number	**9298**
Location	Home farm, Oakenholt	OS Ref.	SJ26078468	Field Name	K
Sample Date	05 February 2018	NVZ	NO	Area Ha.	4.96
Results Date	09 February 2018	2018 Crop	BEET	Subsoil	Clay
Sample Ref	Report 89769 K	2019 Crop	BARLEY	Topsoil	Clay Loam
		SNS Index	**1**	Organic matter	9.90%

Residual Nutrient Status	Unit	Value	Index	Interpretation	Comment
pH		8.1		Acceptable	Suitable for general arable crops
Available Phosphorus P	mg/kg	27	3	Adequate	Suitable for general arable crops
Available Potassium K	mg/kg	191	2	Adequate	Suitable for general arable crops
Available Magnesium Mg	mg/kg	54	2	Adequate	Suitable for general arable crops

Potentially Toxic Elements	Unit	Value	Limit #	Interpretation
$ Total Arsenic	mg/kg	7.90	50	Acceptable
Total Cadmium	mg/kg	0.21	3	Acceptable
Total Chromium	mg/kg	28.00	400	Acceptable
Total Copper	mg/kg	74.70	200	Acceptable
$ Total Fluoride	mg/kg	24.10	500	Acceptable
Total Lead	mg/kg	55.50	300	Acceptable
Total Mercury	mg/kg	0.20	1	Acceptable
$ Total Molybdenum	mg/kg	1.00	4	Acceptable
Total Nickel	mg/kg	20.10	50	Acceptable
$ Total Selenium	mg/kg	0.23	3	Acceptable
Total Zinc	mg/kg	69.60	200	Acceptable

 # Limit under: 1. COGAP & 2. Code of practice for agriculture use of sewage sludge - at pH 5.0 and above

$ Voluntary. These parameters not subject to: 3. (Sewage Sludge) Directive 86/278/EEC or 4. The Sludge (Use in Agriculture) Regulations 1989

Produced by *Paul Sweeney* *12 February 2019*

INTERPRETATION OF CHEMICAL ANALYSIS OF SOIL & WASTE — FIELD No. **9298** — PAUL SWEENEY AGRONOMY LTD

SAMPLE	GENERATED	12/02/2019	Soil Depth cm	20	to cultivation depth
SOI Report 89769 K	PRINTED	22/02/2019	Calculated Soil Mass	2400	tonnes soil / hectare Dry Wt.

Soil Statutory Elements		THIS SOIL		COGAP LIMIT		CAPACITY	THIS WASTE APPLICATION			
PTE, Potentially Toxic Elements, data from Defra Code of Good Agricultural Practice (COGAP) and 1989 Sludge Regulations	Notes	Actual soil concentration	Total Amount Contained	PTE Max permitted at pH >5.0*	Total Amount Contained	Soil Actual as % of max*	Addition from waste	Load as % of actual	Load as % of maximum	Max No. of applications
		from lab analysis	per Ha. based on soil mass above	from COGAP soil code & sludge regs	based on soil mass above	present load as % of COGAP limit	based on analysis & Rate	waste load as % of actual soil load	waste load as % of maximum COGAP soil load	how many like this one to exceed the COGAP limit
	Units	mg/kg	= kg/Ha	mg/kg	= kg/Ha	%	kg	%	%	No
$ Arsenic	As	7.90	18.96	50	120.00	16%	0.005	0.03%	0.00%	20,509
Cadmium	Cd	0.21	0.50	3	7.20	7%	0.000	0.09%	0.01%	14,704
Chromium	Cr	28.00	67.20	400	960.00	7%	0.160	0.24%	0.02%	5,572
Copper	Cu	74.70	179.28	200	480.00	37%	0.073	0.04%	0.02%	4,104
$ Fluoride	F	24.10	57.84	500	1200.00	5%	0.092	0.16%	0.01%	12,427
Lead	Pb	55.50	133.20	300	720.00	19%	0.024	0.02%	0.00%	24,396
Mercury	Hg	0.20	0.48	1	2.40	20%	0.000	0.09%	0.02%	4,638
$ Molybdenum	Mb	1.00	2.40	4	9.60	25%	0.011	0.44%	0.11%	679
Nickel	Ni	20.10	48.24	50	120.00	40%	0.032	0.07%	0.03%	2,219
$ Selenium	Se	0.23	0.55	3	7.20	8%	0.001	0.11%	0.01%	10,705
Zinc	Zn	69.60	167.04	200	480.00	35%	0.476	0.29%	0.10%	657

This data table is designed for advisory purposes to show the relationship between Soil PTE's (actual & maximum) and the additional amounts supplied in waste.

$ *Voluntary. These parameters not subject to: (Sewage Sludge) Directive 86/278/EEC or The Sludge (Use in Agriculture) Regulations 1989*

Produced by *Paul Sweeney* *12 February 2019*

Appendix 2

FIELI 0229 L

INTERPRETATION OF SOIL ANALYSIS - SUITABILITY FOR WASTE APPLICATION **FIELD-L** PAUL SWEENEY AGRONOMY LTD

GENERATED 12 February 2019 PRINTED 22 February 2019 ESSITY UK - HOME FARM OAKENHOLT

Reference

Laboratory	NRM Ltd	Field Location	SJ2684	Field Number	**0229**
Location	Home farm, Oakenholt	OS Ref.	SJ26078468	Field Name	L
Sample Date	05 February 2018	NVZ	NO	Area Ha.	3.96
Results Date	09 February 2018	2018 Crop	BEET	Subsoil	Clay
Sample Ref	Report 89769 L	2019 Crop	BARLEY	Topsoil	Clay Loam
		SNS Index	**1**	Organic matter	9.40%

Residual Nutrient Status	Unit	Value	Index	Interpretation	Comment
pH		7.9		Acceptable	Suitable for general arable crops
Available Phosphorus P	mg/kg	25	2	Adequate	Suitable for general arable crops
Available Potassium K	mg/kg	149	2	Adequate	Suitable for general arable crops
Available Magnesium Mg	mg/kg	49	1	Low	Suitable for general arable crops

Potentially Toxic Elements	Unit	Value	Limit #	Interpretation
$ Total Arsenic	mg/kg	7.70	50	Acceptable
Total Cadmium	mg/kg	0.22	3	Acceptable
Total Chromium	mg/kg	29.70	400	Acceptable
Total Copper	mg/kg	78.30	200	Acceptable
$ Total Fluoride	mg/kg	23.80	500	Acceptable
Total Lead	mg/kg	58.90	300	Acceptable
Total Mercury	mg/kg	0.20	1	Acceptable
$ Total Molybdenum	mg/kg	1.00	4	Acceptable
Total Nickel	mg/kg	13.20	50	Acceptable
$ Total Selenium	mg/kg	0.20	3	Acceptable
Total Zinc	mg/kg	59.10	200	Acceptable

 # Limit under: 1. COGAP & 2. Code of practice for agriculture use of sewage sludge - at pH 5.0 and above

$ Voluntary. These parameters not subject to: 3. (Sewage Sludge) Directive 86/278/EEC or 4. The Sludge (Use in Agriculture) Regulations 1989

Produced by *Paul Sweeney* *12 February 2019*

INTERPRETATION OF CHEMICAL ANALYSIS OF SOIL & WASTE | FIELD No. **0229** | PAUL SWEENEY AGRONOMY LTD

SAMPLE
SO Report 89769 L

GENERATED 12/02/2019
PRINTED 22/02/2019

Soil Depth cm 20 to cultivation depth
Calculated Soil Mass 2400 tonnes soil / hectare Dry Wt.

Soil Statutory Elements		THIS SOIL		COGAP LIMIT		CAPACITY	THIS WASTE APPLICATION			
PTE, Potentially Toxic Elements, data from Defra Code of Good Agricultural Practice (COGAP) and 1989 Sludge Regulations	Notes	Actual soil concentration from lab analysis	Total Amount Contained per Ha. based on soil mass above	PTE Max permitted at pH >5.0* from COGAP soil code & sludge regs	Total Amount Contained based on soil mass above	Soil Actual as % of max* present load as % of COGAP limit	Addition from waste based on analysis & Rate	Load as % of actual waste load as % of actual soil load	Load as % of maximum waste load as % of maximum COGAP soil load	Max No. of applications how many like this one to exceed the COGAP limit
	Units	mg/kg	= kg/Ha	mg/kg	= kg/Ha	%	kg	%	%	No
$ Arsenic	As	7.70	18.48	50	120.00	15%	0.005	0.03%	0.00%	20,607
Cadmium	Cd	0.22	0.53	3	7.20	7%	0.000	0.09%	0.01%	14,651
Chromium	Cr	29.70	71.28	400	960.00	7%	0.160	0.22%	0.02%	5,547
Copper	Cu	78.30	187.92	200	480.00	39%	0.073	0.04%	0.02%	3,986
$ Fluoride	F	23.80	57.12	500	1200.00	5%	0.092	0.16%	0.01%	12,435
Lead	Pb	58.90	141.36	300	720.00	20%	0.024	0.02%	0.00%	24,056
Mercury	Hg	0.20	0.48	1	2.40	20%	0.000	0.09%	0.02%	4,638
$ Molybdenum	Mb	1.00	2.40	4	9.60	25%	0.011	0.44%	0.11%	679
Nickel	Ni	13.20	31.68	50	120.00	26%	0.032	0.10%	0.03%	2,732
$ Selenium	Se	0.20	0.48	3	7.20	7%	0.001	0.13%	0.01%	10,821
Zinc	Zn	59.10	141.84	200	480.00	30%	0.476	0.34%	0.10%	710

This data table is designed for advisory purposes to show the relationship between Soil PTE's (actual & maximum) and the additional amounts supplied in waste.

$ *Voluntary. These parameters not subject to: (Sewage Sludge) Directive 86/278/EEC or The Sludge (Use in Agriculture) Regulations 1989*

Produced by *Paul Sweeney* *12 February 2019*

INTERPRETATION OF SOIL ANALYSIS - SUITABILITY FOR WASTE APPLICATION **FIELD N** PAUL SWEENEY AGRONOMY LTD

GENERATED 12 February 2019 PRINTED 22 February 2019 ESSITY UK - HOME FARM OAKENHOLT

Reference

Laboratory	NRM Ltd
Location	Home farm, Oakenholt
Sample Date	15 April 2016
Results Date	21 April 2016
Sample Ref	SCA-LH-N - 4449

Field Location	SJ2684
OS Ref.	SJ26078468
NVZ	NO
2018 Crop	BARLEY
2019 Crop	BARLEY
SNS Index	**1**

Field Number	**4449**
Field Name	N
Area Ha.	2.26
Subsoil	Clay
Topsoil	Clay Loam
Organic matter	16.00%

Residual Nutrient Status	Unit	Value	Index	Interpretation	Comment
pH		7.4		Acceptable	Suitable for general arable crops
Available Phosphorus P	mg/kg	23	2	Medium	Suitable for general arable crops
Available Potassium K	mg/kg	104	1	Low	Suitable for general arable crops
Available Magnesium Mg	mg/kg	37	1	Low	Suitable for general arable crops

Potentially Toxic Elements	Unit	Value	Limit #	Interpretation
$ Total Arsenic	mg/kg	10.60	50	Acceptable
Total Cadmium	mg/kg	0.37	3	Acceptable
Total Chromium	mg/kg	35.00	400	Acceptable
Total Copper	mg/kg	42.00	200	Acceptable
$ Total Fluoride	mg/kg	2.50	500	Acceptable
Total Lead	mg/kg	112.00	300	Acceptable
Total Mercury	mg/kg	0.04	1	Acceptable
$ Total Molybdenum	mg/kg	1.10	4	Acceptable
Total Nickel	mg/kg	18.80	50	Acceptable
$ Total Selenium	mg/kg	0.19	3	Acceptable
Total Zinc	mg/kg	78.30	200	Acceptable

 # Limit under: 1. COGAP & 2. Code of practice for agriculture use of sewage sludge - at pH 5.0 and above

$ Voluntary. These parameters not subject to: 3. (Sewage Sludge) Directive 86/278/EEC or 4. The Sludge (Use in Agriculture) Regulations 1989

Produced by *Paul Sweeney* *12 February 2019*

Appendix 2 Field FIELD 4449 N

INTERPRETATION OF CHEMICAL ANALYSIS OF SOIL & WASTE | FIELD No. **4449** | PAUL SWEENEY AGRONOMY LTD

SAMPLE	GENERATED	12/02/2019	Soil Depth cm	20	to cultivation depth
SOI SCA-LH-N - 4449	PRINTED	22/02/2019	Calculated Soil Mass	2400	tonnes soil / hectare Dry Wt.

Soil Statutory Elements		THIS SOIL		COGAP LIMIT		CAPACITY	THIS WASTE APPLICATION			
PTE, Potentially Toxic Elements, data from Defra Code of Good Agricultural Practice (COGAP) and 1989 Sludge Regulations	Notes / Units	Actual soil concentration from lab analysis mg/kg	Total Amount Contained per Ha. based on soil mass above = kg/Ha	PTE Max permitted at pH >5.0* from COGAP soil code & sludge regs mg/kg	Total Amount Contained based on soil mass above = kg/Ha	Soil Actual as % of max* present load as % of COGAP limit %	Addition from waste based on analysis & Rate kg	Load as % of actual waste load as % of actual soil load %	Load as % of maximum waste load as % of maximum COGAP soil load %	Max No. of applications how many like this one to exceed the COGAP limit No
$ Arsenic	As	10.60	25.44	50	120.00	21%	0.005	0.02%	0.00%	19,194
Cadmium	Cd	0.37	0.89	3	7.20	12%	0.000	0.05%	0.01%	13,860
Chromium	Cr	35.00	84.00	400	960.00	9%	0.160	0.19%	0.02%	5,468
Copper	Cu	42.00	100.80	200	480.00	21%	0.073	0.07%	0.02%	5,175
$ Fluoride	F	2.50	6.00	500	1200.00	1%	0.092	1.53%	0.01%	12,991
Lead	Pb	112.00	268.80	300	720.00	37%	0.024	0.01%	0.00%	18,758
Mercury	Hg	0.04	0.10	1	2.40	4%	0.000	0.43%	0.02%	5,565
$ Molybdenum	Mb	1.10	2.64	4	9.60	28%	0.011	0.40%	0.11%	657
Nickel	Ni	18.80	45.12	50	120.00	38%	0.032	0.07%	0.03%	2,316
$ Selenium	Se	0.19	0.46	3	7.20	6%	0.001	0.14%	0.01%	10,860
Zinc	Zn	78.30	187.92	200	480.00	39%	0.476	0.25%	0.10%	613

This data table is designed for advisory purposes to show the relationship between Soil PTE's (actual & maximum) and the additional amounts supplied in waste.

$ *Voluntary. These parameters not subject to: (Sewage Sludge) Directive 86/278/EEC or The Sludge (Use in Agriculture) Regulations 1989*

Produced by *Paul Sweeney* *12 February 2019*

Appendix 2 Field FIELI 3450 O

INTERPRETATION OF SOIL ANALYSIS - SUITABILITY FOR WASTE APPLICATION **FIELD O** PAUL SWEENEY AGRONOMY LTD

GENERATED 12 February 2019 PRINTED 22 February 2019 ESSITY UK - HOME FARM OAKENHOLT

Reference

Laboratory	NRM Ltd
Location	Home farm, Oakenholt
Sample Date	15 April 2016
Results Date	21 April 2016
Sample Ref	SCA-LH-O - 3450

Field Location	SJ2684
OS Ref.	SJ26078468
NVZ	NO
2018 Crop	WHEAT
2019 Crop	WHEAT
SNS Index	**1**

Field Number	**3450**
Field Name	O
Area Ha.	3.91
Subsoil	Clay
Topsoil	Clay Loam
Organic matter	12.80%

Residual Nutrient Status	Unit	Value	Index	Interpretation	Comment
pH		7.4		Acceptable	Suitable for general arable crops
Available Phosphorus P	mg/kg	39	3	Medium	Suitable for general arable crops
Available Potassium K	mg/kg	162	2	Medium	Suitable for general arable crops
Available Magnesium Mg	mg/kg	41	1	Low	Suitable for general arable crops

Potentially Toxic Elements	Unit	Value	Limit #	Interpretation
$ Total Arsenic	mg/kg	8.80	50	Acceptable
Total Cadmium	mg/kg	0.35	3	Acceptable
Total Chromium	mg/kg	30.60	400	Acceptable
Total Copper	mg/kg	33.70	200	Acceptable
$ Total Fluoride	mg/kg	11.30	500	Acceptable
Total Lead	mg/kg	103.00	300	Acceptable
Total Mercury	mg/kg	0.04	1	Acceptable
$ Total Molybdenum	mg/kg	1.20	4	Acceptable
Total Nickel	mg/kg	16.20	50	Acceptable
$ Total Selenium	mg/kg	0.23	3	Acceptable
Total Zinc	mg/kg	82.00	200	Acceptable

 # Limit under: 1. COGAP & 2. Code of practice for agriculture use of sewage sludge - at pH 5.0 and above

$ Voluntary. These parameters not subject to: 3. (Sewage Sludge) Directive 86/278/EEC or 4. The Sludge (Use in Agriculture) Regulations 1989

Produced by *Paul Sweeney* *12 February 2019*

INTERPRETATION OF CHEMICAL ANALYSIS OF SOIL & WASTE | FIELD No. **3450** | PAUL SWEENEY AGRONOMY LTD

SAMPLE	GENERATED	12/02/2019	Soil Depth cm	20	to cultivation depth
SOI #REF!	PRINTED	22/02/2019	Calculated Soil Mass	2400	tonnes soil / hectare Dry Wt.

Soil Statutory Elements		THIS SOIL		COGAP LIMIT		CAPACITY	THIS WASTE APPLICATION			
PTE, Potentially Toxic Elements, data from Defra Code of Good Agricultural Practice (COGAP) and 1989 Sludge Regulations	Notes	Actual soil concentration	Total Amount Contained	PTE Max permitted at pH >5.0*	Total Amount Contained	Soil Actual as % of max*	Addition from waste	Load as % of actual	Load as % of maximum	Max No. of applications
		from lab analysis	per Ha. based on soil mass above	from COGAP soil code & sludge regs	based on soil mass above	present load as % of COGAP limit	based on analysis & Rate	waste load as % of actual soil load	waste load as % of maximum COGAP soil load	how many like this one to exceed the COGAP limit
	Units	mg/kg	= kg/Ha	mg/kg	= kg/Ha	%	kg	%	%	No
$ Arsenic	As	8.80	21.12	50	120.00	18%	0.005	0.02%	0.00%	20,071
Cadmium	Cd	0.35	0.84	3	7.20	12%	0.000	0.05%	0.01%	13,966
Chromium	Cr	30.60	73.44	400	960.00	8%	0.160	0.22%	0.02%	5,533
Copper	Cu	33.70	80.88	200	480.00	17%	0.073	0.09%	0.02%	5,447
$ Fluoride	F	11.30	27.12	500	1200.00	2%	0.092	0.34%	0.01%	12,761
Lead	Pb	103.00	247.20	300	720.00	34%	0.024	0.01%	0.00%	19,656
Mercury	Hg	0.04	0.10	1	2.40	4%	0.000	0.43%	0.02%	5,565
$ Molybdenum	Mb	1.20	2.88	4	9.60	30%	0.011	0.37%	0.11%	634
Nickel	Ni	16.20	38.88	50	120.00	32%	0.032	0.08%	0.03%	2,509
$ Selenium	Se	0.23	0.55	3	7.20	8%	0.001	0.11%	0.01%	10,705
Zinc	Zn	82.00	196.80	200	480.00	41%	0.476	0.24%	0.10%	595

This data table is designed for advisory purposes to show the relationship between Soil PTE's (actual & maximum) and the additional amounts supplied in waste.

$ *Voluntary. These parameters not subject to: (Sewage Sludge) Directive 86/278/EEC or The Sludge (Use in Agriculture) Regulations 1989*

Produced by *Paul Sweeney* *12 February 2019*

INTERPRETATION OF SOIL ANALYSIS - SUITABILITY FOR WASTE APPLICATION **FIELD P** PAUL SWEENEY AGRONOMY LTD

GENERATED 12 February 2019 PRINTED 22 February 2019 ESSITY UK - HOME FARM OAKENHOLT

Reference

Laboratory	NRM Ltd	Field Location	SJ2684	Field Number	**1625**
Location	Home farm, Oakenholt	OS Ref.	SJ26078468	Field Name	P
Sample Date	15 April 2016	NVZ	NO	Area Ha.	3.46
Results Date	21 April 2016	2018 Crop	BARLEY	Subsoil	Clay
Sample Ref	SCA-LH-P - 1625	2019 Crop	BARLEY	Topsoil	Clay Loam
		SNS Index	**1**	Organic matter	12%

Residual Nutrient Status	Unit	Value	Index	Interpretation	Comment
pH		7.4		Acceptable	Suitable for general arable crops
Available Phosphorus P	mg/kg	21	2	Medium	Suitable for general arable crops
Available Potassium K	mg/kg	126	2	Medium	Suitable for general arable crops
Available Magnesium Mg	mg/kg	30	1	Low	Suitable for general arable crops

	Potentially Toxic Elements	Unit	Value	Limit #	Interpretation
$	Total Arsenic	mg/kg	7.80	50	Acceptable
	Total Cadmium	mg/kg	0.31	3	Acceptable
	Total Chromium	mg/kg	35.80	400	Acceptable
	Total Copper	mg/kg	27.40	200	Acceptable
$	Total Fluoride	mg/kg	13.80	500	Acceptable
	Total Lead	mg/kg	102.00	300	Acceptable
	Total Mercury	mg/kg	0.05	1	Acceptable
$	Total Molybdenum	mg/kg	1.10	4	Acceptable
	Total Nickel	mg/kg	66.90	50	Acceptable
$	Total Selenium	mg/kg	0.23	3	Acceptable
	Total Zinc	mg/kg	66.90	200	Acceptable

 # Limit under: 1. COGAP & 2. Code of practice for agriculture use of sewage sludge - at pH 5.0 and above

$ Voluntary. These parameters not subject to: 3. (Sewage Sludge) Directive 86/278/EEC or 4. The Sludge (Use in Agriculture) Regulations 1989

Produced by *Paul Sweeney* *12 February 2019*

Appendix 2 Field FIELI1625 P

INTERPRETATION OF CHEMICAL ANALYSIS OF SOIL & WASTE FIELD No. **1625** PAUL SWEENEY AGRONOMY LTD

SAMPLE	GENERATED	12/02/2019	Soil Depth cm	20	to cultivation depth
SOI #REF!	PRINTED	22/02/2019	Calculated Soil Mass	2400	tonnes soil / hectare Dry Wt.

Soil Statutory Elements		THIS SOIL		COGAP LIMIT		CAPACITY	THIS WASTE APPLICATION			
PTE, Potentially Toxic Elements, data from Defra Code of Good Agricultural Practice (COGAP) and 1989 Sludge Regulations	Notes	Actual soil concentration	Total Amount Contained	PTE Max permitted at pH >5.0*	Total Amount Contained	Soil Actual as % of max*	Addition from waste	Load as % of actual	Load as % of maximum	Max No. of applications
		from lab analysis	per Ha. based on soil mass above	from COGAP soil code & sludge regs	based on soil mass above	present load as % of COGAP limit	based on analysis & Rate	waste load as % of actual soil load	waste load as % of maximum COGAP soil load	how many like this one to exceed the COGAP limit
	Units	mg/kg	= kg/Ha	mg/kg	= kg/Ha	%	kg	%	%	No
$ Arsenic	As	7.80	18.72	50	120.00	16%	0.005	0.03%	0.00%	20,558
Cadmium	Cd	0.31	0.74	3	7.20	10%	0.000	0.06%	0.01%	14,177
Chromium	Cr	35.80	85.92	400	960.00	9%	0.160	0.19%	0.02%	5,456
Copper	Cu	27.40	65.76	200	480.00	14%	0.073	0.11%	0.02%	5,653
$ Fluoride	F	13.80	33.12	500	1200.00	3%	0.092	0.28%	0.01%	12,696
Lead	Pb	102.00	244.80	300	720.00	34%	0.024	0.01%	0.00%	19,756
Mercury	Hg	0.05	0.12	1	2.40	5%	0.000	0.35%	0.02%	5,507
$ Molybdenum	Mb	1.10	2.64	4	9.60	28%	0.011	0.40%	0.11%	657
Nickel	Ni	66.90	160.56	50	120.00	134%	0.032	0.02%	0.03%	- 1,254
$ Selenium	Se	0.23	0.55	3	7.20	8%	0.001	0.11%	0.01%	10,705
Zinc	Zn	66.90	160.56	200	480.00	33%	0.476	0.30%	0.10%	671

This data table is designed for advisory purposes to show the relationship between Soil PTE's (actual & maximum) and the additional amounts supplied in waste.

$ Voluntary. These parameters not subject to: (Sewage Sludge) Directive 86/278/EEC or The Sludge (Use in Agriculture) Regulations 1989

Produced by *Paul Sweeney* *12 February 2019*

INTERPRETATION OF SOIL ANALYSIS - SUITABILITY FOR WASTE APPLICATION **FIELD-J** PAUL SWEENEY AGRONOMY LTD

GENERATED 12 February 2019 PRINTED 22 February 2019 ESSITY UK - HOME FARM OAKENHOLT

Reference

Laboratory	NRM Ltd	Field Location	SJ2684	Field Number	**1743**
Location	Home farm, Oakenholt	OS Ref.	SJ26078468	Field Name	J
Sample Date	05 February 2018	NVZ	NO	Area Ha.	4.06
Results Date	09 February 2018	2018 Crop	MAIZE	Subsoil	Clay
Sample Ref	Report 89769 J	2019 Crop	MAIZE	Topsoil	Clay Loam
		SNS Index	**1**	Organic matter	8.20%

Residual Nutrient Status	Unit	Value	Index	Interpretation	Comment
pH		8.0		Acceptable	Suitable for general arable crops
Available Phosphorus P	mg/kg	39	3	High	Suitable for general arable crops
Available Potassium K	mg/kg	309	3	High	Suitable for general arable crops
Available Magnesium Mg	mg/kg	79	2	Acceptable	Suitable for general arable crops

Potentially Toxic Elements	Unit	Value	Limit #	Interpretation
$ Total Arsenic	mg/kg	25.00	50	Acceptable
Total Cadmium	mg/kg	0.50	3	Acceptable
Total Chromium	mg/kg	49.20	400	Acceptable
Total Copper	mg/kg	29.80	200	Acceptable
$ Total Fluoride	mg/kg	21.60	500	Acceptable
Total Lead	mg/kg	41.30	300	Acceptable
Total Mercury	mg/kg	0.20	1	Acceptable
$ Total Molybdenum	mg/kg	1.00	4	Acceptable
Total Nickel	mg/kg	26.30	50	Acceptable
$ Total Selenium	mg/kg	0.44	3	Acceptable
Total Zinc	mg/kg	98.60	200	Acceptable

 # Limit under: 1. COGAP & 2. Code of practice for agriculture use of sewage sludge - at pH 5.0 and above

$ Voluntary. These parameters not subject to: 3. (Sewage Sludge) Directive 86/278/EEC or 4. The Sludge (Use in Agriculture) Regulations 1989

Produced by *Paul Sweeney* *12 February 2019*

Appendix 2 Field FIELI 1743 J

INTERPRETATION OF CHEMICAL ANALYSIS OF SOIL & WASTE — FIELD No. **1743** — PAUL SWEENEY AGRONOMY LTD

SAMPLE	GENERATED	12/02/2019	Soil Depth cm	20	to cultivation depth
SOI Report 89769 J	PRINTED	22/02/2019	Calculated Soil Mass	2400	tonnes soil / hectare Dry Wt.

Soil Statutory Elements		THIS SOIL		COGAP LIMIT		CAPACITY	THIS WASTE APPLICATION			
PTE, Potentially Toxic Elements, data from Defra Code of Good Agricultural Practice (COGAP) and 1989 Sludge Regulations	Notes	Actual soil concentration from lab analysis	Total Amount Contained per Ha. based on soil mass above	PTE Max permitted at pH >5.0* from COGAP soil code & sludge regs	Total Amount Contained based on soil mass above	Soil Actual as % of max* present load as % of COGAP limit	Addition from waste based on analysis & Rate	Load as % of actual waste load as % of actual soil load	Load as % of maximum waste load as % of maximum COGAP soil load	Max No. of applications how many like this one to exceed the COGAP limit
	Units	mg/kg	= kg/Ha	mg/kg	= kg/Ha	%	kg	%	%	No
$ Arsenic	As	25.00	60.00	50	120.00	50%	0.005	0.01%	0.00%	12,179
Cadmium	Cd	0.50	1.20	3	7.20	17%	0.000	0.04%	0.01%	13,175
Chromium	Cr	49.20	118.08	400	960.00	12%	0.160	0.14%	0.02%	5,255
Copper	Cu	29.80	71.52	200	480.00	15%	0.073	0.10%	0.02%	5,574
$ Fluoride	F	21.60	51.84	500	1200.00	4%	0.092	0.18%	0.01%	12,492
Lead	Pb	41.30	99.12	300	720.00	14%	0.024	0.02%	0.00%	25,813
Mercury	Hg	0.20	0.48	1	2.40	20%	0.000	0.09%	0.02%	4,638
$ Molybdenum	Mb	1.00	2.40	4	9.60	25%	0.011	0.44%	0.11%	679
Nickel	Ni	26.30	63.12	50	120.00	53%	0.032	0.05%	0.03%	1,759
$ Selenium	Se	0.44	1.06	3	7.20	15%	0.001	0.06%	0.01%	9,894
Zinc	Zn	98.60	236.64	200	480.00	49%	0.476	0.20%	0.10%	511

This data table is designed for advisory purposes to show the relationship between Soil PTE's (actual & maximum) and the additional amounts supplied in waste.

$ *Voluntary. These parameters not subject to: (Sewage Sludge) Directive 86/278/EEC or The Sludge (Use in Agriculture) Regulations 1989*

Produced by *Paul Sweeney* *12 February 2019*

INTERPRETATION OF SOIL ANALYSIS - SUITABILITY FOR WASTE APPLICATION **FIELD 4** PAUL SWEENEY AGRONOMY LTD

GENERATED 12 February 2019 PRINTED 22 February 2019 ESSITY UK - HOME FARM OAKENHOLT

Reference

Laboratory	NRM Ltd	Field Location	SJ2684	Field Number	**3921**
Location	Home farm, Oakenholt	OS Ref.	SJ26078468	Field Name	LH4
Sample Date	15 April 2016	NVZ	NO	Area Ha.	8.66
Results Date	21 April 2016	2018 Crop	BARLEY	Subsoil	Clay
Sample Ref	SCA-LH-4 - 3921	2019 Crop	BARLEY	Topsoil	Clay Loam
		SNS Index	**1**	Organic matter	19.20%

Residual Nutrient Status	Unit	Value	Index	Interpretation	Comment
pH		5.8		Acceptable	Suitable for general arable crops
Available Phosphorus P	mg/kg	15	2	Low	Suitable for general arable crops
Available Potassium K	mg/kg	135	1	Medium	Suitable for general arable crops
Available Magnesium Mg	mg/kg	61	1	Low	Suitable for general arable crops

Potentially Toxic Elements	Unit	Value	Limit #	Interpretation
$ Total Arsenic	mg/kg	8.20	50	Acceptable
Total Cadmium	mg/kg	0.28	3	Acceptable
Total Chromium	mg/kg	30.30	400	Acceptable
Total Copper	mg/kg	13.00	200	Acceptable
$ Total Fluoride	mg/kg	18.80	500	Acceptable
Total Lead	mg/kg	94.00	300	Acceptable
Total Mercury	mg/kg	0.03	1	Acceptable
$ Total Molybdenum	mg/kg	1.00	4	Acceptable
Total Nickel	mg/kg	14.20	50	Acceptable
$ Total Selenium	mg/kg	0.23	3	Acceptable
Total Zinc	mg/kg	67.50	200	Acceptable

 # Limit under: 1. COGAP & 2. Code of practice for agriculture use of sewage sludge - at pH 5.0 and above

$ Voluntary. These parameters not subject to: 3. (Sewage Sludge) Directive 86/278/EEC or 4. The Sludge (Use in Agriculture) Regulations 1989

Produced by *Paul Sweeney* *12 February 2019*

Appendix 2 Field FIELD 3921 LH4

INTERPRETATION OF CHEMICAL ANALYSIS OF SOIL & WASTE | FIELD No. **3921** | PAUL SWEENEY AGRONOMY LTD

SAMPLE	GENERATED	12/02/2019	Soil Depth cm	20 to cultivation depth
SOI SCA-LH-4 - 3921	PRINTED	22/02/2019	Calculated Soil Mass	2400 tonnes soil / hectare Dry Wt.

Soil Statutory Elements		THIS SOIL		COGAP LIMIT		CAPACITY	THIS WASTE APPLICATION			
PTE, Potentially Toxic Elements, data from Defra Code of Good Agricultural Practice (COGAP) and 1989 Sludge Regulations	Notes	Actual soil concentration	Total Amount Contained	PTE Max permitted at pH >5.0*	Total Amount Contained	Soil Actual as % of max*	Addition from waste	Load as % of actual	Load as % of maximum	Max No. of applications
		from lab analysis	per Ha. based on soil mass above	from COGAP soil code & sludge regs	based on soil mass above	present load as % of COGAP limit	based on analysis & Rate	waste load as % of actual soil load	waste load as % of maximum COGAP soil load	how many like this one to exceed the COGAP limit
	Units	mg/kg	= kg/Ha	mg/kg	= kg/Ha	%	kg	%	%	No
$ Arsenic	As	8.20	19.68	50	120.00	16%	0.005	0.03%	0.00%	20,363
Cadmium	Cd	0.28	0.67	3	7.20	9%	0.000	0.07%	0.01%	14,335
Chromium	Cr	30.30	72.72	400	960.00	8%	0.160	0.22%	0.02%	5,538
Copper	Cu	13.00	31.20	200	480.00	7%	0.073	0.23%	0.02%	6,125
$ Fluoride	F	18.80	45.12	500	1200.00	4%	0.092	0.20%	0.01%	12,566
Lead	Pb	94.00	225.60	300	720.00	31%	0.024	0.01%	0.00%	20,554
Mercury	Hg	0.03	0.07	1	2.40	3%	0.000	0.58%	0.02%	5,623
$ Molybdenum	Mb	1.00	2.40	4	9.60	25%	0.011	0.44%	0.11%	679
Nickel	Ni	14.20	34.08	50	120.00	28%	0.032	0.09%	0.03%	2,657
$ Selenium	Se	0.23	0.55	3	7.20	8%	0.001	0.11%	0.01%	10,705
Zinc	Zn	67.50	162.00	200	480.00	34%	0.476	0.29%	0.10%	668

This data table is designed for advisory purposes to show the relationship between Soil PTE's (actual & maximum) and the additional amounts supplied in waste.

$ *Voluntary. These parameters not subject to: (Sewage Sludge) Directive 86/278/EEC or The Sludge (Use in Agriculture) Regulations 1989*

Produced by *Paul Sweeney* *12 February 2019*

SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - L0229

PAUL SWEENEY AGRONOMY LTD
40 CROFT AVENUE
BROMBOROUGH
WIRRAL
CH62 2BR

R860

Please quote above code for all enquiries

HOME FARM
OAKENHOLT

SOIL

Date Received	05-FEB-2018
Date Reported	09-FEB-2018

Laboratory References

Report Number	89769
Sample Number	371840

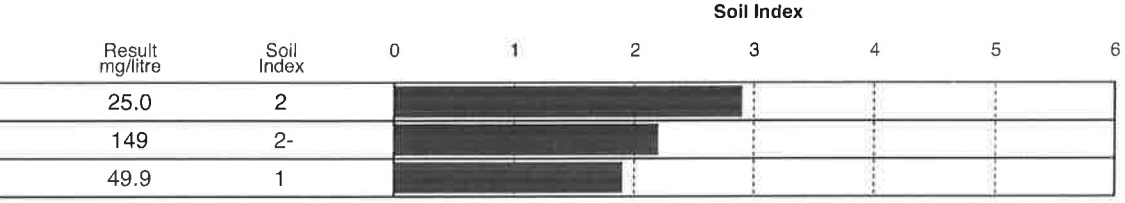
ANALYTICAL RESULTS *on 'dry matter' basis.*

pH (1)

Determinand	Result
Soil pH	7.9

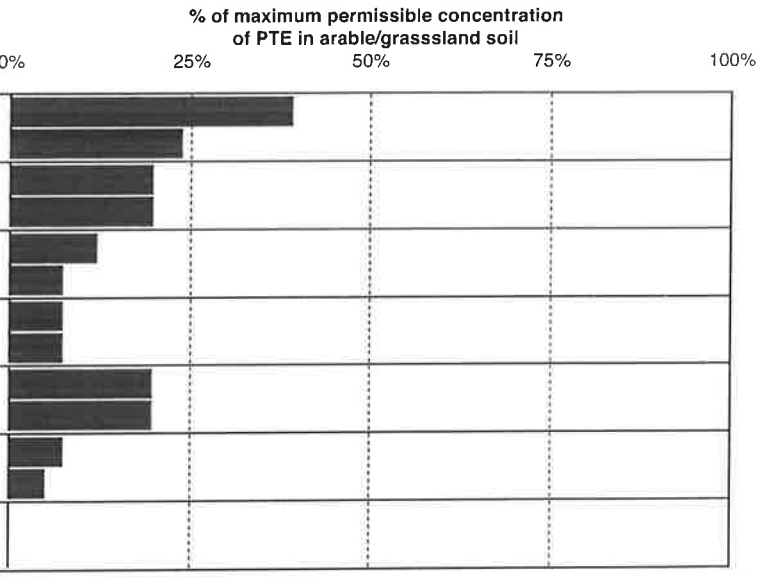
Soil Nutrients (1)

Determinand	Result mg/litre	Soil Index
Soil Phosphorus as P	25.0	2
Soil Potassium as K	149	2-
Soil Magnesium as Mg	49.9	1



Potentially Toxic Elements (2)

Determinand	Result mg/kg		Maximum mg/kg
Total Copper as Cu	78.3	Arable	200
		Grassland	330
Total Zinc as Zn	59.1	Arable	300
		Grassland	300
Total Nickel as Ni	13.2	Arable	110
		Grassland	180
Total Cadmium as Cd	0.22	Arable	3
		Grassland	3
Total Lead as Pb	58.9	Arable	300
		Grassland	300
Total Chromium as Cr	29.7	Arable	400
		Grassland	600
Total Mercury as Hg	<0.2	Arable	1
		Grassland	1.5



(1) Recommendations for liming and fertiliser should be obtained from Defra's Fertiliser Manual (RB209). The analytical methods used are as described in Defra's RB427.

(2) Concentration of Potentially Toxic Elements (PTE, commonly referred to as 'heavy metals') are in mg/kg dry soil. The maximum and the percentage of this maximum permissible concentration of PTE in soil are derived from the values in Defra's Code of Practice for Agricultural Use of Sewage Sludge (England & Wales) 1996. If applying organic manures to this soil it is important to ensure the soil is managed with a pH no less than 5.0, and that the PTE maximum values are not exceeded following the application. For soil where the pH value is less than 5.2, a FACTS Qualified Adviser should be consulted. Further details are provided in the Sludge Code.

Released by J Doyle Date 09/02/18

NRM Coopers Bridge, Braziers Lane, Bracknell, Berkshire RG42 6NS
Tel: +44 (0) 1344 886338 **Fax:** +44 (0) 1344 890972 **Email:** enquiries@nrm.uk.com **www.**nrm.uk.com

SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - L0229

PAUL SWEENEY AGRONOMY LTD
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WIRRAL
CH62 2BR

R860

Please quote above code for all enquiries

HOME FARM
OAKENHOLT

SOIL

Date Received	05-FEB-2018
Date Reported	09-FEB-2018

Laboratory References

Report Number	89769
Sample Number	371840

ANALYTICAL RESULTS *on 'dry matter' basis.*

Potentially Toxic Elements (2)

Determinand	Result mg/kg		Maximum mg/kg	% of maximum permissible concentration of PTE in arable/grasssland soil (0% 25% 50% 75% 100%)
Total Molybdenum as Mo	<1	Arable	4	
		Grassland	4	
Total Selenium as Se	0.20	Arable	3	
		Grassland	5	
Total Arsenic as As	7.7	Arable	50	
		Grassland	50	
Fluoride as Fl	23.8	Arable	500	
		Grassland	500	

(1) Recommendations for liming and fertiliser should be obtained from Defra's Fertiliser Manual (RB209). The analytical methods used are as described in Defra's RB427.

(2) Concentration of Potentially Toxic Elements (PTE, commonly referred to as 'heavy metals') are in mg/kg dry soil. The maximum and the percentage of this maximum permissible concentration of PTE in soil are derived from the values in Defra's Code of Practice for Agricultural Use of Sewage Sludge (England & Wales) 1996. If applying organic manures to this soil it is important to ensure the soil is managed with a pH no less than 5.0, and that the PTE maximum values are not exceeded following the application. For soil where the pH value is less than 5.2, a FACTS Qualified Adviser should be consulted. Further details are provided in the Sludge Code.

Released by J Doyle Date 09/02/18

NRM Coopers Bridge, Braziers Lane, Bracknell, Berkshire RG42 6NS
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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - L0229

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R860

Please quote above code for all enqulries

HOME FARM
OAKENHOLT

SOIL

Date Received	05-FEB-2018
Date Reported	09-FEB-2018

Laboratory References

Report Number	89769
Sample Number	371840

ANALYTICAL RESULTS *on 'dry matter' basis.*

Determinand	Units	Result
Organic Matter LOI	% w/w	9.4

NRM Coopers Bridge, Braziers Lane, Bracknell, Berkshire RG42 6NS
Tel: +44 (0) 1344 886338 **Fax:** +44 (0) 1344 890972 **Email:** enquiries@nrm.uk.com **www**.nrm.uk.com

SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - J1743

PAUL SWEENEY AGRONOMY LTD
40 CROFT AVENUE
BROMBOROUGH
WIRRAL
CH62 2BR

R860

Please quote above code for all enquiries

HOME FARM
OAKENHOLT

SOIL

Date Received	05-FEB-2018
Date Reported	09-FEB-2018

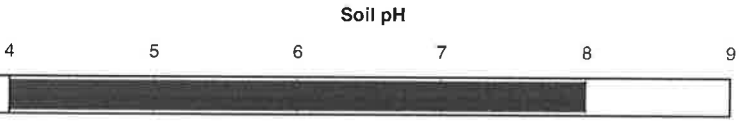
Laboratory References

Report Number	89769
Sample Number	371838

ANALYTICAL RESULTS *on 'dry matter' basis.*

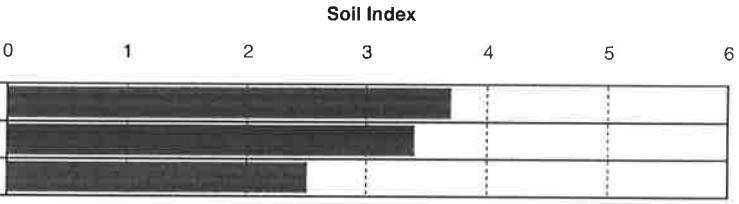
pH (1)

Determinand	Result
Soil pH	8.0



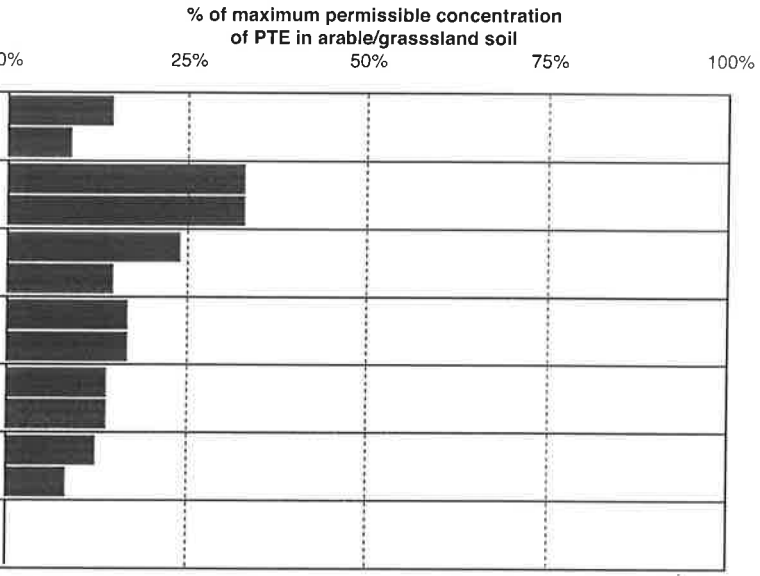
Soil Nutrients (1)

Determinand	Result mg/litre	Soil Index
Soil Phosphorus as P	39.6	3
Soil Potassium as K	309	3
Soil Magnesium as Mg	79.7	2



Potentially Toxic Elements (2)

Determinand	Result mg/kg		Maximum mg/kg
Total Copper as Cu	28.8	Arable	200
		Grassland	330
Total Zinc as Zn	98.6	Arable	300
		Grassland	300
Total Nickel as Ni	26.3	Arable	110
		Grassland	180
Total Cadmium as Cd	0.50	Arable	3
		Grassland	3
Total Lead as Pb	41.3	Arable	300
		Grassland	300
Total Chromium as Cr	49.2	Arable	400
		Grassland	600
Total Mercury as Hg	<0.2	Arable	1
		Grassland	1.5



(1) Recommendations for liming and fertiliser should be obtained from Defra's Fertiliser Manual (RB209). The analytical methods used are as described in Defra's RB427.

(2) Concentration of Potentially Toxic Elements (PTE, commonly referred to as 'heavy metals') are in mg/kg dry soil. The maximum and the percentage of this maximum permissible concentration of PTE in soil are derived from the values in Defra's Code of Practice for Agricultural Use of Sewage Sludge (England & Wales) 1996. If applying organic manures to this soil it is important to ensure the soil is managed with a pH no less than 5.0, and that the PTE maximum values are not exceeded following the application. For soil where the pH value is less than 5.2, a FACTS Qualified Adviser should be consulted. Further details are provided in the Sludge Code.

Released by J Doyle Date 09/02/18

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HOME FARM
OAKENHOLT

SOIL

Date Received	05-FEB-2018
Date Reported	09-FEB-2018

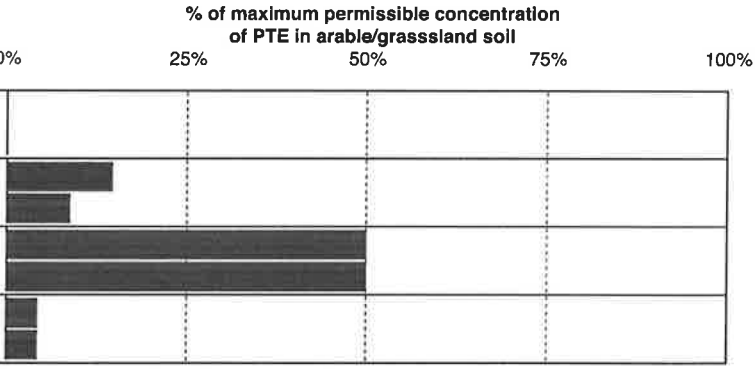
Laboratory References

Report Number	89769
Sample Number	371838

ANALYTICAL RESULTS *on 'dry matter' basis.*

Potentially Toxic Elements (2)

Determinand	Result mg/kg		Maximum mg/kg
Total Molybdenum as Mo	<1	Arable	4
		Grassland	4
Total Selenium as Se	0.44	Arable	3
		Grassland	5
Total Arsenic as As	25.0	Arable	50
		Grassland	50
Fluoride as Fl	21.6	Arable	500
		Grassland	500



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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - J1743

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WIRRAL
CH62 2BR

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HOME FARM
OAKENHOLT

SOIL

Date Received	05-FEB-2018
Date Reported	09-FEB-2018

Laboratory References

Report Number	89769
Sample Number	371838

ANALYTICAL RESULTS *on 'dry matter' basis.*

Determinand	Units	Result
Organic Matter LOI	% w/w	8.2

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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - K9298

PAUL SWEENEY AGRONOMY LTD
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BROMBOROUGH
WIRRAL
CH62 2BR

R860

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HOME FARM
OAKENHOLT

SOIL

Date Received	05-FEB-2018
Date Reported	09-FEB-2018

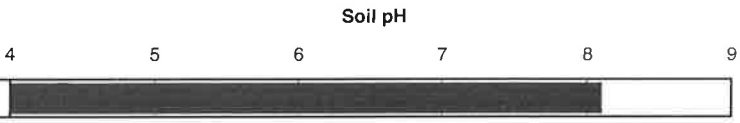
Laboratory References

Report Number	89769
Sample Number	371839

ANALYTICAL RESULTS *on 'dry matter' basis.*

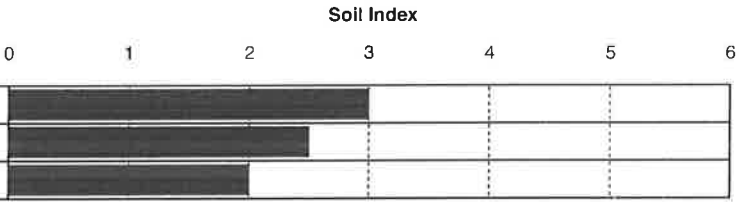
pH (1)

Determinand	Result
Soil pH	8.1



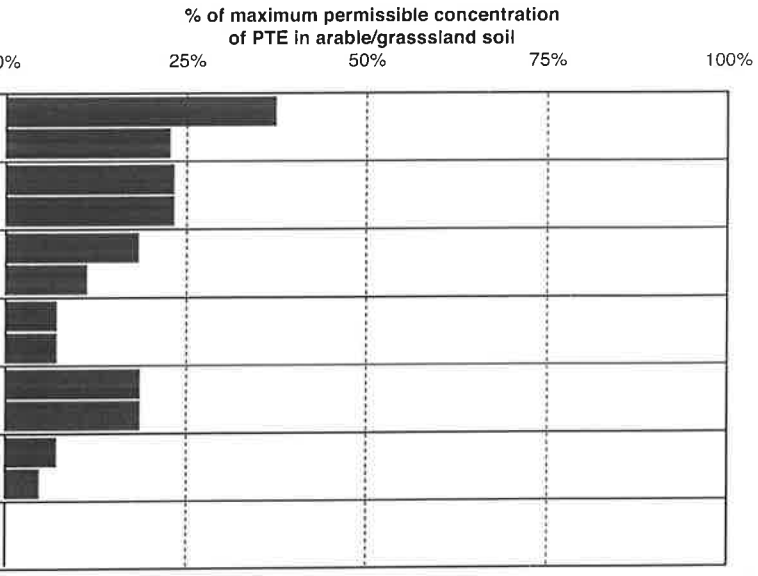
Soil Nutrients (1)

Determinand	Result mg/litre	Soil Index
Soil Phosphorus as P	27.4	3
Soil Potassium as K	191	2+
Soil Magnesium as Mg	54.5	2



Potentially Toxic Elements (2)

Determinand	Result mg/kg		Maximum mg/kg
Total Copper as Cu	74.7	Arable	200
		Grassland	330
Total Zinc as Zn	69.6	Arable	300
		Grassland	300
Total Nickel as Ni	20.1	Arable	110
		Grassland	180
Total Cadmium as Cd	0.21	Arable	3
		Grassland	3
Total Lead as Pb	55.5	Arable	300
		Grassland	300
Total Chromium as Cr	28.0	Arable	400
		Grassland	600
Total Mercury as Hg	<0.2	Arable	1
		Grassland	1.5



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Released by J Doyle Date 09/02/18

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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - K9298

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40 CROFT AVENUE
BROMBOROUGH
WIRRAL
CH62 2BR

R860

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HOME FARM
OAKENHOLT

SOIL

Date Received	05-FEB-2018
Date Reported	09-FEB-2018

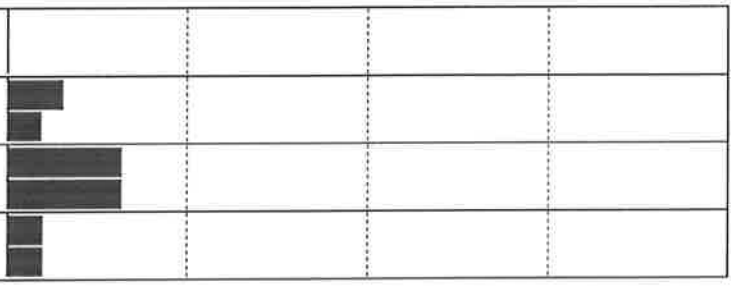
Laboratory References

Report Number	89769
Sample Number	371839

ANALYTICAL RESULTS *on 'dry matter' basis.*

Potentially Toxic Elements (2)

Determinand	Result mg/kg		Maximum mg/kg
Total Molybdenum as Mo	<1	Arable	4
		Grassland	4
Total Selenium as Se	0.23	Arable	3
		Grassland	5
Total Arsenic as As	7.9	Arable	50
		Grassland	50
Fluoride as Fl	24.1	Arable	500
		Grassland	500



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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - K9298

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HOME FARM
OAKENHOLT

SOIL

Date Received	05-FEB-2018
Date Reported	09-FEB-2018

Laboratory References

Report Number	89769
Sample Number	371839

ANALYTICAL RESULTS *on 'dry matter' basis.*

Determinand	Units	Result
Organic Matter LOI	% w/w	9.9

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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - D 4827

PAUL SWEENEY AGRONOMY LTD
40 CROFT AVENUE
BROMBOROUGH
WIRRAL
CH62 2BR

R860

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HOME FARM

SOIL

Date Received	15-APR-2016
Date Reported	21-APR-2016

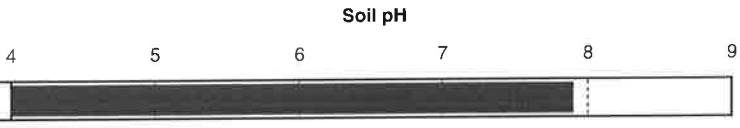
Laboratory References

Report Number	14416
Sample Number	302215

ANALYTICAL RESULTS *on 'dry matter' basis.*

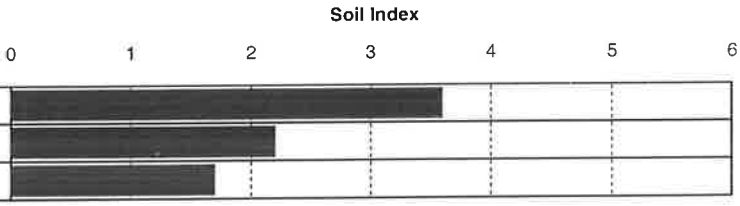
pH (1)

Determinand	Result
Soil pH	7.9



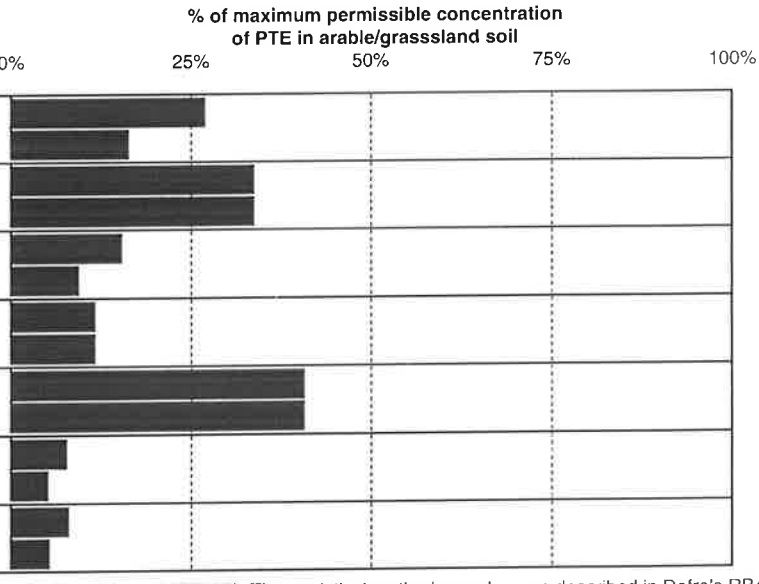
Soil Nutrients (1)

Determinand	Result mg/litre	Soil Index
Soil Phosphorus as P	38.0	3
Soil Potassium as K	154	2-
Soil Magnesium as Mg	42.8	1



Potentially Toxic Elements (2)

Determinand	Result mg/kg		Maximum mg/kg
Total Copper as Cu	53.8	Arable	200
		Grassland	330
Total Zinc as Zn	101	Arable	300
		Grassland	300
Total Nickel as Ni	16.9	Arable	110
		Grassland	180
Total Cadmium as Cd	0.35	Arable	3
		Grassland	3
Total Lead as Pb	122	Arable	300
		Grassland	300
Total Chromium as Cr	30.9	Arable	400
		Grassland	600
Total Mercury as Hg	0.08	Arable	1
		Grassland	1.5



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Released by J Doyle Date 21/04/16

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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - D 4827

PAUL SWEENEY AGRONOMY LTD
40 CROFT AVENUE
BROMBOROUGH
WIRRAL
CH62 2BR

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HOME FARM

SOIL

Date Received	15-APR-2016
Date Reported	21-APR-2016

Laboratory References

Report Number	14416
Sample Number	302215

ANALYTICAL RESULTS *on 'dry matter' basis.*

Determinand	Units	Result
Total Arsenic	mg/kg	10.6
Total Selenium	mg/kg	0.30
Fluoride 2:1 ratio	mg/kg	<1
Total Molybdenum	mg/kg	1.2
Organic Matter LOI	% w/w	11.2

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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - E 3320

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BROMBOROUGH
WIRRAL
CH62 2BR

R860

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HOME FARM

SOIL

Date Received	15-APR-2016
Date Reported	21-APR-2016

Laboratory References

Report Number	14416
Sample Number	302216

ANALYTICAL RESULTS *on 'dry matter' basis.*

pH (1)

Determinand	Result	Soil pH 4 5 6 7 8 9
Soil pH	8.1	

Soil Nutrients (1)

Determinand	Result mg/litre	Soil Index	Soil Index 0 1 2 3 4 5 6
Soil Phosphorus as P	19.6	2	
Soil Potassium as K	78.6	1	
Soil Magnesium as Mg	48.2	1	

Potentially Toxic Elements (2)

Determinand	Result mg/kg		Maximum mg/kg	% of maximum permissible concentration of PTE in arable/grasssland soil 0% 25% 50% 75% 100%
Total Copper as Cu	39.5	Arable	200	
		Grassland	330	
Total Zinc as Zn	77.0	Arable	300	
		Grassland	300	
Total Nickel as Ni	15.6	Arable	110	
		Grassland	180	
Total Cadmium as Cd	0.28	Arable	3	
		Grassland	3	
Total Lead as Pb	74.3	Arable	300	
		Grassland	300	
Total Chromium as Cr	28.5	Arable	400	
		Grassland	600	
Total Mercury as Hg	0.07	Arable	1	
		Grassland	1.5	

(1) Recommendations for liming and fertiliser should be obtained from Defra's Fertiliser Manual (RB209). The analytical methods used are as described in Defra's RB427.

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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - E 3320

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WIRRAL
CH62 2BR

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HOME FARM

SOIL

Date Received	15-APR-2016
Date Reported	21-APR-2016

Laboratory References

Report Number	14416
Sample Number	302216

ANALYTICAL RESULTS *on 'dry matter' basis.*

Determinand	Units	Result
Total Arsenic	mg/kg	10.3
Total Selenium	mg/kg	0.28
Fluoride 2:1 ratio	mg/kg	<1
Total Molybdenum	mg/kg	1.0
Organic Matter LOI	% w/w	11.5

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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - 4 3921

PAUL SWEENEY AGRONOMY LTD
40 CROFT AVENUE
BROMBOROUGH
WIRRAL
CH62 2BR

R860

Please quote above code for all enquiries

HOME FARM

SOIL

Date Received	15-APR-2016
Date Reported	21-APR-2016

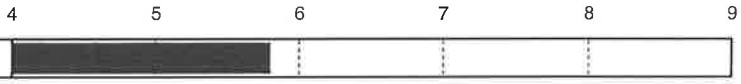
Laboratory References

Report Number	14416
Sample Number	302217

ANALYTICAL RESULTS *on 'dry matter' basis.*

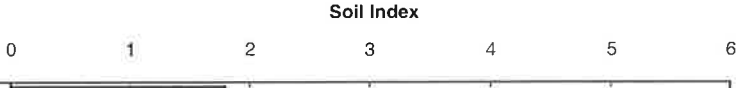
pH (1)

Determinand	Result
Soil pH	5.8



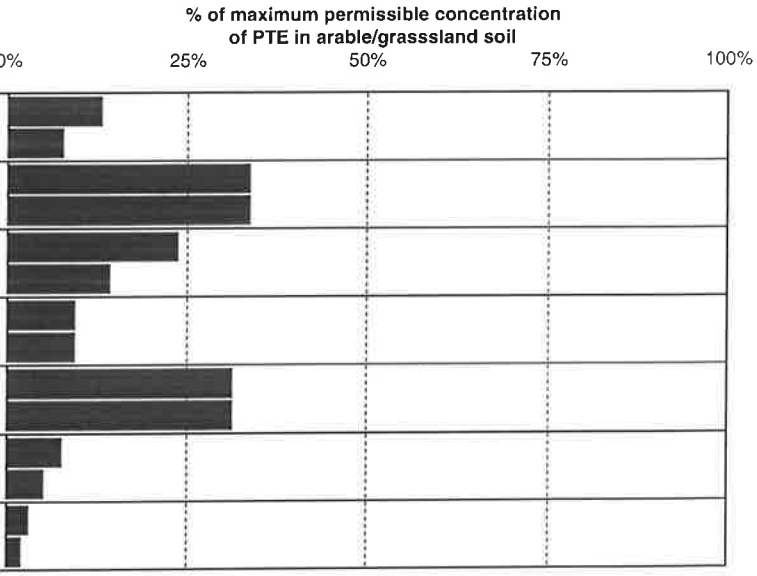
Soil Nutrients (1)

Determinand	Result mg/litre	Soil Index
Soil Phosphorus as P	14.6	1
Soil Potassium as K	135	2-
Soil Magnesium as Mg	60.6	2



Potentially Toxic Elements (2)

Determinand	Result mg/kg		Maximum mg/kg
Total Copper as Cu	13.0	Arable	100
		Grassland	170
Total Zinc as Zn	67.5	Arable	200
		Grassland	200
Total Nickel as Ni	14.2	Arable	60
		Grassland	100
Total Cadmium as Cd	0.28	Arable	3
		Grassland	3
Total Lead as Pb	94.0	Arable	300
		Grassland	300
Total Chromium as Cr	30.3	Arable	400
		Grassland	600
Total Mercury as Hg	0.03	Arable	1
		Grassland	1.5



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Released by J Doyle Date 21/04/16

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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - 4 3921

PAUL SWEENEY AGRONOMY LTD
40 CROFT AVENUE
BROMBOROUGH
WIRRAL
CH62 2BR

R860

Please quote above code for all enquiries

HOME FARM

SOIL

Date Received	15-APR-2016
Date Reported	21-APR-2016

Laboratory References

Report Number	14416
Sample Number	302217

ANALYTICAL RESULTS *on 'dry matter' basis.*

Determinand	Units	Result
Total Arsenic	mg/kg	8.2
Total Selenium	mg/kg	0.23
Fluoride 2:1 ratio	mg/kg	18.8
Total Molybdenum	mg/kg	<1
Organic Matter LOI	% w/w	19.2

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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - N 4449

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BROMBOROUGH
WIRRAL
CH62 2BR

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HOME FARM

SOIL

Date Received	15-APR-2016
Date Reported	21-APR-2016

Laboratory References

Report Number	14416
Sample Number	302218

ANALYTICAL RESULTS *on 'dry matter' basis.*

pH (1)

Determinand	Result	Soil pH 4 5 6 7 8 9
Soil pH	7.7	

Soil Nutrients (1)

Determinand	Result mg/litre	Soil Index	Soil Index 0 1 2 3 4 5 6
Soil Phosphorus as P	23.4	2	
Soil Potassium as K	104	1	
Soil Magnesium as Mg	36.8	1	

Potentially Toxic Elements (2)

Determinand	Result mg/kg		Maximum mg/kg	% of maximum permissible concentration of PTE in arable/grasssland soil 0% 25% 50% 75% 100%
Total Copper as Cu	42.0	Arable	200	
		Grassland	330	
Total Zinc as Zn	78.3	Arable	300	
		Grassland	300	
Total Nickel as Ni	18.8	Arable	110	
		Grassland	180	
Total Cadmium as Cd	0.37	Arable	3	
		Grassland	3	
Total Lead as Pb	112	Arable	300	
		Grassland	300	
Total Chromium as Cr	35.0	Arable	400	
		Grassland	600	
Total Mercury as Hg	0.04	Arable	1	
		Grassland	1.5	

(1) Recommendations for liming and fertiliser should be obtained from Defra's Fertiliser Manual (RB209). The analytical methods used are as described in Defra's RB427.

(2) Concentration of Potentially Toxic Elements (PTE, commonly referred to as 'heavy metals') are in mg/kg dry soil. The maximum and the percentage of this maximum permissible concentration of PTE in soil are derived from the values in Defra's Code of Practice for Agricultural Use of Sewage Sludge (England & Wales) 1996. If applying organic manures to this soil it is important to ensure the soil is managed with a pH no less than 5.0, and that the PTE maximum values are not exceeded following the application. For soil where the pH value is less than 5.2, a FACTS Qualified Adviser should be consulted. Further details are provided in the Sludge Code.

Released by J Doyle Date 21/04/16

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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - N 4449

PAUL SWEENEY AGRONOMY LTD
40 CROFT AVENUE
BROMBOROUGH
WIRRAL
CH62 2BR

R860

Please quote above code for all enquiries

HOME FARM

SOIL

Date Received	15-APR-2016
Date Reported	21-APR-2016

Laboratory References

Report Number	14416
Sample Number	302218

ANALYTICAL RESULTS *on 'dry matter' basis.*

Determinand	Units	Result
Total Arsenic	mg/kg	10.6
Total Selenium	mg/kg	0.19
Fluoride 2:1 ratio	mg/kg	2.5
Total Molybdenum	mg/kg	1.1
Organic Matter LOI	% w/w	16.0

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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - O 3450

PAUL SWEENEY AGRONOMY LTD
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CH62 2BR

R860

Please quote above code for all enquiries

HOME FARM

SOIL

Date Received	15-APR-2016
Date Reported	21-APR-2016

Laboratory References

Report Number	14416
Sample Number	302219

ANALYTICAL RESULTS *on 'dry matter' basis.*

pH (1)

Determinand	Result	Soil pH 4 5 6 7 8 9
Soil pH	7.4	

Soil Nutrients (1)

Determinand	Result mg/litre	Soil Index	Soil Index 0 1 2 3 4 5 6
Soil Phosphorus as P	36.6	3	
Soil Potassium as K	162	2-	
Soil Magnesium as Mg	40.9	1	

Potentially Toxic Elements (2)

Determinand	Result mg/kg		Maximum mg/kg	% of maximum permissible concentration of PTE in arable/grasssland soil 0% 25% 50% 75% 100%
Total Copper as Cu	33.7	Arable	200	
		Grassland	330	
Total Zinc as Zn	82.0	Arable	300	
		Grassland	300	
Total Nickel as Ni	16.2	Arable	110	
		Grassland	180	
Total Cadmium as Cd	0.35	Arable	3	
		Grassland	3	
Total Lead as Pb	103	Arable	300	
		Grassland	300	
Total Chromium as Cr	30.6	Arable	400	
		Grassland	600	
Total Mercury as Hg	0.04	Arable	1	
		Grassland	1.5	

(1) Recommendations for liming and fertiliser should be obtained from Defra's Fertiliser Manual (RB209). The analytical methods used are as described in Defra's RB427.

(2) Concentration of Potentially Toxic Elements (PTE, commonly referred to as 'heavy metals') are in mg/kg dry soil. The maximum and the percentage of this maximum permissible concentration of PTE in soil are derived from the values in Defra's Code of Practice for Agricultural Use of Sewage Sludge (England & Wales) 1996. If applying organic manures to this soil it is important to ensure the soil is managed with a pH no less than 5.0, and that the PTE maximum values are not exceeded following the application. For soil where the pH value is less than 5.2, a FACTS Qualified Adviser should be consulted. Further details are provided in the Sludge Code.

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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - O 3450

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WIRRAL
CH62 2BR

R860

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HOME FARM

SOIL

Date Received	15-APR-2016
Date Reported	21-APR-2016

Laboratory References

Report Number	14416
Sample Number	302219

ANALYTICAL RESULTS *on 'dry matter' basis.*

Determinand	Units	Result
Total Arsenic	mg/kg	8.8
Total Selenium	mg/kg	0.23
Fluoride 2:1 ratio	mg/kg	11.3
Total Molybdenum	mg/kg	1.2
Organic Matter LOI	% w/w	12.8

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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - P 1625

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WIRRAL
CH62 2BR

R860

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HOME FARM

SOIL

Date Received	15-APR-2016
Date Reported	21-APR-2016

Laboratory References

Report Number	14416
Sample Number	302220

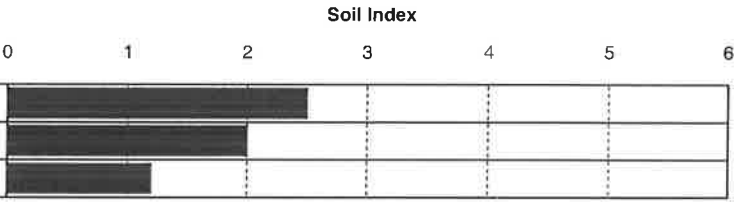
ANALYTICAL RESULTS *on 'dry matter' basis.*

pH (1)

Determinand	Result
Soil pH	7.4

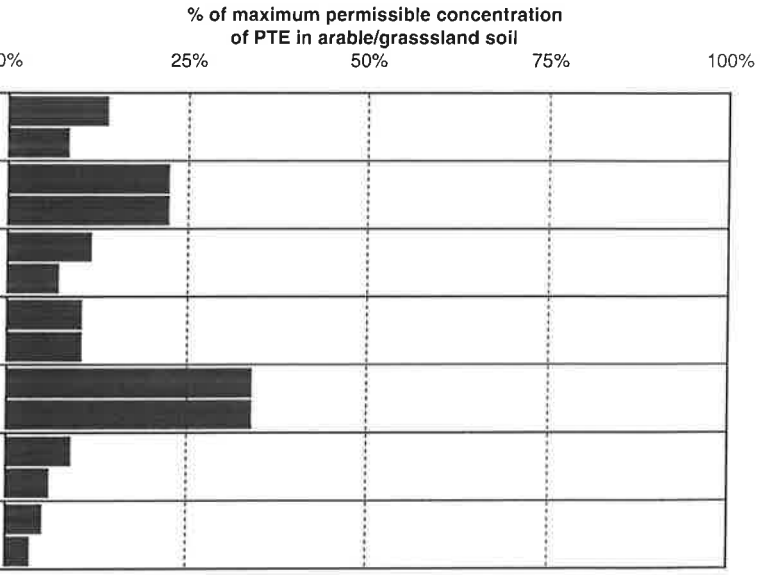
Soil Nutrients (1)

Determinand	Result mg/litre	Soil Index
Soil Phosphorus as P	21.2	2
Soil Potassium as K	126	2-
Soil Magnesium as Mg	30.4	1



Potentially Toxic Elements (2)

Determinand	Result mg/kg		Maximum mg/kg
Total Copper as Cu	27.4	Arable	200
		Grassland	330
Total Zinc as Zn	66.9	Arable	300
		Grassland	300
Total Nickel as Ni	12.7	Arable	110
		Grassland	180
Total Cadmium as Cd	0.31	Arable	3
		Grassland	3
Total Lead as Pb	102	Arable	300
		Grassland	300
Total Chromium as Cr	35.8	Arable	400
		Grassland	600
Total Mercury as Hg	0.05	Arable	1
		Grassland	1.5



(1) Recommendations for liming and fertiliser should be obtained from Defra's Fertiliser Manual (RB209). The analytical methods used are as described in Defra's RB427.

(2) Concentration of Potentially Toxic Elements (PTE, commonly referred to as 'heavy metals') are in mg/kg dry soil. The maximum and the percentage of this maximum permissible concentration of PTE in soil are derived from the values in Defra's Code of Practice for Agricultural Use of Sewage Sludge (England & Wales) 1996. If applying organic manures to this soil it is important to ensure the soil is managed with a pH no less than 5.0, and that the PTE maximum values are not exceeded following the application. For soil where the pH value is less than 5.2, a FACTS Qualified Adviser should be consulted. Further details are provided in the Sludge Code.

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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - P 1625

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HOME FARM

SOIL

Date Received	15-APR-2016
Date Reported	21-APR-2016

Laboratory References

Report Number	14416
Sample Number	302220

ANALYTICAL RESULTS *on 'dry matter' basis.*

Determinand	Units	Result
Total Arsenic	mg/kg	7.8
Total Selenium	mg/kg	0.23
Fluoride 2:1 ratio	mg/kg	13.8
Total Molybdenum	mg/kg	1.1
Organic Matter LOI	% w/w	12.0

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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - Q 1820

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CH62 2BR

R860

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HOME FARM

SOIL

Date Received	15-APR-2016
Date Reported	21-APR-2016

Laboratory References

Report Number	14416
Sample Number	302221

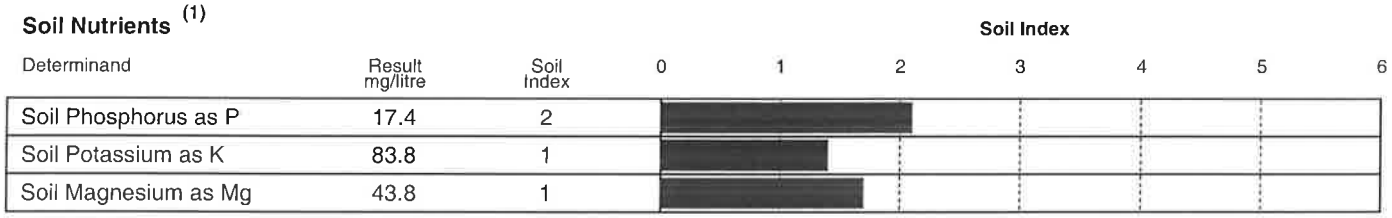
ANALYTICAL RESULTS *on 'dry matter' basis.*

pH (1)

Determinand	Result
Soil pH	8.2

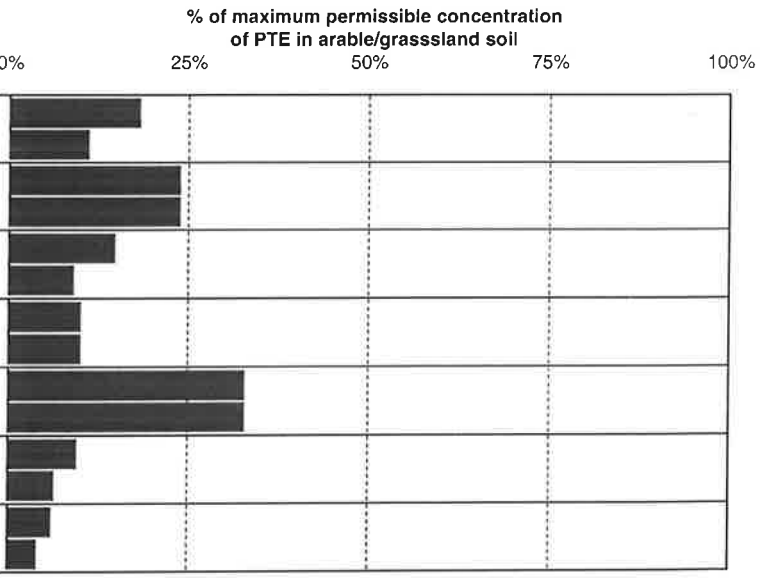
Soil Nutrients (1)

Determinand	Result mg/litre	Soil Index
Soil Phosphorus as P	17.4	2
Soil Potassium as K	83.8	1
Soil Magnesium as Mg	43.8	1



Potentially Toxic Elements (2)

Determinand	Result mg/kg		Maximum mg/kg
Total Copper as Cu	36.3	Arable	200
		Grassland	330
Total Zinc as Zn	71.5	Arable	300
		Grassland	300
Total Nickel as Ni	16.2	Arable	110
		Grassland	180
Total Cadmium as Cd	0.30	Arable	3
		Grassland	3
Total Lead as Pb	98.6	Arable	300
		Grassland	300
Total Chromium as Cr	38.0	Arable	400
		Grassland	600
Total Mercury as Hg	0.06	Arable	1
		Grassland	1.5



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(2) Concentration of Potentially Toxic Elements (PTE, commonly referred to as 'heavy metals') are in mg/kg dry soil. The maximum and the percentage of this maximum permissible concentration of PTE in soil are derived from the values in Defra's Code of Practice for Agricultural Use of Sewage Sludge (England & Wales) 1996. If applying organic manures to this soil it is important to ensure the soil is managed with a pH no less than 5.0, and that the PTE maximum values are not exceeded following the application. For soil where the pH value is less than 5.2, a FACTS Qualified Adviser should be consulted. Further details are provided in the Sludge Code.

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SOIL CHEMICAL ANALYSIS REPORT FOR FIELD - Q 1820

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CH62 2BR

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Please quote above code for all enquiries

HOME FARM

SOIL

Date Received	15-APR-2016
Date Reported	21-APR-2016

Laboratory References

Report Number	14416
Sample Number	302221

ANALYTICAL RESULTS *on 'dry matter' basis.*

Determinand	Units	Result
Total Arsenic	mg/kg	9.9
Total Selenium	mg/kg	0.27
Fluoride 2:1 ratio	mg/kg	<1
Total Molybdenum	mg/kg	<1
Organic Matter LOI	% w/w	13.3

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Appendix 3a Summary data - Nutrient Supply - 'DRY' Sludge

	Waste Application Rate					
	Fresh	36	t/ha	Dry Matter	4.1	t/ha
Nutrient	Total Supply		5-year release est.			
	kg/ha		kg/ha			
N	124		62			Nitrogen
P_2O_5	50		25			Phosphate
K_2O	7		5.6			Potash
MgO	19		10			Magnesium
SO_3	28		14			Sulphur
Ca	22		22			Calcium

Appendix 3b Summary data - Nutrient Supply - 'WET' Sludge FIELDS D & E ONLY

	Waste Application Rate					
	Fresh	250	t/ha	Dry Matter	1.7	t/ha
Nutrient	Total Supply		5-year release est.			
	kg/ha		kg/ha			
N	100		50			Nitrogen
P_2O_5	13		7			Phosphate
K_2O	11		8			Potash
MgO	12		8			Magnesium
SO_3	29		15			Sulphur
Ca	28		28			Calcium

Appendix 4

Laboratory Data Sheets

Results follow of an example of the analysis of the waste material.

Two results are shown:

1. 'Dry' paper sludge (de-watered) at 11.5% DS taken in January 2019.
2. 'Wet' paper sludge at 0.68 % DS taken in January 2019.

The plant has a policy of routine testing and results will be repeated in JULY 2019. Should results differ markedly from those previous, a correction to spreading rate may be made.

Samples are also taken routinely for 'wet' liquid sludge as a contingency in the event of future plant breakdown in which case this type of waste may be spread (on fields D & E)

'Wet' sludge, where it is used, is essentially the same material but containing water. In the event that liquid is spread, the maximum rate applied is 250 t/ha to comply with COGAP recommendations. This would typically supply no more than 100 kg/ha total N.

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ESSITY OAKENHOLT

PAPER SLUDGE

PAPER SLUDGE

Sample Reference :

ESSITY SLUDGE JAN 19

Sample Matrix : PAPER SLUDGE

Laboratory References	
Report Number	39227
Sample Number	98395

Date Received	11-JAN-2019
Date Reported	23-JAN-2019

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

The sample will be kept as the dry ground sample for at least 1 month.

ANALYTICAL RESULTS *on 'dry matter' basis.*

Determinand	Value	Units
Oven Dry Matter	11.5	%
Total Nitrogen	2.99	% w/w
Total Carbon	40.2	% w/w
C:N Ratio	13:1	
Nitrate Nitrogen	<10	mg/kg
Ammonium Nitrogen	801	mg/kg
Total Phosphorus (P)	5323	mg/kg
Total Potassium (K)	1422	mg/kg
Total Magnesium (Mg)	2818	mg/kg
Total Copper (Cu)	17.7	mg/kg

Released by *Danny Weare* Date *23/01/19*

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ESSITY OAKENHOLT

PAPER SLUDGE

PAPER SLUDGE

Sample Reference :

ESSITY SLUDGE JAN 19

Sample Matrix : PAPER SLUDGE

Laboratory References	
Report Number	39227
Sample Number	98395

Date Received	11-JAN-2019
Date Reported	23-JAN-2019

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

The sample will be kept as the dry ground sample for at least 1 month.

ANALYTICAL RESULTS *on 'dry matter' basis.*

Determinand	Value	Units
Total Zinc (Zn)	115	mg/kg
Total Sulphur (S)	2761	mg/kg
Total Calcium (Ca)	5495	mg/kg
Total Molybdenum (Mo)	2.56	mg/kg
Total Manganese (Mn)	28.5	mg/kg
Total Lead (Pb)	5.81	mg/kg
Total Cadmium (Cd)	0.11	mg/kg
Total Mercury (Hg)	<0.1	mg/kg
Total Nickel (Ni)	7.81	mg/kg
Total Chromium (Cr)	38.7	mg/kg

Released by ..... *Danny Weare* ..... Date ..... *23/01/19* .....

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ESSITY OAKENHOLT

PAPER SLUDGE

PAPER SLUDGE

Sample Reference :

ESSITY SLUDGE JAN 19

Sample Matrix : PAPER SLUDGE

Laboratory References	
Report Number	39227
Sample Number	98395

Date Received	11-JAN-2019
Date Reported	23-JAN-2019

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

The sample will be kept as the dry ground sample for at least 1 month.

ANALYTICAL RESULTS *on 'dry matter' basis.*

Determinand	Value	Units
Total Sodium (Na)	1562	mg/kg
pH 1:6 [Fresh]	5.30	
Organic Matter LOI	84.7	% w/w
Lime Equivalent as CaCO3	<2	% w/w
Total Aluminium	793	mg/kg
Fluoride [100:1 H2S04 Soluble]	22.2	mg/kg
Total Arsenic (As)	1.19	mg/kg
Total Selenium (Se)	0.15	mg/kg
C.O.D. [fresh]	144000	mg/l
Neutralising Value as CaO [TNV]	<1	% w/w

Released by *Danny Weare* Date *23/01/19*

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CH62 2BR

R860

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ESSITY OAKENHOLT

PAPER SLUDGE

PAPER SLUDGE

Sample Reference :

PAPER SLUDGE WET

Sample Matrix : PAPER SLUDGE

Laboratory References	
Report Number	39202
Sample Number	77902

Date Received	11-JAN-2019
Date Reported	17-JAN-2019

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

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

ANALYTICAL RESULTS *on 'as received' basis.*

Determinand	Value	Units
Oven Dry Solids	0.680	%
Total Nitrogen	<0.04	% w/w
Total Carbon	0.20	% w/w
C:N Ratio	N.A.	
Nitrate Nitrogen	<10	mg/kg
Ammonium Nitrogen	<50	mg/kg
Total Phosphorus (P)	22.0	mg/kg
Total Potassium (K)	35.9	mg/kg
Total Magnesium (Mg)	28.1	mg/kg
Total Copper (Cu)	<0.2	mg/kg

Released by Darren Whitbread Date 17/01/19

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CH62 2BR

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ESSITY OAKENHOLT

PAPER SLUDGE

PAPER SLUDGE

Sample Reference :

PAPER SLUDGE WET

Sample Matrix : PAPER SLUDGE

Laboratory References	
Report Number	39202
Sample Number	77902

Date Received	11-JAN-2019
Date Reported	17-JAN-2019

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

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

ANALYTICAL RESULTS *on 'as received' basis.*

Determinand	Value	Units
Total Zinc (Zn)	0.66	mg/kg
Total Sulphur (S)	46.9	mg/kg
Total Calcium (Ca)	115	mg/kg
Total Molybdenum (Mo)	<0.05	mg/kg
Total Manganese (Mn)	<0.5	mg/kg
Total Lead (Pb)	<0.5	mg/kg
Total Cadmium (Cd)	<0.01	mg/kg
Total Mercury (Hg)	<0.05	mg/kg
Total Nickel (Ni)	<0.2	mg/kg
Total Chromium (Cr)	0.40	mg/kg

Released by ..... *Darren Whitbread* Date *17/01/19*

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CH62 2BR

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ESSITY OAKENHOLT

PAPER SLUDGE

PAPER SLUDGE

Sample Reference :

PAPER SLUDGE WET

Sample Matrix : PAPER SLUDGE

Laboratory References	
Report Number	39202
Sample Number	77902

Date Received	11-JAN-2019
Date Reported	17-JAN-2019

The sample submitted was of adequate size to complete all analysis requested.
The sample will be kept under refrigeration for at least 3 weeks.

ANALYTICAL RESULTS *on 'as received' basis.*

Determinand	Value	Units
Total Sodium (Na)	125	mg/kg
pH 1:6 [Fresh]	5.08	
Organic Matter LOI	0.55	% w/w
Lime Equivalent as CaCO3	<2	% w/w
Total Aluminium	3.49	mg/kg
Fluoride [100:1 H2S04 Soluble]	<10	mg/kg
Total Arsenic (As)	<0.5	mg/kg
Total Selenium (Se)	<0.02	mg/kg
C.O.D. [fresh]	7880	mg/l
Neutralising Value as CaO [TNV]	<1	% w/w

Released by ..... Darren Whitbread ..... Date ..... 17/01/19 .....

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Appendix 5

Crop Nutrition Data

Advice given to the applicant on crop nutritional requirements for these fields based on the supply of nutrients from the waste application.

This will be amended / updated at the time of application as future cropping is finalised.

Fields		D, E, Q
Number		No's, 4727, 3320, 1820
Grid Ref		SJ26486927
Crop Area	Ha	2.1 + 3.83+0.8 = 6.73 Ha
Soil Texture		Sandy / Clay Loam
Last Crop		Turnips
Next Crop		Beet (Fodder)
Anticipated yield	Tonnes / ha	60
Soil Nitrogen Supply	SNS	1
Assessed crop N requirement	kg/ha	130
Estimated N supply from waste	kg/ha	25
Fertiliser N Requirement	kg/ha	105
Soil P index		2 or 3
Fertiliser Requirement	kg/ha P_2O_5	0
Soil K index		1
Fertiliser Requirement	kg/ha K_2O	120
Soil PTE levels	COGAP	All within limit

Fields		K, L, N P, 4
Number		No's 9298, 0229, 4449, 1625, 3921
Grid Ref		SJ26447049
Crop Area	Ha	4.96+ 3.96 + 2.26 + 3.46 + 8.66 = 23.30
Soil Texture		Sandy Loam / Clay Loam
Last Crop		Beet / Barley
Next Crop		Barley
Anticipated yield	Tonnes / ha	6.0
Soil Nitrogen Supply	SNS	1
Assessed crop N requirement	kg/ha	150
Estimated N supply from waste	kg/ha	25
Fertiliser N Requirement	kg/ha	125
Soil P index		>2
Fertiliser Requirement	kg/ha P_2O_5	0
Soil K index		>1
Fertiliser Requirement	kg/ha K_2O	120
Soil PTE levels	COGAP	All within limit

Fields		O
Number		No's, 3450
Grid Ref		SJ26486927
Crop Area	Ha	= 3.91 Ha
Soil Texture		Sandy / Clay Loam
Last Crop		BEET
Next Crop		WHEAT
Anticipated yield	Tonnes / ha	9
Soil Nitrogen Supply	SNS	1
Assessed crop N requirement	kg/ha	200
Estimated N supply from waste	kg/ha	25
Fertiliser N Requirement	kg/ha	175
Soil P index		3
Fertiliser Requirement	kg/ha P_2O_5	0
Soil K index		2
Fertiliser Requirement	kg/ha K_2O	120
Soil PTE levels	COGAP	All within limit

Fields		J,
Number		No 1743,
Grid Ref		SJ26447049
Crop Area	Ha	4.06 = 4.06
Soil Texture		Sandy Loam / Clay Loam
Last Crop		MAIZE
Next Crop		MAIZE
Anticipated yield	Tonnes / ha	40
Soil Nitrogen Supply	SNS	1
Assessed crop N requirement	kg/ha	125
Estimated N supply from waste	kg/ha	25
Fertiliser N Requirement	kg/ha	132
Soil P index		3
Fertiliser Requirement	kg/ha P_2O_5	0
Soil K index		3
Fertiliser Requirement	kg/ha K_2O	0
Soil PTE levels	COGAP	All within limit

Appendix 5b
Repeat Waste Applications, previous Deployment

	2018 waste applications PAN-002333			2019 – APPLICATION PLAN		
FIELD	**Crop**	**Type & Rate**	**Application Timing**	**Crop**	**Type & Rate**	**Application Timing**
		T/ha			**T / ha**	
D	Turnips	Liquid Sludge 100	June 2018	Beet	Contingency Liquid 250	
E	Turnips	Liquid sludge 100	May 2018	Beet	Contingency Liquid 250	
Q	Turnips	None		Beet	Dry Sludge 36	April / May
K	Beet	Dry sludge 23	April 2018	Barley	Dry Sludge 36	April / May
L	Beet	None		Barley	Dry Sludge 36	April / May
N	Barley	Dry Sludge 28	August 2018	Barley	Dry Sludge 36	August
O	Wheat	Dry Sludge 28	September 2018	Wheat	Dry Sludge 36	August
P	Barley	Dry Sludge 14	October 2018	Barley	Dry Sludge 36	September
J	Maize	None		Maize	Dry Sludge 36	April / May
4	Barley	Dry Sludge 33	February 2019	Barley	Dry Sludge 36	Feb / March 2020

Because the application rate of the waste is so low, applications in repeated seasons do not pose any risk of over-application either of nutrients or PTE.

The maximum application rate in 2018 (of the 'dry' sludge) was actually 28 T/ha which will have supplied a total N application of 62 kg/ha Total N (= 25% of the annual Cogap / NVZ limit). The 2019 application rate is programmed at a total 0f 124 Kg/ha N (50% of the Cogap / NVZ limit). Therefore, there is no risk that any of these limits will be breached – even if repeat applications were made within 12 months of each other. In fact, applications are normally programmed to occur a minimum of 9 months apart and often fall at close to 12 months, just depending how the cropping season falls.

Liquid waste 'wet' sludge' is planned for application in fields D & E as a contingency at a maximum application rate of 250 t/ha, being the Cogap limit. In reality, when liquid waste is spread, the actual rate is normally 100 T/ha. The 250 T rate would apply Total N at 100 kg/ha and therefore the 100 T rate will supply only 40 kg/ha total N.

Fields D & E were, in fact, treated with liquid waste in May and June 2018 (at a rate of 100 T/ha). Should liquid waste be available in 2019, it will be applied to the same fields again and there is no risk of breaching the Cogap / NVZ limit.

Appendix 6

Official & Scientific Publications

Selected references to the need to maintain and enhance soil organic matter are given below:

Excerpts: REPORTS OF THE TECHNICAL WORKING GROUPS ESTABLISHED UNDER THE THEMATIC STRATEGY FOR SOIL PROTECTION

Van-Camp. L., Bujarrabal, B., Gentile, A-R., Jones, R.J.A., Montanarella, L., Olazabal, C. and Selvaradjou, S-K. (2004). Reports of the Technical Working Groups Established under the Thematic Strategy for Soil Protection. EUR 21319 EN/3, 872 pp.
Office for Official Publications of the European Communities, Luxembourg.

VOLUME – III ORGANIC MATTER AND BIODIVERSITY
Task Group 4 on EXOGENOUS ORGANIC MATTER (EOM)

P402 Recommendations concerning soil improvement and other environmental benefit
This report concludes that EOM use should be viewed as a positive activity that is to be recommended in production systems where good practices, soil and EOM quality issues are fully observed and accounted for.

1. The application of EOM on soil is in principle recommended if it is of an appropriate quality and if it is applied according to good practices.
2. If these two requisites are fulfilled, the application of EOM is recommended because it can contribute to maintaining adequate soil organic matter levels and to managing soil organic matter and assist with reducing soil erosion particularly in areas where degradation of soil is an issue. It can supply stable and non-stable organic matter to soils in support of important soil functions.
3. Contrary to mineral fertiliser which does not contain organic matter, the application of EOM can also
enhance biological activity in soil, which induces better aggregation and/or better porosity of soils.
4. The application of EOM can thus improve tilth and workability, increases buffer capacity, may reduce
nutrient leaching, improves water retention, etc. of treated soil.
5. All of which impinge upon savings of energy, savings of non renewable resources (such as mineral phosphates), protection of organic soils from peat production (as compost can be added to soil improvers and growing media, replacing partially peat) and sustainable management of croplands.
6. The application of EOM is also recommended because it can close nutrient cycles, contribute to reduce nutrient leaching and less reliance on nonrenewable materials such as mineral phosphates.

Conclusions
EOM use has a very positive role to play at an EU level. With specific reference to the EU Soil Thematic Strategy, EOM application to soil can contribute to maintaining adequate soil organic matter levels and to managing soil organic matter, assist with reducing soil erosion particularly in areas where degradation of soil is an issue.
Continuously, and intensively, cultivated arable land is seen as a particular priority in terms of promoting organic inputs. Prevention, precaution and sustainable soil management should be at the core of soil protection and sustainable land use policies. Degraded soils have a reduced potential to perform key functions, and because soil is essentially non-renewable, may not regenerate or recover. This requires a longer term view to be taken in view of the fact that the build-up of organic matter in soils is generally much slower that its decline. EOM has the potential to address both short and long term objectives for soil protection including contributing to an improvement in soil biodiversity. However, establishing a single threshold value for soil organic matter content at an EU level is not considered to be appropriate or desirable given the diversity of soil types, climatic conditions and

multiplicity of soil functions across Europe. This is better carried out at a local scale to assess status and necessary actions to address any concerns. With specific reference to the Kyoto Protocol relative to the Climate Change, EOM application to soil can maintain or increase organic carbon in soils, permitting biosequestration of carbon in soils. This report also stresses how significant EOM additions to soils are to the management of waste in Europe.
Integrated EOM management can make a substantial contribution to sustainable development targets. So far as is possible, as much of society's resources should be recycled to allow completion of nutrient cycles, so long as this is done in a responsible manner. Protecting nonrenewable mineral resource such as mineral phosphates and peat are also issues that the use of EOM can help to address for wider benefit.
The positive role of EOM on soils requires policies that encourage this to happen. The key to integrate waste management into soil protection policies. A considerable challenge exists in terms of balancing agricultural, energy recovery, waste management and soil protection policies, however.
As EOM of inappropriate quality may participate to the contamination of soils, waters and more generally environment, a comprehensive approach is required to ensure protection of soil, water and air quality from the production and use of EOM. Consideration needs to be given to the overall environmental impact (i.e. air, climate change, soil, water, living organisms, etc.) of encouraging EOM recycling (for example: would the increased loss of ammonia and subsequent impacts on air quality that would result from composting of manure and slurry outweigh the benefits of stabilising the OM?). Research work should be undertaken to make this type of assessment.
It is necessary to think more holistically about measures to manage EOM and to first consider the potential negative or positive impacts and the effectiveness of current or projected measures and whether these may deliver the necessary benefits (for example, IPPC Directive, regulation for the authorisation of additives in feeding stuff belonging to group of trace elements, project of Directive for limiting the Cd content in phosphates, Nitrates Directive, measures to tackle diffuse pollution within the Water Framework Directive, CAP reform, project of Directive on biowaste, project of revision of the Directive on sludge, Animal By-product Regulation, Directive on renewable energy sources, Landfill Directive, etc.).
In particular, this will require continued implementation of existing Directives, for example the Nitrates Directive, as well as the Commission advancing Directives for Sludge and Biowaste respectively.

P415 7. RECOMMENDATIONS

7.1. Soil improvement and other positive environmental benefit

The application of EOM on soil is in principle recommended if it is of an appropriate quality and if it is applied according to good practices. If these two requisites are fulfilled, the application of EOM is recommended because it can contribute to maintaining adequate soil organic matter levels and to managing soil organic matter and assist with reducing soil erosion particularly in areas where degradation of soil is an issue. A site-specific minimum level of SOM is a key element to the maintenance of different soil functions. Contrary to mineral fertiliser which does not contain organic matter, the application of EOM can also enhance biological activity in soil, which induces better aggregation and/or better porosity of soils. Microbial activity, which plays an essential role in the decomposition of exogenous organic matter, is influenced by soil pH. Soils in Central and Northern Europe may have a natural trend toward acidity; in these situations lime treated sewage sludge may help to enhance pH.
The application of EOM can thus improve tilth and workability, increases buffer capacity, may reduce nutrient leaching, improves water retention, etc. All of which impinge upon savings of energy, savings of non renewable resources (such as mineral phosphates), protection of organic soils from peat production (as compost can be added to soil improvers and growing media, replacing partially peat) and sustainable
management of croplands The application of EOM is also recommended in order to complete nutrient cycles, as EOM contains nutrients (mainly nitrogen and phosphorus) in different forms, quantities and availability according to the type of EOM.

Excerpt: 'The First Soil Action Plan for England: 2004-2006'. Defra

P14 The EU Soil Thematic Strategy identifies contamination, erosion and organic matter as three

priority issues for European soils and is also developing overarching plans for soil monitoring and R&D. The EU strategy will be a key element in soil policy over the coming years, providing a framework in which to develop the Government's policies and actions.
P17 Defra will seek, during negotiations on the proposed Bio-Waste Directive, to agree arrangements which encourage the return of organic material to soil, but in ways which respect the natural diversity of soils and do not impair their long term functioning.
P20 There is particular concern over levels of organic matter in some soils under tillage, because of the links between organic matter and soil structure and erosion.

Excerpt: 'Sustainable Farming and Food Strategy – indicator data sheet'. Defra.

Environmental outcome: Better use of natural resources.
Headline indicator H 5: Soil quality - soil organic matter
Organic matter is important for soil fertility, stability and water retention.
Changes in soil organic matter are gradual.
Since 1980 there has been an estimated average overall loss of soil organic matter of:
• 15% in arable and rotational grass soils;
• 16% in soils under permanent managed grassland;
• 23% in soils on agriculturally managed, semi-natural land.
Target
To halt the decline of soil organic matter caused by agricultural practices in vulnerable soils by 2025, whilst maintaining, as a minimum, the soil organic matter of other agricultural soils, taking into account the impacts of climate change.
This indicator was updated in June 2006.

Excerpt: 'Cross Compliance – Defra Guidance for Soil Management 2006'

P6 .What is Good Agricultural & Environmental Condition (GAEC) for soils?
Good soil management means better productivity as well as improved environmental standards; it is vital to achieving good agricultural practice on your farm. Preventing soil eroding from fields and maintaining soil organic matter and a good soil structure are central to your responsibility for meeting the soil standards of GAEC.
P10. Maintaining soil organic matter.
Soil organic matter improves the workability and fertility of soils, helps to maintain good structure and reduces the risk of capping, slumping and erosion. Continuous arable cropping reduces soil organic matter and positive action may be needed on some soils to maintain or increase current contents.
Organic matter is added to soil by:

- returning crop residues;
- introducing cover crops, grass leys or longer periods of grass into the rotation; or
- applying bulky organic manures.

P11. General principles of good soil husbandry.
Soil organic matter improves soil stability and increases workability.
P20 Peaty soils
This group includes peat and organic soils that may be found both in lowland and upland situations. Peat topsoils contain more than 50% organic matter, while organic soils have more than 12%. These soils are widespread in the uplands and are also found in lowland bogs and river valleys. They are intensively farmed in the Fens of eastern England and the Lancashire Mosses. In the Fens and Mosses these soils are very important for arable and vegetable production. They are vulnerable to soil loss by wind erosion because they are light and loose. When drained and cultivated, these soils are vulnerable to 'wastage' by oxidation of the peat.

Excerpt : 'UK SOIL DEGRADATION'
The Parliamentary Office of Science and Technology, Number 265, July 2006

Soil organic matter
Organic matter is vital for the physical, chemical and biological functioning of soils. *Around 18% of the organic matter present in arable topsoils in 1980 had been lost by 1995.* One of the reasons for this was that grasslands were ploughed for arable use. Some experts consider that the amount of organic matter in some soils may now be reaching such low levels that crop production may not be sustainable in the long term. As organic matter declines, so does the soil structure, so that the soil becomes more susceptible to physical erosion. *Steps being taken to address loss of organic matter from soils include recycling farm manures, sewage sludge, and composted green wastes in soils.* However, injudicious application of these organic materials may lead to diffuse water (nitrate and phosphate) pollution, and air pollution (odour and ammonia).
The challenges in future are to maintain and where possible enhance soil organic matter while minimising the polluting effects of applying organic materials.

POST is an office of both Houses of Parliament, charged with providing independent and balanced analysis of public policy issues that have a basis in science and technology.

Excerpt: "The State of Soils in England & Wales", Environment Agency, 2004

P17 Manure, slurry and waste applied to land
Some controlled wastes can be spread to land for agricultural or ecological benefits, as long as the wastes are not a pollution or health risk. There is a lack of collated data on the amount and quality of this waste, but an estimated 4.5 million tonnes of industrial waste is recovered to land each year. The paper and food and drink industries are major sources. Conditions applied through the waste regulations should prevent any long-term build-up in soils of contaminants, but this also depends on responsible management. This route for recovery of value from waste may become more important as industries seek alternatives to landfill.
Spreading sewage sludge and controlled wastes on land is often the best practicable environmental option to recover these materials and benefit soils. However, care is needed to avoid detriment to the soil and other environmental media. All inputs must be accounted for by land managers so that safe loading limits of nutrients and contaminants are not exceeded.

P18 The quality of agricultural soils
Soil is a farmer's key asset. Good soil husbandry should help to maintain yields and reduce the costs of soil damage both on and off the farm. The organic matter content of soil is a key indicator. It is a food supply and habitat for soil organisms, maintains soil structure, holds and recycles nutrients and retains pesticides and other chemicals, allowing some to be broken down biologically. Between 1979-81 and 1995 the organic matter content of agricultural topsoils in England and Wales fell by an average of 0.5 per cent (Figure 15). This may be related partly to the conversion of grasslands to arable use and partly to dilution caused by deeper ploughing. This loss may not be significant for crops, as the organic content of most farmland soils remains above the suggested critical threshold of two per cent, but it may affect other functions

Excerpt: "CEC Towards a Thematic Strategy for Soil Protection", European Commission 2002

"Erosion is triggered by a combination of factors such as steep slopes, climate (e.g. long dry periods followed by heavy rainfall), inappropriate land use, land cover patterns (e.g. sparse vegetation) and ecological disasters (e.g. forest fires). Moreover, some intrinsic features of a soil can make it more prone to erosion (e.g. a thin layer of topsoil, silty texture or low organic matter content)."

"Soil organic matter is composed of organic material (plant root remains, leaves, excrements), living organisms (bacteria, fungi, earthworms and other soil fauna) and humus, the stable end-product of the decomposition of organic material in the soil by the slow action of soil organisms. As such it is constantly built up and decomposed, so that carbon is released to the atmosphere as CO_2 and recaptured through the process of photosynthesis.
Organic matter plays a central role in maintaining key soil functions and is an essential determinant of erosion resistance and soil fertility. It assures the binding and buffering capacity of soil, thus contributing to limit diffusion of pollution from soil to water.
Figures for England and Wales show that the percentage of soils with less than 3.6% organic matter rose from 35% to 42% in the period 1980-1995 probably due to changing management practices. "

"Although the complexity of soil biodiversity dynamics is not yet fully understood, there is evidence that biological activity in soils is largely dependent on the occurrence of appropriate levels of organic matter."

Abstract: "Is there a critical level of organic matter in the agricultural soils of temperate regions: a review "

P. Loveland and J. Webb
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"Soil organic matter (SOM) is a complex mixture, which influences a number of soil properties and nutrient cycling, and is itself influenced in kind and amount by land-use, soil type, climate and vegetation. *There is considerable concern that, if SOM concentrations in soils are allowed to decrease too much, then the productive capacity of agriculture will be compromised by deterioration in soil physical properties and by impairment of soil nutrient cycling mechanisms. This has clear implications for the sustainable use of soil.*

We have focussed our discussion from the standpoint of the sustainability of UK agriculture, because we know that best, but similar concerns are equally valid elsewhere in the world. Although soil scientists would expect to find different behaviour in different soils at different 'critical' concentrations of SOM, it seems widely believed that a major threshold is 2% soil organic carbon (SOC) (ca. 3.4% SOM), below which potentially serious decline in soil quality will occur."

SITE-SPECIFIC risk assessment for standard rules set number SR2010No4

DOCUMENT RA - ESSITY - 12022019

Standard Facility: Waste operation: Mobile Plant for landspreading

Location: HOME FAMR , OAKENHOLT, FLINT, CH7 6DF

Risk assessment carried out by: Paul Sweeney, Paul Sweeney Agronomy Ltd

Date: 12-Feb-19

The scope of the permit and associated rules is defined by the following risk criteria:

Parameter 1	Permitted activities - The storage and recovery of waste by landspreading (R13, R10) .
Parameter 2	Permitted wastes -waste suitable for landspreading as specified by the SR.
Parameter 3	Maximum quantity of waste stored limited to 3000 tonnes at any one time
Parameter 4	No point source discharges to controlled waters or groundwater
Parameter 5	The activities must not be carried out within 10m of a watercourse
Parameter 6	The activity must not be carried out within 50m from any spring or well or any borehole used to supply water for domestic or food production
Parameter 7	The activity must not be carried out in an SPZ 1

Abbreviations: SR - Standard Rule

Data and information				Judgement				Action (by OPERATOR)	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of the risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of the risk after management? (This residual risk will be controlled by Compliance Assessment).
Local human population	Releases of airborne dusts/ particulate matter	Harm to human health - respiratory irritation and illness.	Air transport then inhalation	Low	Medium	Low	Permitted waste types are spread on land and have a low potential to produce bio aerosols, and particulate matter.	Permitted waste types are spread on ARABLE land and have a low potential to produce bio aerosols, and particulate matter. WASTE WILL BE INCORPORATED INTO SOIL MASS BY CULTIVATION. NO	Low
Local human population	As above	Nuisance dust on cars, clothing etc.	Deposition from air	Low	Medium	Low	Permitted waste types are spread on land and have a low MINIMALpotential to	As above	Low
Local human population	Emissions; litter	Nuisance loss of amenity and harm to pet health	Transport through air	Low	Low	Low	No litter in waste being spread	SR requires an emissions management plan when appropriate - appropriate measures may include litter picking affected	Low

Data and information				Judgement				Action (by OPERATOR)	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of the risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of the risk after management? (This residual risk will be controlled by Compliance Assessment).
Local human population and local environment.	Emissions; litter and mud on local roads	Nuisance, loss of amenity, risk of accident	Vehicles entering and leaving site	Medium	Medium	Medium	Road safety. Tractors/ spreaders trailing mud and debris from fields	As above. OPERATOR WILL ENSURE USE OF Appropriate measures. TO include clearing the waste, road sweeping affected area,	Low
Local human population	Odour	Nuisance, loss of amenity	Air transport then inhalation.	Medium	Medium	Medium	Local residents often sensitive to odour, permitted waste types have medium odour potential depends on waste type and	SR - emissions shall be free from odour.... SR - odour management plan required.	Low
Local human population	Noise and vibration	Nuisance, loss of amenity, loss of sleep.	Noise through the air and vibration through the ground.	Medium	Medium	Medium	Local residents often sensitive to noise and vibration.	SR - emissions shall be free from noise and vibration..... SR (if required) - noise and vibration management plan. SPECIFIC WASTE NOT ODOROUS AND WILL BE INCORPORATED INTO	Low
Local human population and local environment	Scavenging birds and animals	Harm to human health , nuisance, loss of amenity	Transport through air	Low	Medium	Low	Permitted waste types are unlikely to attract scavenging animals. WASTE CONTAINS NO BIOLOGICAL ELEMENTS ATTRACTIVE TO BIRDS	SR - Emissions of substances not controlled by emission limits (excluding odour and noise) shall not cause pollution. The operator shall not be taken to have breached this rule if appropriate measures, including, but not limited to, those specified in any approved emissions management plan, have been taken to prevent or where that is not practicable, to minimise, those emissions. SR (if required) - emissions	Low
Local human population	Pests (e.g. flies)	Harm to human health, nuisance, loss of amenity	Air transport and over land	Medium	Medium	Medium	Some potential for pests. SPECIFIC WASTE DOES NOT	As above	Low
Local human population and local environment	Flooding of site	If waste is washed off site it may contaminate buildings / gardens / natural habitats downstream.	Flood waters	Medium	Medium	Low	Permitted waste types are stored securely prior to landspreading.	SR - activities shall be managed and operated in accordance with a management system (will include site security measures to prevent unauthorised access). WASTE WILL BE INCORPORATED INTO SOIL MASS BY CULTIVATION.	Very low

Data and information				Judgement				Action (by OPERATOR)	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of the risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of the risk after management? (This residual risk will be controlled by Compliance Assessment).
Local human population and / or livestock after gaining unauthorised access to the waste operation	All on-site hazards: wastes; machinery and vehicles.	Bodily injury	Direct physical contact	Medium	Low	Low	Only a low magnitude risk is estimated for landspreading operations	SR - activities shall be managed and operated in accordance with a management system (will include flood risk management) .NO LOADING OR SPREADING ACTIVITIES WILL TAKE PLACE WHILE ANY PERSONS, OTHER THAN OPERATORS	Low
Local human population and local environment.	Arson and / or vandalism causing the release of polluting materials to air (smoke or fumes), water or land.	Respiratory irritation, illness and nuisance to local population. Injury to staff, fire fighters or arsonists/vandals. Pollution of water	Air transport of smoke. Spillages and contaminated firewater by direct run-off from site and via surface water	Medium	Low	Low	Only a low magnitude risk is estimated. WASTE WITH BELOW 17% DS NOT NORMALLY COMBUSTIBLE.	SR - activities shall be managed and operated in accordance with a management system (will include site security measures to prevent unauthorised access).	Low
Local human population and local environment	Accidental fire causing the release of polluting materials to air (smoke or fumes), water or land.	Respiratory irritation, illness and nuisance to local population. Injury to staff or fire fighters. Pollution of water or land.	As above.	Low	Low	Low	As above.	As above (excluding comments on access to waste). Permitted activities do not include the burning of waste.	Low
All surface waters close to and downstream of site.	Spillage of liquids, leachate from waste, contaminated rainwater run-off from waste e.g. containing suspended solids.	Acute effects: oxygen depletion, fish kill and algal blooms	Direct run-off from site across ground surface, via surface water drains, ditches etc.	Medium	Medium	Medium	No point source emissions to water are permitted, but there is potential for run-off from landspreading activities particularly during heavy rain.	SR - distance criteria from surface waters are a requirement of the rules. All liquid wastes require secure storage. SR - (emissions of substances not controlled be emission limits), WASTES INCORPORATED INTO SOIL MASS BY MECHANICAL CULTIVATION. WASTES NOT	Low
All surface waters close to and downstream of site.	As above	Chronic effects: deterioration of water quality	As above. Indirect run-off via the soil layer	Medium	Medium	Medium	There is a medium risk of magnitude	As above	Low

Data and information				Judgement				Action (by OPERATOR)	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of the risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of the risk after management? (This residual risk will be controlled by Compliance Assessment).
Abstraction from watercourse downstream of facility (for agricultural or potable use).	As above	Acute effects, closure of abstraction intakes.	Direct run-off from site across ground surface, via surface water drains, ditches etc. then	Medium	Medium	Medium	No emissions are permitted but permitted wastes have potential to cause pollution.	The activity must not be carried out within 250 metres of a spring, well or borehole supplying water for human consumption or food production or 50 metres of a spring, well or borehole supplying water for other purposes. NO SPRINGS, WELLS OR BOREHOLES	Low
Groundwater	As above	Chronic effects: contamination of groundwater, requiring treatment of water or closure of borehole.	Transport through soil/groundwater then extraction at borehole.	Medium	Medium	Medium	No emissions are permitted but permitted wastes have potential to cause pollution	SR. Protection of groundwater, no spreading in groundwater source protection zone. Additional risk assessment required if in an groundwatersource protection zone 2 to be approved by EA before operations commence. LAND NOT	Low
Local human population	Contaminated waters used for recreational purposes	Harm to human health - skin damage or gastro-intestinal illness.	Direct contact or ingestion	Low	Medium	Low	Unlikely to occur	Emissions of substances not controlled by emission limits (excluding odour and noise) shall not cause pollution. The operator shall not be taken to have breached this rule if appropriate measures, including, but not limited to, those specified in any approved emissions management plan, have been taken to prevent or where that is not practicable, to minimise, those	Low
Soils	Direct application to land	Deterioration of soil, damage to soil structure or build up of contaminants in the soil	Direct application	Medium	Medium	Medium	Permitted wastes may contain contaminants	SR wastes must be spread in accordance with the deployment form and any waste spread shall not damage the soil structure or cause the unacceptable build up of potentially toxic elements in the soil. Additional assessment of waste spread from table	Low

Data and information				Judgement				Action (by OPERATOR)	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of the risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of the risk after management? (This residual risk will be controlled by Compliance Assessment).
Protected nature conservation sites - European sites and SSSIs	Deterioration of site through toxic contamination, nutrient enrichment, habitat loss, siltation, smothering, disturbance and predation.	Harm to protected site through toxic contamination, nutrient enrichment, disturbance etc.	Any	Medium	Medium	Medium	Dust, ammonia volatilisation, direct application, run off from fields etc	SR - Emissions of substances not controlled by emission limits (excluding odour and noise) shall not cause pollution. The operator shall not be taken to have breached this rule if appropriate measures, including, but not limited to, those specified in any approved emissions management plan, have been taken to prevent or where that is not practicable, to minimise, those emissions. SR - (deployment form) LOCAL WILDLIFE SITE	Low

SPECIFIC MEASURES AND MITIGATION FIELD-BY-FIELD

FIELD NAME	RISK ITEM	ISSUE	MITIGATION	RESIDUAL RISK
D	STORAGE HEAP	SITE SHOULD BE ACCESSIBLE FOR TRACTORS & MACHINERY WHILST NOT CREATING A RISK OF RUN-OFF, SOIL DAMAGE, MUD	ASSESSMENT MADE PRIOR TO LOADING / EMPTYING STORAGE SITE. FIELD PROTECTION BOARDS TO BE USED IF REQUIRED.	LOW
D	WATERCOURSE / PONDS	CONTAMINATION	10 M NO SPREAD BUFFER ZONE ALONGSIDE DITCH & PONDS	LOW
D	PUBLIC FOOTPATH	CONTAMINATION, RISK TO WALKERS	10 M NO SPREAD BUFFER ZONE ALONGSIDE PUBLIC FOOTPATHS. ALL FIELD OPERATIONS SUSPENDED IN CASE ANY FOOTPATH USERS PRESENT.	LOW
E	WATERCOURSE / PONDS	CONTAMINATION	10 M NO SPREAD BUFFER ZONE ALONGSIDE DITCH & PONDS	LOW

Data and information				Judgement				Action (by OPERATOR)	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of the risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of the risk after management? (This residual risk will be controlled by Compliance Assessment).
Q	WATERCOURSE / PONDS	CONTAMINATION					10 M NO SPREAD BUFFER ZONE ALONGSIDE DITCH & PONDS		LOW
Q	ADJACENT WOODLAND	CONTAMINATION					COMMERCIAL FARM WOODLAND ONLY. NO SPECIFIC PROTECTION ZONE REQUIRED.		LOW
J	WATERCOURSE / PONDS	CONTAMINATION					10 M NO SPREAD BUFFER ZONE ALONGSIDE DITCH & PONDS		LOW
L	WATERCOURSE / PONDS	CONTAMINATION					10 M NO SPREAD BUFFER ZONE ALONGSIDE DITCH & PONDS		LOW
K	WATERCOURSE / PONDS	CONTAMINATION					10 M NO SPREAD BUFFER ZONE ALONGSIDE DITCH & PONDS		LOW
K	PUBLIC FOOTPATH	CONTAMINATION, RISK TO WALKERS					10 M NO SPREAD BUFFER ZONE ALONGSIDE PUBLIC FOOTPATHS. ALL FIELD OPERATIONS SUSPENDED IN CASE ANY FOOTPATH USERS PRESENT.		LOW
4	STORAGE HEAP	SITE SHOULD BE ACCESSIBLE FOR TRACTORS & MACHINERY WHILST NOT CREATING A RISK OF RUN-OFF, SOIL DAMAGE, MUD					ASSESSMENT MADE PRIOR TO LOADING / EMPTYING STORAGE SITE. FIELD PROTECTION BOARDS TO BE USED IF REQUIRED.		LOW
4	WATERCOURSE / PONDS	CONTAMINATION					10 M NO SPREAD BUFFER ZONE ALONGSIDE DITCH & PONDS		LOW
4	TRACK	CONTAMINATION, RISK TO USERS					THE TRACK WITHIN THIS FIELD IS NOT A PUBLIC FOOTPATH, IT IS A FARM TRACK ONLY. NO NEED FOR A PROTECTION ZONE BUT A CHECK WILL BE MADE PRIOR TO OPERATIONS TO ENSURE THAT NO PERSONS		LOW
N	WATERCOURSE / PONDS	CONTAMINATION					10 M NO SPREAD BUFFER ZONE ALONGSIDE DITCH & PONDS		LOW
O	WATERCOURSE / PONDS	CONTAMINATION					10 M NO SPREAD BUFFER ZONE ALONGSIDE DITCH & PONDS		LOW

Data and information				Judgement				Action (by OPERATOR)	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of the risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of the risk after management? (This residual risk will be controlled by Compliance Assessment).
P	WOODLAND / LOCAL WILDLIFE SITE	CONTAMINATION					20 M NO SPREAD BUFFER ZONE ALONGSIDE WOODLAND BOUNDARY		LOW
P	WATERCOURSE / PONDS	CONTAMINATION					10 M NO SPREAD BUFFER ZONE ALONGSIDE DITCH & PONDS		LOW
P	PUBLIC FOOTPATH SOUTH OF FIELD BOUNDARY (	CONTAMINATION, RISK TO WALKERS					10 M NO SPREAD BUFFER ZONE ALONGSIDE PUBLIC FOOTPATHS. ALL FIELD OPERATIONS SUSPENDED IN CASE ANY FOOTPATH USERS PRESENT.		LOW

Notes: Red triangle indicates comment containing supporting information
Yellow columns contain drop down menus that allow automatic evaluation of risk in green column