



Groundscape
Environmental Ltd

Waste Recovery Plan

**CJ & PH George
Nansmerrow Farm
Tresillian
Truro
Cornwall TR2 4AP**

Proposed Earth Lined Slurry Lagoon

Ref: EPR/XP3124SH/A001

(Previously EPR/KB3506UU/A001)

Original Issue: 23rd September 2021



The purpose of this document is to support the Environmental Permit application for the use of waste to construct a slurry lagoon on the original pre application advice reference EPR/KB3506UU/A001.

Issue Record

Version	Date	Issued To	Issued By	Changes
1		All with original application.	RF	n/a
2		Internal Only	RF	See Version 6
3		Internal Only	RF	See Version 6
4		Internal Only	RF	See Version 6
5		Internal Only	RF	See Version 6
6	28 th Sep 2023	EA with revised application.	RF	<p>Page 8 - Design Construction and Fit for Purpose This section is elaborated on following EA feedback, is intended for clarification, and has no impact on waste codes, volumes, waste recovery test or other evidence provided in v1 of the Waste Recovery Plan.</p> <p>Page 7 - Suitability of Site Won Materials This section has been added in order to clarify compliance with Ciria C759b Part 2. This has no impact on waste codes, volumes, waste recovery test or other evidence provided in V1 of the Waste Recovery Plan.</p> <p>2.4 Construction Standards This section has been added in order to clarify compliance with Ciria C759b Part 2. This has no impact on waste codes, volumes, waste recovery test or other evidence provided in V1 of the Waste Recovery Plan.</p> <p>Appendix 5 Environmental Risk Assessment This has been raised to Version 2 to reflect the ESSP and HRA which were not issued with the previous application.</p>
7	30 th Dec 2024	All	AL	<ol style="list-style-type: none"> Page 6 - Differentiation between haul road waste codes and construction waste codes reverted back to V1 format. Permit reference EPR/KB3506UU/A001 updated to EPR/XP3124SH/A001 on cover page.

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1.1 Site Background

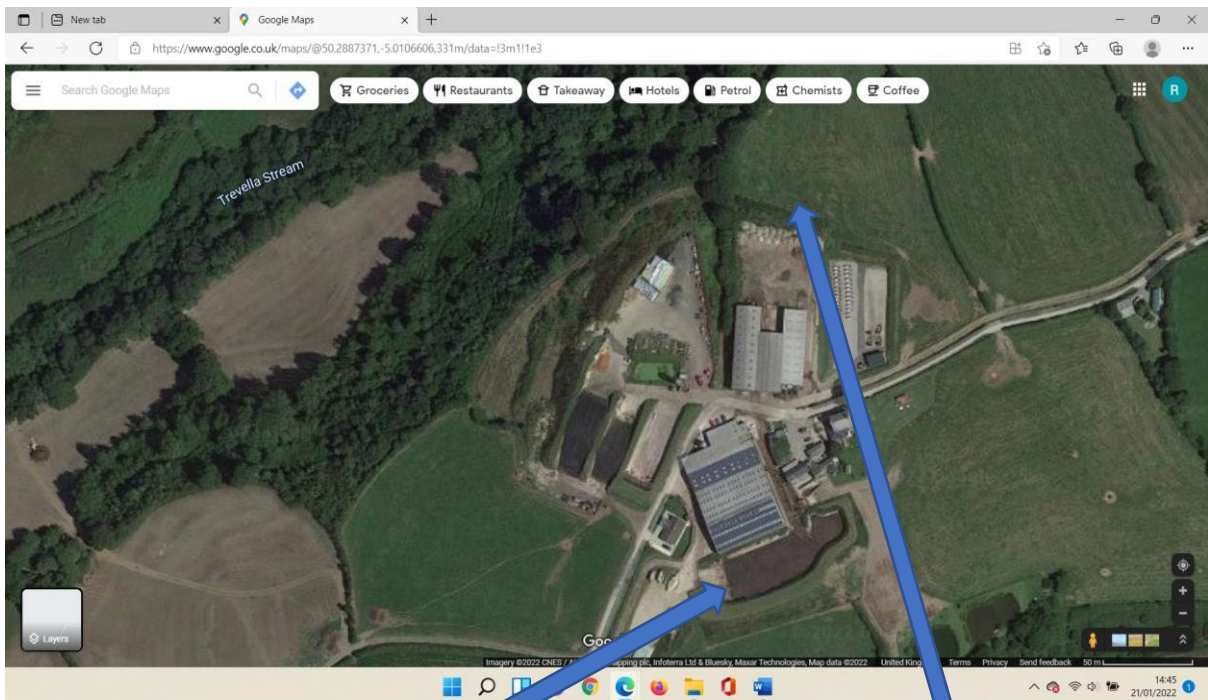
Nansmerrow Farm is a family-owned specialist dairy farm working 200 acres of owned working land and 350 acres of additional rented land. The operation also incorporates Polperrow Farm within the stated acreage. The land is mainly let to grass for grazing or conserved as clamp silage. Two hundred acres of maize are grown for silage. All the land falls within a Nitrate Vulnerable Zone (NVZ).

The farm has 300 head of dairy cows with an average milk yield of 3750000 litres per year. (12500 litres per cow) Calving is continuous throughout the year. Milking takes place in a modern milking shed which occupies the land adjacent to the proposed slurry lagoon. The buildings at Polperrow Farm are used for rearing replacement stock.

The cattle shed has capacity for 74 cattle but has granted planning permission to extend the building to accommodate 136 livestock for milking. Included in the planning permission is the proposed new slurry lagoon which is required for both the additional cattle and the shortfall of storage in the existing operation.

The existing silage capacity is 5000m³ and is located as per the aerial image below.

The purposed expansion of the dairy herd, cattle shed and slurry lagoon amount to a considerable capital investment by the owner, with a great deal of cost occurred to date in the obtaining of planning permission, design and professional consultation fees.



Existing slurry lagoon
(Capacity 5000m³)

Proposed location of
new slurry lagoon

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1.2 Purpose of the work

- Why the scheme is needed

There is a clearly defined requirement for the scheme as part of an overall expansion for the dairy operation as set out by in the independent agricultural report 31st January 2020. With the increase in head of cattle from dairy the by-product volume of slurry needs to be stored for use as a natural fertiliser for use on the farm.

Even setting aside the expansion of the dairy operation there is an existing shortfall of slurry storage.

- How the scheme will be carried out

The scheme has a specific purpose serving as a crucial part of the dairy expansion. The slurry lagoon has been professionally designed to meet the technical requirements for the operation. The lagoon will be constructed in accordance with the engineered design and the granted planning permission.

The finished lagoon will be as sympathetic as possible to the surrounding landscape, with grassed banks to blend in as much as possible with the adjoining topography. The lagoon will be constructed by the importation of waste soils and sub soils described under waste code 17 05 04 Soil and stone. With the haul tracks and access points being constructed with importation of demolition hardcore under wastes included in section 1.3

- How the scheme will meet the need

With the changing agricultural sector, due to the restructuring from the U.K leaving the European Union. It has been identified that the dairy operation needs to expand to future proof the family business. Planning permission for the expansion of the dairy and slurry lagoon has already been approved. Consideration now needs to be given to the most environmentally friendly method of construction that best serves the circular economy. The naturally occurring clays found at the location have been identified as being suitable for providing a natural waterproof liner to retain the liquid slurry and therefore minimise the requirements of imported material.

The construction type of using natural clay liners and soils is a proven method of achieving the structural requirements of a lagoon of the design type.

The requirement is to identify the most suitable material to construct the banks of the lagoon. The lagoon has been designed as naturally aesthetic as possible and to blend in with the surrounding topography.

The main engineering requirements for the material used to construct the banks of the lagoon are compaction and binding which is crucial to the supporting structural integrity for retaining the pressure of the liquid slurry.

The lagoon has been designed to use naturally occurring local soils and sub soils as they fulfil the engineering requirements of scheme and would be better suited to the location. Supported by Appendix 4.

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1.3 Quality of Waste & Quantity of Waste to be Used

- **Quality of Waste**

The lagoon has been designed to be constructed using soils and subsoils with the two access roads being constructed of hardcore and waste concrete.

The quality of the waste will be controlled by the Waste Acceptance Procedure and regular analytical analysis.

The waste codes to be utilised as follows:

Lagoon

17.05.04 Soil and stone other than those mentioned in 17.05.03

01.01.02 Wastes from mineral non metalliferous excavation

Access Tracks

170101 concrete

170102 bricks

170103 tiles and ceramics

170107 mixture of concrete, bricks, tiles and ceramics tother than those mentioned in 170106

170302 bituminous mixtures other than those mentioned in 170301

170508 track ballast other than those mentioned in 170507

170506 dredging spoil other than those mentioned 170506

010408 waste gravel & crushed rocks other than those mentioned in 010407

- **Volume**

The scheme has been designed to fulfil the requirements of slurry production from the dairy herd with approved plans setting out the construction methods and volumes of imported constructed material from the site topographical drawing LT001 prepared by Alpha Land Surveys. (Appendix 2)

The design and the capacity requirements for slurry containment dictate the volume of material required, be that of waste or primary material.

This calculation states that circa 20,000m³ of imported material is required.

(20,000m³ excludes the clay liner volume)

1.4 Waste Recovery Test

An alternative method for construction of the lagoon would be a use of a processed soil to a recognised standard for the lagoon banks while still utilising the site won clay for the liner. The haul roads could be constructed using a primary aggregate from a land-based quarry.

A quotation has been obtained from a local supplier Maen Karne Ltd (Appendices 6). The cost of the soil element of the lagoon using this material is £9.75 pt. The total cost of this material would be £292500.00 net if based on a conversion rate of 1.5 Tonnes to the cubic metre for soil.

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The soil will be deposited via tipper lorry directly in the vicinity it is required therefore mitigating the requirement for onsite haulage.

The material will be placed and compacted by excavator under the supervision of the Design Consultant Engineer.

The overall costs have been estimated as follows

- Importation of Materials £292500.00
- Design Consultant Engineer £3850.00
- Fencing of the lagoon £ 5250.00
- Fuel for excavator £ 4500.00 estimated

Total £306100.00

1.5 Funding to Use Non-Waste Materials

The funding of the use of non-waste materials can be adequately re-couped over a 5 ½ year period from the addition herd capacity producing £57705 P.A profit.

Project costing £306100.00 as identified in section 1.4

Annual additional profit from herd expansion £57705 P.A

$£57705 \times 5.5 = £317377.50$ This figure allows for a variation of £11277.50 to cope with additional rise in fuel costs and other nominal expenditures.

A fully budgeted cost sheet is provided in appendices 8 produced by Laurence Gould Partnership Ltd CJ & PH George financial advisors.

1.6 Obligations to Complete the Scheme

There is a self-imposed requirement to complete the scheme by way that the farm will not be able to complete its expansion of the dairy herd without the completion of the slurry lagoon. This in turn would call into question the long term financial viability of the farm.

2. Evidence the Waste is Serving a Useful Purpose

2.1 Quantity of Waste Used

This calculation states that circa 20,000m³ of imported material is required.

(20,000m³ excludes the clay liner volume)

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With the need for additional slurry storage as part of the expansion of the dairy herd and planning already being granted for the construction of both the cattle shed and slurry lagoon the requirement for the construction has been proven. There is already established evidence that the construction of such lagoons using soils and subsoils with naturally occurring clay liners from site as an alternative to primary materials.

As the soils and sub soils (inert waste) will be sourced locally it will have a minimal environmental impact on the surrounding area and look as natural as possible with grassed banks.

• Plans

Detailed plans have been drafted for the lagoon design and can be found in Appendices 1 and 2 and associated documents ESSD and Hydrogeological Risk Assessment.

Meeting Quality Standards

• Design Construction and Fit for Purpose

The feasibility and investigations into the construction of the lagoon on site has been performed by Bob Watson Bsc, Msc, MIAgrE. Mr Watson is an independent agricultural advisor specializing in soil management and farm manures for over 25 years in the south west of England and Wales. Mr Watsons main clients have been individual farmers, but he has also provided technical policy training and guidance to Government departments. Work includes farm soil appraisals and guidelines for constructing earthen lined lagoons with in excess of 25 constructed to date.

Appendix 4 provides a detailed explanation as to the design and construction feasibility that has been undertaken to establish the suitability of the site and potential suitability of site won materials as the impermeable lining.

Considerations

• Soil erosion

The scheme is an engineered structure serving the purpose of retaining slurry within confines of clay lined soil bund. The construction is a tried and tested method of building a slurry lagoon that adequately perform its requirements. Careful attention to compaction of soils and sub soils will minimise the potential for soil erosion The structural integrity of lagoon will be inspected and maintained on a regular basis with the outer banks being laid to grass to minimise soil movement.

• Flood Risk

The topography of the cattle shed and lagoon as per the planning permission present a very low risk of flooding with the lagoon location on the side of a hill. This is identified by the site plan Appendix 1 and photograph.

Deposit for Recovery Permits

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The scheme has sought pre-application advice as per your reference EPR/KB3506UU/A001 dated 1.7.21. The Environment Agency's appraisal based on the information provided was to propose two options for the use waste to construct the lagoon. Either to undertake the scheme under a DOW:Cop or seek a Bespoke Environmental Permit.

Bespoke Waste Recovery Permit

Due to the site location and the complications of finding volume donor sites with suitable material under a DOW:Cop scheme, it is more realistic to seek approval for a Bespoke Permit for the importation of waste soils and subsoils .

Suitability of Site Won Materials

The naturally occurring soils and subsoils found on site have been confirmed as being suitable to form the non-permeable liner. The conclusion drawn from pit excavation, soil examination, and hand texturing is sufficient quantities of suitable material are available of construction of an impermeable liner at least a meter thick.

Because there is sufficient material to lay up the lagoon impermeable layers, the soil texture and stone content of imported inert waste materials is not critical to the lagoon build. The design construction will be in accordance with CIRA guidance 759 Part 2 Design and Construction guide. Final design will be submitted to the Environment Agency at least 14 days prior to commencement of construction.

2.2 Waste Acceptance Procedure

Acceptance

All vehicles bringing waste on to site must have a completed Waste Transfer Ticket, a legible copy to be deposited in the site hut located at the start of the lagoon haul road.

In the event of commercial waste being brought onto site without a Waste Transfer Note hauliers will be requested to complete a generic Waste Transfer Note provided in the site hut. Waste can only be accepted if it complies with L.O.W codes (List of Waste) and descriptions set out in the sites Environmental Permit (E.M.S) and site permit. Site permit to be displayed in the site hut with a copy of the sites EMS and risk assessments. If a site operative is available a visual inspection and counter signature on the Waste Transfer Ticket is to be obtained. Once preliminary checks have been completed the driver will be informed where to discharge the load or a marker board will identify the tipping location.

All individual waste carriers must produce evidence of a valid Waste Carriers Licence a copy to be retained on site. Where possible a secondary inspection of the load will then be conducted by the machine operator/banksman to ensure that the waste is compliant with the permit conditions this will include a visual and olfactory.

Donor sites producing more than 5 loads of suitable soils and sub soils must provide a completed W.I. Form (Waste Information Form) see Appendix 7.

Donor sites producing more than 12 loads of suitable souls and sub soils must provide chemical analysis of the material.

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Waste Acceptance Schematic

All drivers to receive training on Waste Acceptance Procedure for suitable waste types for the site.

Is the Paper Work Correct ?, Is the Waste compliant ?
 1. Check material complies with permit requirements
 2. Waste Conveyance Note (To be fully completed for all waste transactions)
 3. Registered Waste Carriers Certificate

Additional Requirements
 Waste Information Form (W.I.F) Waste Acceptance Criteria Form (W.A.C)

Is the Driver wearing the correct P.P.E

Inspect the load, is the material permitted by the licence?. **"If No"**

Reject load from site

Ensure that the vehicle driver is aware of the site rules and conditions, direct the driver to tipping point. **(Training/Induction)**

Counter sign W.T.T or issue a W.T.T

Up date input records

Inspect the waste after tipping, Is the waste acceptable ?
 "If Yes process" **"If No"**

Reload Waste remove from site to permitted facility or Quarantine for later disposal to a permitted facility

Complete Waste Rejection Form

W.T.T -Waste Transfer Ticket

Up date Site Diary/ Daily Site Report

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2.3 Alternative Non-Waste Materials

Consideration has been given to a variety of design options to minimise the requirements for the importation of waste for the construction of the slurry lagoon. As a result, an Agricultural Adviser was appointed to give professional advice on finding the best practical design solution using the sites natural topography and potential natural occurring materials to construct the lagoon. This process resulted through extensive testing a suitable clay material being identified on the site that will act as the lagoon liner.

This will reduce the volume of material required to complete the construction of the lagoon and intern reduce vehicle movements to and from site.

With the liner taken into consideration, a suitable primary material needs to be sourced offering the structural similarities as a naturally occurring soils, subsoils and their compaction values. The nearest match

2.4 Construction Standards

Design and construction of the slurry lagoon will be in accordance with current standards and guidance. Final design is dependent on the waste types included in the permit as it cannot be presumed that all wastes proposed will be approved/permited.

Site won material identified in the report at Appendix 4 will be tested in accordance with BS 1377:Part 6:1990 - Methods of test for Soils for civil engineering purposes - Part 6: Consolidation and permeability tests in hydraulic cells and with pore pressure measurement.

The design and construction of the slurry lagoon will follow guidance provided on the gov.uk web site for storing silage, slurry and agricultural fuel oil, or whichever guidance is valid at the time should this be superseded. It will also be in accordance with the following standards/guidance.

- Ciria publication C759b Part 2 – Design and Construction of Livestock Manure and Sileage Infrastructure for Agriculture.
- BS 5502-50:1993+A2:2010 - Buildings and structures for agriculture. Code of practice for design, construction and use of storage tanks and reception pits for livestock slurry.

Other standards cited within the Ciria publication may also apply, for example in the use of specific materials.

A photographic record of construction will be maintained throughout the construction phase.

Final details of the slurry lagoon design will be provided to the Environment Agency at least 14 days prior to commencement of construction activities.

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3. Risk Assessment (Bespoke Permit)

3.1 Risk Assessment: Water

An Environmental Risk Assessment has been undertaken taking into consideration the protected habitat within a 50m distance of the lagoon. Detailed information can be found in the ESSD Report E17 and Hydrogeological Risk Assessment E17

3.2 Engineering Work

A detailed explanation on to the process and technical requirements for the engineering work is to be found in Appendices A.4

3.3 Gas Monitoring

The nature of the inert materials being used in the construction of the slurry lagoon make it highly unlikely that the soils and sub soils will produce any gas. Similar materials have been used elsewhere on the farm under a separate Environmental Permit without and cause for concern on monitoring requirements

3.4 Aftercare Monitoring

As the imported waste is being used to construct a designed engineered structure for the purpose of retaining slurry for distribution on to agricultural land. The structural integrity of the lagoon is paramount and will therefore be regularly inspected for any signs of deterioration or damage.

3.5 Time Scale

The intention is to complete the construction of the lagoon as soon as possible to take the additional slurry volume due to the increase in the dairy herd. It is anticipated that to source the amount of soils and hardcore to the required specification for the construction of the lagoon the project will take a period of approximately 12 months, although a shorter period would be preferable.

Origin sources of suitable waste soils vary in volume and location and will have a major bearing in the timescale of construction. In addition, weather and vehicle logistics will also influence the time scale.

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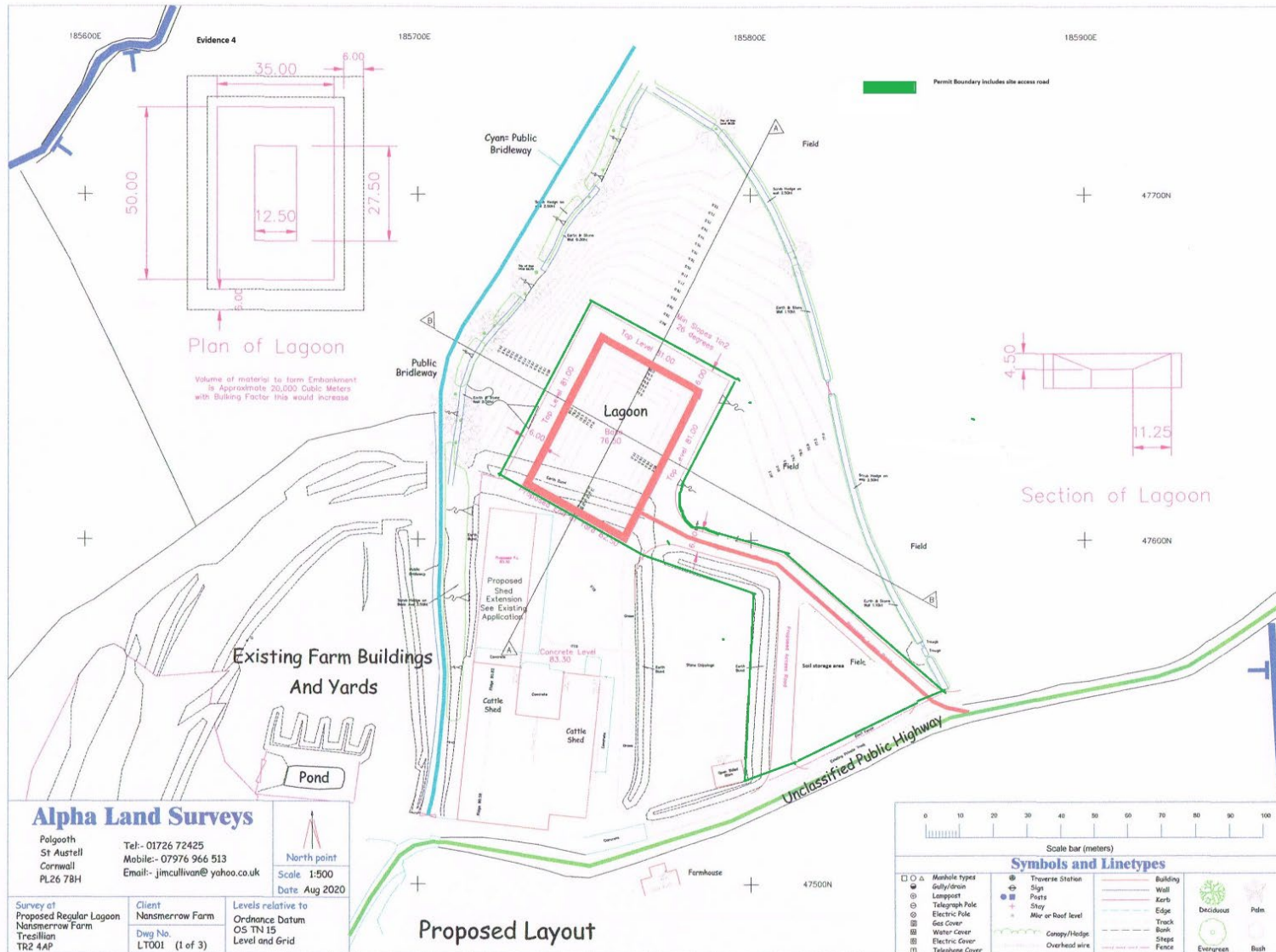
Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

Appendices

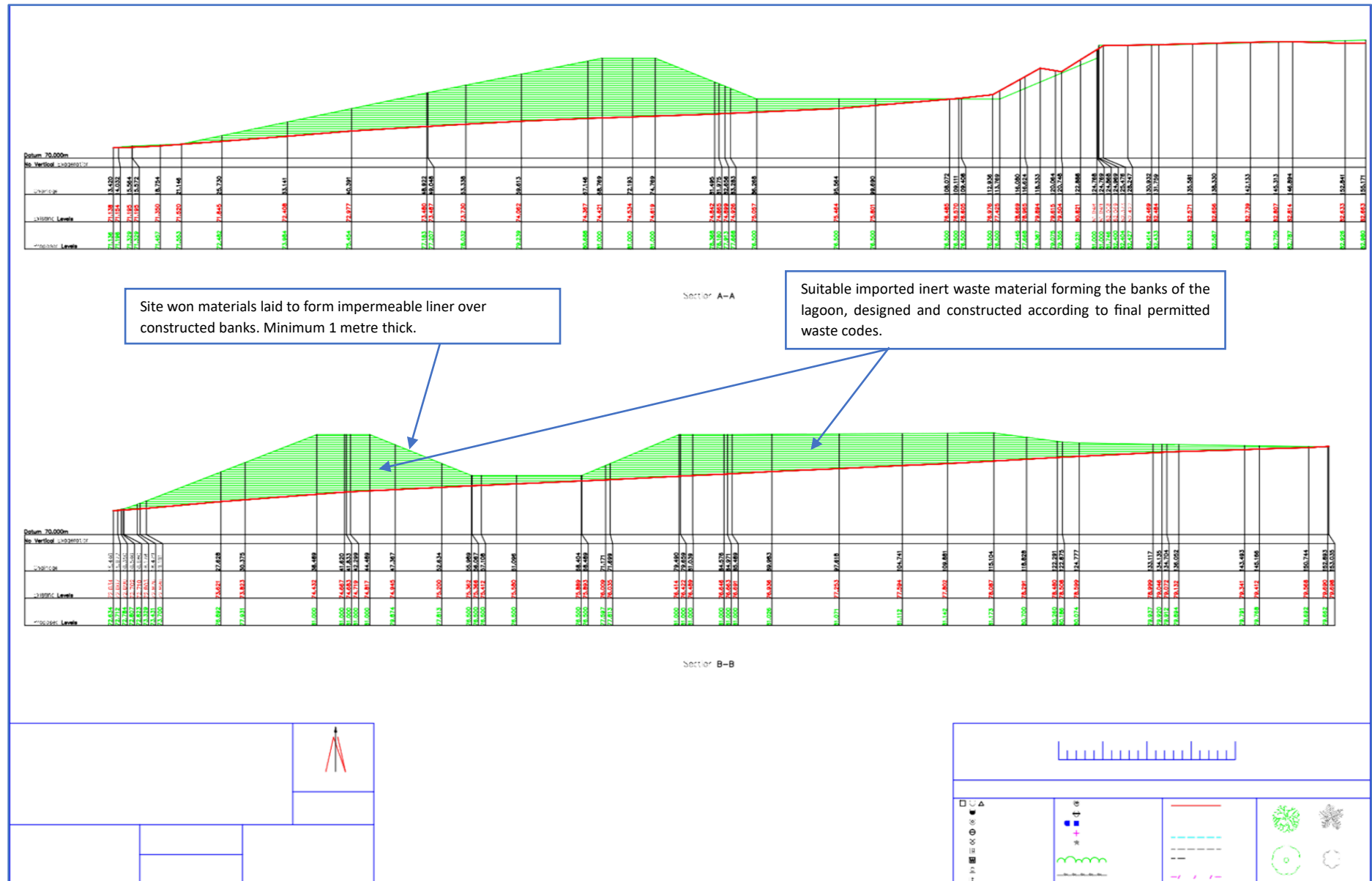
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Appendix 1 Site Plan



Appendix 2 Cross Section of Proposed New Slurry Lagoon



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Appendix 3 Planning Consent

Cornwall Council

Correspondence Address: Cornwall Council Planning, PO Box 676, Threemilestone, Truro, TR1 9EQ
Email: planning@cornwall.gov.uk
Tel: 0300 1234151
Web: www.cornwall.gov.uk



Application number: PA20/09290

Agent:

Lodge And Thomas
58 Lemon Street
Truro
TR1 2PY

Applicant:

Mr P George
Nansmerrow Farm
Tresillian
Truro
Cornwall
TR2 4AP

Town And Country Planning Act 1990 (As Amended)
Town And Country Planning (Development Management Procedure) (England)
Order 2015

Grant of Conditional Planning Permission

CORNWALL COUNCIL, being the Local Planning Authority, **HEREBY GRANTS CONDITIONAL PERMISSION**, subject to the conditions set out on the attached schedule, for the development proposed in the following application received on 22 October 2020 and accompanying plans:

Description of Development: Construction of slurry store associated with a recently approved new dairy building

Location of Development: Nansmerrow Farm Tresillian Truro Cornwall TR2 4AP

Parish: Probus

YOUR ATTENTION IS DRAWN TO THE ATTACHED NOTES.

DATED: 5 January 2021

Louise Wood - Service Director Planning and Sustainable Development

ACFULZ

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Appendix 4 Feasibility Study

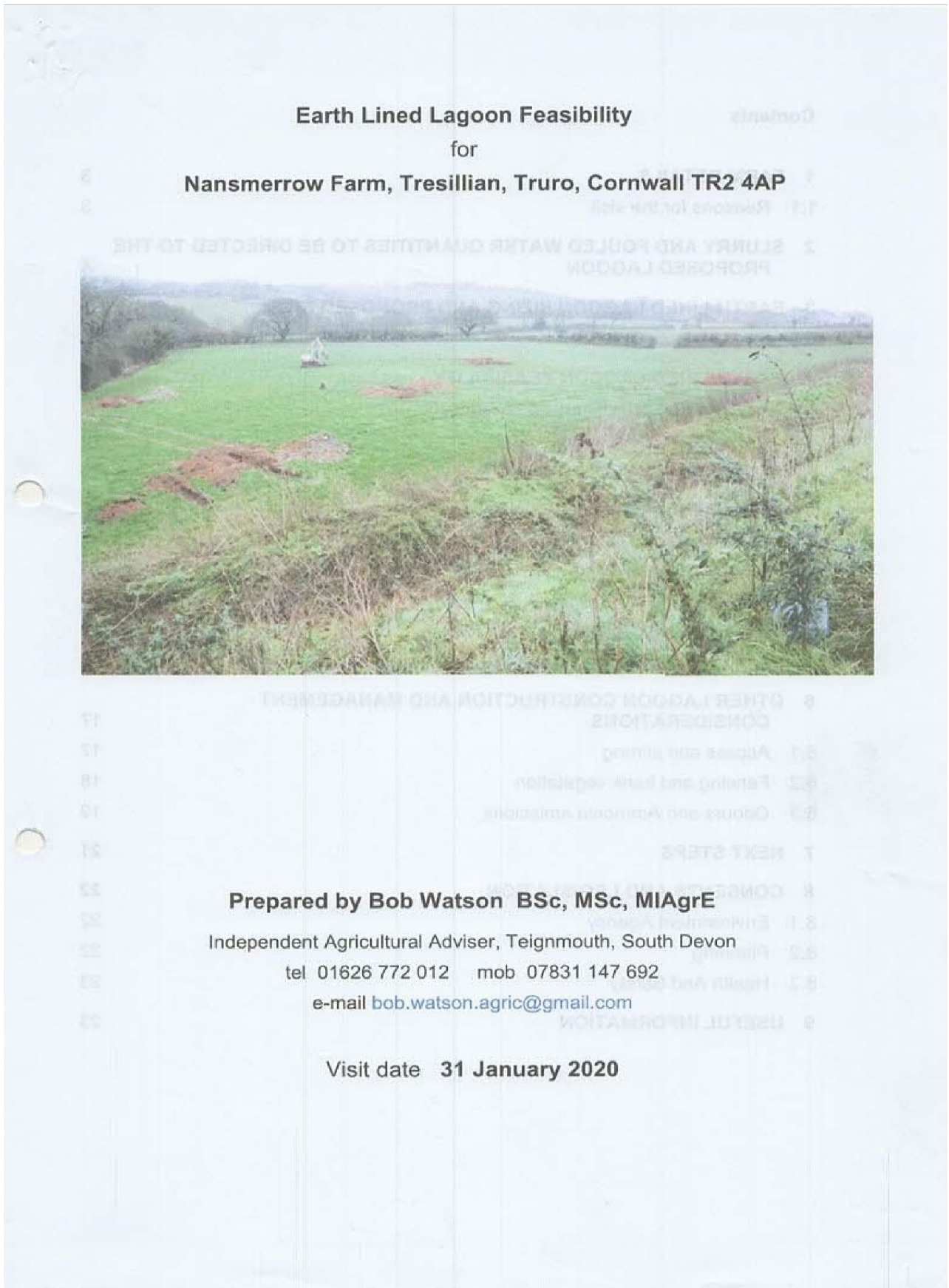
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Appendices A.4 Consultant Report



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SUMMARY

- Slurry storage capacity at Nansmerrow is only just adequate to meet NVZ storage requirements.
- As part of planned improvements to livestock accommodation on the north side of the farmyard, the farm would like to add an additional 5 months' storage for slurry and fouled water arising from this area.
- A suitable earth-lined lagoon to contain 5 months' slurry, yard runoff and dairy and parlour washings could be constructed on a 0.8 acre site situated on sloping land just below the north side of the farmyard.
- Test pits show the lagoon site to be feasible for earth-lined lagoon construction. Soil samples have been taken for subsequent laboratory testing of permeability.
- Construction guidelines have been given for lagoon construction. These are based on CIRIA C759b information.

1 FARM DETAILS

Nansmerrow is a specialist dairy unit based on 200 acres of owned land (Nansmerrow, and adjoining Polperrow farms) and 350 acres of rented land. All of this land falls within a Nitrate Vulnerable Zone (NVZ). Land use is mainly to grass, which is grazed or conserved as clamp silage. Two hundred acres of maize are grown for silage.

300 dairy cows (year-round calving, with average milk yield 12,500 litres per cow per year) are milked and year-round cubicle-housed on sea sand at Nansmerrow farmyard. The Polperrow farm buildings are available for rearing replacement stock.

1.1 Reasons for the visit

The farm's NVZ records show that the existing earth-lined lagoon (to the south of the farm buildings) is just adequate to provide 5 months storage for excreta from existing livestock, along with fouled yard runoff and dairy and parlour washings.

Proposed alterations to the buildings to the north of the farmyard include an increase in cubicle housing capacity (from 75 to 150 cows), and open feed and loafing yards for in-milk and dry cows, and some youngstock. By providing five months storage capacity for slurry and foul water arising from these buildings, the existing lagoon will have capacity in reserve to accommodate increased winter rainfall.

There is land on the farm which is suitable for the construction of an impermeable earth-lined lagoon for slurry storage.

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This report summarises volumes to be stored and gives an example lagoon size for the containment of this material.

During the visit, test pits were dug on the proposed lagoon site and soils were assessed for permeability. Based on these findings, example lagoon base and bank construction details are given, in accordance with the recommendations given in CIRIA reports:

Livestock manure and silage storage infrastructure for agriculture, parts C759a and C759b

Full details are provided at the end of this report.

2 SLURRY AND FOULED WATER QUANTITIES TO BE DIRECTED TO THE PROPOSED LAGOON

Slurry collected from the proposed buildings to the north side of the farmyard (in NVZ Guidance booklet Annex 5 format) will be:

Livestock type	Livestock number	Proportion of excreta collected as slurry	Volume per livestock unit per month m ³	Slurry volume produced each month m ³	Slurry volume produced in 5 months m ³
Dairy cow after first calf (over 9000 litres milk yield)	150	100%	1.92	288	1,440

Your rainfall:

Year	Oct	Nov	Dec	Jan	Feb	winter total	winter monthly average
1,140	114	129	139	141	105	628	126

These figures are based on your telephone STD code, as used in the Dairy Co NVZ slurry storage booklet (phone 01285 646 500 for a copy).

Based on 628 mm of winter rainfall, and the farm's information on open yard areas, the **Fouled water** volumes arising from the proposed fouled open to the north side of the farmyard will be:

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Source of fouled water	Area (m ²)	Volume in 5 winter months (m ³)	NVZ Definition
loafing yard for dry cows	500	315	slurry
loafing yard for youngstock	300	189	slurry
loafing yard for cows in milk	200	126	slurry
'Slurry' and 'dirty water' combined	1,000	630	
		139,000	gallons

Under current NVZ regulations, lightly fouled water is described as 'dirty water', which can be spread during the closed period. On the other hand, excreted slurry and fouled yard runoff described as NVZ 'slurry' (see table above) cannot be spread to land during the closed period.

In total, **5 months' slurry and fouled water** from the north side of the farmyard will be

$$1,440 + 630 = 2,070 \text{ m}^3$$

3 EARTH-LINED LAGOON SIZING AND PROPOSED SITE

As an example of lagoon dimensions to contain all the slurry and fouled water from winter housing from the north side of the farmyard (2,070 m³), if a rectangular 4.5 metre deep lagoon were built on flat ground, it would need to be 50 x 35 metres along the inside top banks, giving a total volume of 4,300 m³. These dimensions allow for

- 1 in 2½ slopes on the inner lagoon banks (see photo, and diagram in CIRIA 759b)
- the rain falling into the lagoon over 5 winter months
- a 750 mm design freeboard.



Overall land area required could be in the order of 0.33 hectares (0.8 acre) including the outer banks.

Your site is not flat and fitting a lagoon into it would probably not result in a perfectly rectangular shape, but the above example gives some idea of the dimensions that you need to work to.

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3.1 Proposed site

The proposed lagoon site is shown over an air photo of the farmyard and adjacent land (north upwards). The lagoon outline and inner bank tops are shown in red, with 5 metre contours shown in yellow. The test pit locations are numbered 1 to 5:



The nearest watercourse is the Trevella stream, situated 250 metres to the north of the lagoon site

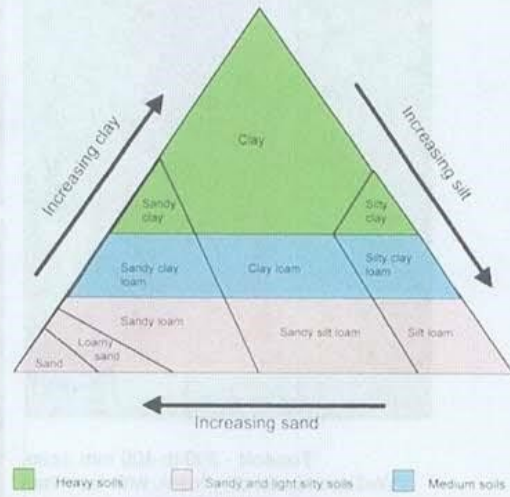
4 EARTH LINED LAGOON FEASIBILITY

The most suitable soils for impermeable lagoon base and embankment construction have a 20-30% clay content, shown as the blue 'clay loam' area in the middle of the soil texturing diagram to the right.

These soils have a suitably low permeability (10^{-9} metres per second or less), combined with high strength.

Clay contents above 30% (green areas) result in very low permeability, but care is needed during construction to ensure that embankments are stable, and that any cracking during dry weather does not compromise lagoon permeability.

In clay loam and clay soils, some stone content can be tolerated without compromising permeability.



4.1 Test pits and preliminary soil examination

Five pits were dug at the locations marked on the plan, using a 360 degree excavator.

Soil was placed adjacent to each pit in discreet piles for hand texturing for clay content, and to establish stone content. A representative sample from soil zones judged to be suitably impermeable was bagged and left on the farm, to be sent off for soil permeability testing.

The photos below show the main soil/stone/shale combinations excavated from the pits.

No water ingress was seen in any of the pits

Waste Recovery Plan

Slurry Lagoon Nansmerrow Farm, Tresillian, Truro



Topsoil - 300 to 400 mm deep.
Well structured clay loam, with less than
5% stones to 5-10 mm.

This material would be **suitable** to form an impermeable lagoon layer, though you may prefer to use it for lining the outer lagoon banks, or for other uses on the farm.



8

Waste Recovery Plan

Slurry Lagoon Nansmerrow Farm, Tresillian, Truro



Middle layer - between 0.4 and 2 metres thick

Yellow clay with 20-30% hard stones, between 50 and 100 mm across.

This material would be **very suitable** to form an impermeable lagoon layer



Below around 2 metres depth in pits 1, 2, and 5, and below half a metre depth in pits 3 and 4 the shale content was above 80%, and the shale platelets were larger (150 to 250 mm across).

This material would **not** be suitable to form an impermeable lagoon layer, though it could be used for track bases and hardstanding areas elsewhere on the farm

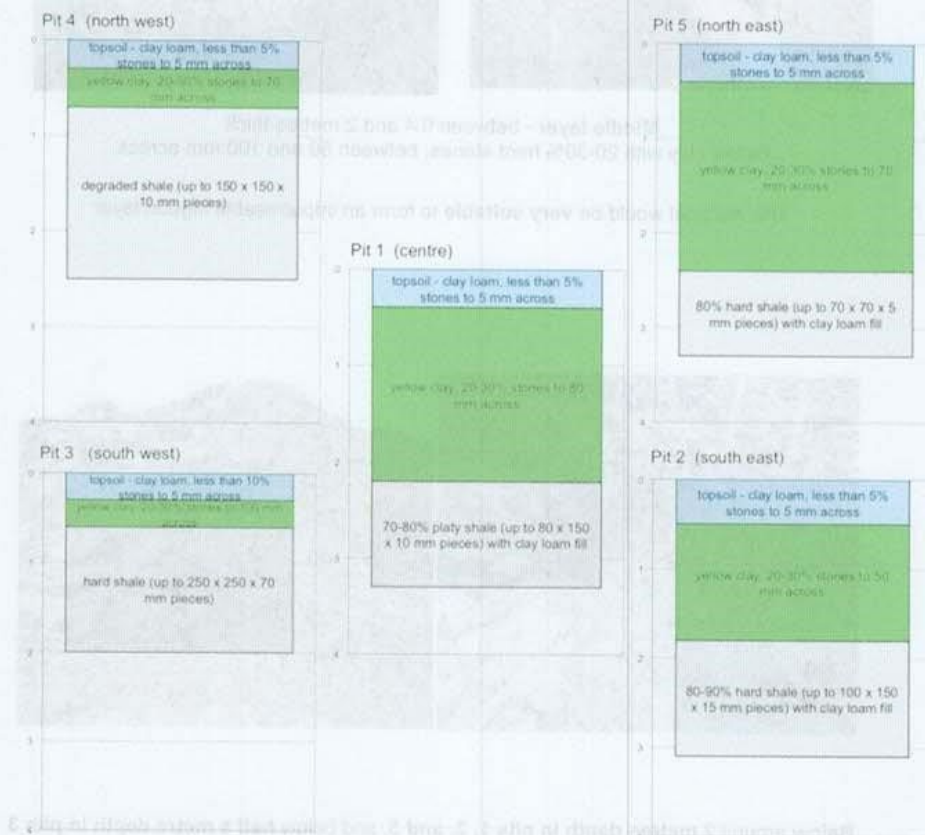
Waste Recovery Plan

Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

4.2 Test pit profiles

Soil textures and stone content from all five pits are shown graphically below, with pit depth in metres shown on the y-axis.

- Soils judged to be suitable for construction of impermeable lagoon bases or banks are coloured blue (clay loams) or green (clays). Soils judged as unsuitable (more than 30% stone) are coloured grey



The **conclusion** drawn from pit excavation, soil examination, and hand texturing is that sufficient quantities of suitable material are available for the construction of an impermeable earth-lined lagoon with impermeable layers at least a metre thick (see later for layup options).

There are also large quantities of topsoil available from excavations during farm building construction, which can be built into the lagoon impermeable layers.

However, the stonier, more permeable material (grey zones in diagram above), should not be used for the impermeable zones of the lagoon banks or base.

Waste Recovery Plan

Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

The farm plans to apply for a waste exemption to allow the import of soil and stone material to increase the thickness of the lower lagoon banks. Because there is sufficient material on site to lay up the lagoon impermeable layers, the soil texture and stone content of the imported material is not critical to the lagoon build.

4.3 Laboratory testing of permeability

During the pit excavations, I sub-sampled the topsoil/low-stone content clay layers in pits 1 to 5, and left the soil material with you to send off for lab testing.

The required test is 'Determination of the Permeability of Clayey Soils in a Triaxial Cell Using the Accelerated Permeability Test (Test Method - BS1377: Part 6: 1990: 6)'

In addition, a 'Particle Size Distribution' will give clay, silt, and sand percentages of the sample.

The cost of a test is typically between £130 and £150, depending on how many days the sample needs to be kept on the test rig (the test is usually completed in a week or two)

Keep the soil test results, since these will confirm their suitability for lagoon construction.

5 EARTH LINED LAGOON CONSTRUCTION

5.1 Site and soil considerations

General considerations are:

- The outsides of the embankments must be at least 10 metres from open drains and watercourses.
- Relocate any drains
- Remove topsoil from the site, including the area of the embankments
- Remove and temporarily store the impermeable clay layer on or near to the site
- Excavate to final lagoon depth over the base and bank areas, allowing additional depth for an impermeable soil liner to be built up on the lagoon base
- Provide a proper key for embankment construction
- Using suitable impermeable soil-fill, place and compact in uniform layers using mechanical plant
- Provide a permanent safety fence, at least 1.3 metres high and of un-climbable construction



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Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

5.2 Base and bank design

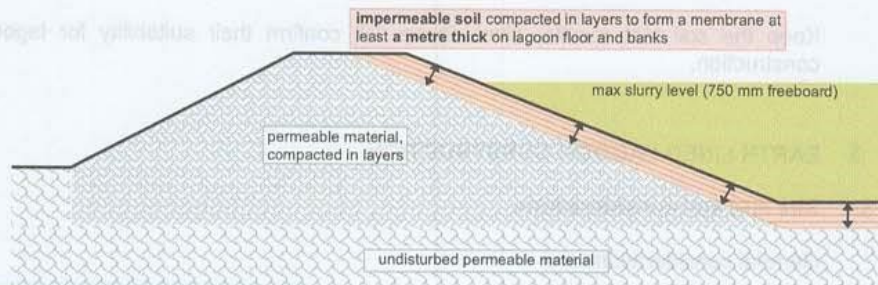
The CIRIA C759b report shows that various types of construction are possible, depending on the material available and the location of impermeable soil layers.

The most appropriate bank sections for the Nansmerrow lagoon site are shown below:

Built-up embankment profile

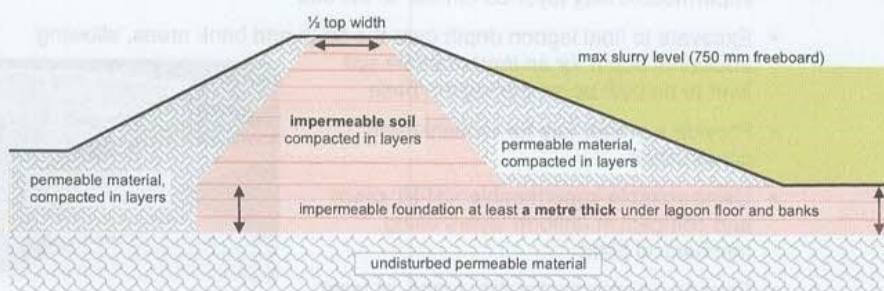
We have shown that there is sufficient impermeable soil to be used as a liner. A number of options are open for construction, and are described on pages 60 and 61 of the CIRIA guide (section 7.4.4 Construction process – zoned construction). In all the examples given, the banks and base of the finished lagoon have been lined with a metre-thick layer of suitably impermeable soil, **running continuously between the banks and base.**

The simplest bank construction method would be to remove and stockpile the liner soil, construct the base and banks, and compact the liner soil back over it:



Alternatively, the example profile below (1 in 2 slope on the outside; 1 in 2.5 on the inside) provides protection for the impermeable zone, which is located in the centre of the raised embankment, and faced with stonier material. This will help to reduce the risk of scouring the impermeable layer when the lagoon contents are being stirred.

This does require more planning to place the impermeable layers in the correct locations and depths, though:



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However thoroughly an embankment is constructed, **settlement** will occur, and this should be taken into account when designing the lagoon. A 10 per cent allowance should be added to the embankment height when initially constructed, to allow for settlement, unless more precise estimates are available from detailed geotechnical investigations.

Embankment tops

Where the tops of the embankments are not to be driven on, suggested minimum widths are shown in the [Table 7.3](#), from page 53 of the [CIRIA guide](#):

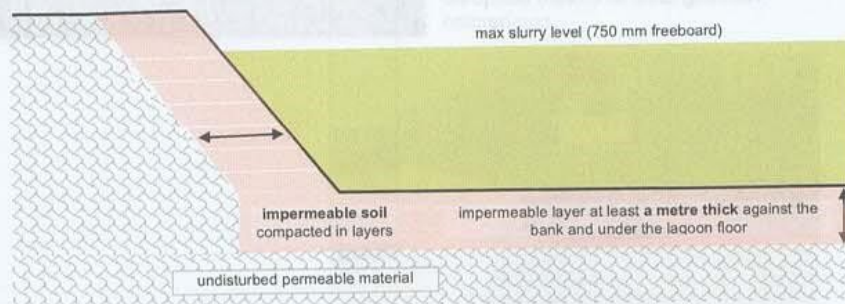
Bank height (m)	Minimum top width (m)
2	2.5
3	2.75
4	3.0
5	3.25

The top of the embankment should be domed so that rainwater is directed away quickly. If the top of the embankment is used for vehicular access, the embankment must be wide enough to accommodate the vehicle without risk of damaging the top or internal/ external walls.

Excavated slope profile

As described on page 60 of the [CIRIA guide](#) (section 7.3.5 [Embankment geometry](#)), A lagoon dug into suitably impermeable undisturbed soil could have steeper sides than those given above - for instance, up to a 1 in 1.5 slope, provided that it is stable.

On the uphill side of the lagoon, where the excavated profile will probably include stony material, it would make more sense to create a metre thick layer of suitably compacted soil against the bank:



If the impermeable material cannot easily be compacted by running up and down the bank, it may be easier to come up the bank with a 2-3 metre wide shelf, so that a vibrating roller can be safely towed along it.

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The shelf could later be planed back to a metre thick, should the impermeable soil is needed elsewhere in the build. However, leaving the wider shelf in place would be preferable since it provides additional material; should light scouring or erosion of the bank surface occur during the life of the lagoon.

5.3 Site preparation

Overall, the site will need to be stripped to a depth of a metre below the final lagoon floor level, and an additional metre or more into the hillside, depending on how you plan to line the cut slope. Material should be stockpiled separately as topsoil, impermeable soil, and permeable material (too stony for the impermeable layers of the finished lagoon).

If necessary, small amounts of groundwater can be intercepted by a shallow drain to suitable perforated drainage pipes located under or outside of the lagoon impermeable layers.

5.4 Base and bank construction

It is important to ensure that soil is adequately compacted. The photos below show this operation in progress.

A shallow (250 mm) layer of soil with 20-30% clay content is being rolled 4 times by a 2 metre wide 8 tonne vibrating roller to ensure adequate compaction



Here, a shallower (100-150mm) layer of soil with 20-30% clay content is being rolled 4-6 times by an 8-wheeled 20 tonne excavator to ensure adequate compaction.

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The data in the table below, reproduced from CIRIA report C759b, page 59 is the kind of information that a reputable contractor needs in order to ensure that compaction is properly achieved.

Type of compaction plant	Category	Max. depth of compacted layer (mm)	Minimum number of passes	Soil types		
Smooth wheeled roller (or vibratory roller operating without vibration)	Over 2100 kg up to 2700 kg	125	8	Cohesive or granular		
	Over 2700 kg up to 5400 kg	125	6			
	Mass per metre width of roll:	Over 5400 kg	150		4	
Grid roller	Over 2700 kg up to 5400 kg	150	10	Stiffer cohesive or granular		
	Mass per metre width of roll	Over 5400 kg up to 8000 kg	150		8	
		Over 8000 kg	150		4	
Sheepsfoot (tamping) roller	Over 4000 kg	225	4	Stiffer cohesive or granular		
Mass per metre				See note		
Width of roll:						
Pneumatic tyred roller	Over 1000 kg to 1500 kg	125	6	Softer cohesive or granular		
	Mass per wheel:	Over 1500 kg up to 2000 kg	150		5	
		Over 2000 kg up to 2500 kg	175		4	
		Over 2500 kg	200		4	
Vibratory roller	Less than 700 kg	100	Unsuitable	granular		
	Mass per metre width of a vibratory roll:	Over 7000 kg up to 1300 kg	125		12	
		Over 1300 kg up to 1800 kg	150		8	
		Over 1800 kg up to 2300 kg	175		4	
		Over 2300 kg up to 2900kg	200		4	
		Over 2900 kg up to 3600 kg	225		4	
		Over 3600 kg up to 4300 kg	250		4	
		Over 4300 kg up to 5000 kg	275		4	
	Over 5000 kg		4			

CIRIA C759b suggests that soils comprising more than 30 per cent of stones larger than 20 mm will compromise overall impermeability, and should be regarded as not suitable for impermeable lagoon base or embankment construction, and this has been taken into account in sections 4 and 5 of this report.

However, experience has shown that many shale subsoils of more than 30% stone content will compact into a more impermeable layer under a heavy vibratory roller, provided that the soil fill is a clay or a clay loam in texture.

When laying up the 'permeable' part of an embankment, therefore, I would recommend layering and compaction to add to the overall impermeability of the finished lagoon.



The photo shows large shale pieces pulverised by 4 passes of a heavy vibrating roller

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5.5 A cautionary note about 'key trenches'

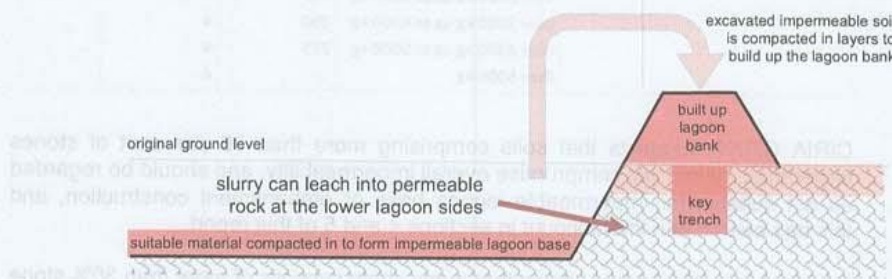
The preceding sections of this report have shown examples of lagoon bank and base lay-up that will ensure a minimum thickness of suitably compacted impermeable soil running **continuously** from the base of the finished lagoon to the bank tops.

Experience has shown that, when constructing farm lagoons, some contractors have been satisfied to start at existing ground level and excavate a so-called 'key trench' at the mid-point of the proposed lagoon banks. This is typically at a safe working depth of around 2 metres.



Low-permeability soil is compacted back into the trench in shallow layers, as in the diagram and photo above (the vehicle in the trench is towing a vibrating roller).

Lagoon construction then proceeds by excavating impermeable material from inside the lagoon area and compacting this material over the key trenches. Laying up the metre-thick lagoon floor liner is often the last major job.



This approach saves on machinery and labour time, and may be effective for shallower lagoon construction. However, at the proposed lagoon site, with a 5.5 metre height difference between the lagoon banks and excavated base (allowing for excavation and re-compaction of the metre-thick liner), the following shortfalls may arise:

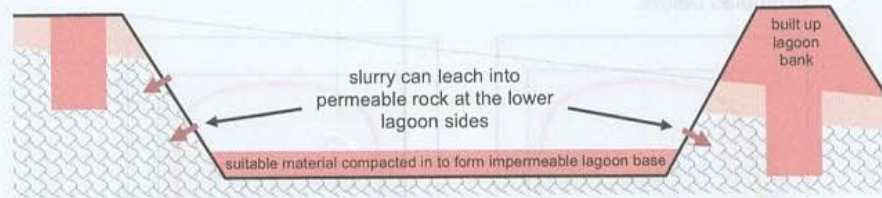
- the key trench may not have reached sufficient depth to meet the lagoon base liner
- the re-compacted lagoon base liner will not meet the re-compacted soil in the key trench

This can allow leakage from the finished lagoon through the unprotected permeable area.

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Also, on a sloping site such as yours, the gap between a key trench and the lagoon base will be greater on the uphill side:



When discussing lagoon construction with a contractor, ensure that they describe in detail how they will ensure that the impermeable lagoon base liner will meet the impermeable bank liner - **on all sides of the lagoon**. Ask them to illustrate their proposed construction method with cross-section sketches, or diagrams.

6 OTHER LAGOON CONSTRUCTION AND MANAGEMENT CONSIDERATIONS

6.1 Access and stirring

I would advise providing drive-in access to the lagoon so that operations such as stirring and slurry removal can be undertaken from within the lagoon.

This allows the banks to be fenced along the inside top sides, saving on fencing costs.

Ramps can be constructed on gentle gradients by locating them on an internal corner of the lagoon, as in the photo.



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In terms of impact in the landscape, grassed banks soon blend into the general field and hedge landscape.

The 2.5 acre lagoon in this photo lies in the North Cornwall coastal landscape, and the lower bank is 12 metres high.

The banks are grazed by sheep, and within a year it has become difficult to distinguish the lagoon from the field and hedgerows around it.



6.3 Odours and Ammonia emissions

In a slurry store or lagoon, undigested fibres in the cow's excreta rise to the surface and form a crust. This can be very effective in reducing odours and ammonia leaving the store. In a comprehensive 2007 research and review paper (full reference at the end of this report), it was shown that a reduction in ammonia emission of about 60% was typical from crusted stores.

The photo shows an example of a large lagoon with a crusted surface.

In the unlikely event that crusting does not take place quickly, straw can be blown onto the lagoon surface to accelerate the process.

For maximum benefit of slurry nutrients to crop growth (and reduction of nitrate losses by leaching), application of lagoon contents to land will normally be during the early spring months.



Where there may be sensitive receptors (e.g. dwellings) in the vicinity of the proposed lagoon or fields on which slurry is to be spread, the lagoon will have sufficient capacity to allow a delay in spreading, should there be a risk of odours reaching any nearby properties.



Clean air strategy, and Manufactured covers for slurry stores

As part of Defra's Clean Air Strategy 2019, proposed regulations to reduce ammonia emissions from farming will include 'a requirement for all slurry and digestate stores and manure heaps to be covered by 2027'. In the Strategy document, Defra states that it will 'support farmers to make investments in the farm infrastructure and equipment that will reduce emissions'


At this stage of policy development, it is not clear whether slurry crusting will be regarded as a legitimate slurry store cover, or whether an artificial (i.e. manufactured) cover will be required.

A guidance leaflet published by BPEX in 2003 (excerpt below) shows three possible types of manufactured covers for slurry lagoons with large surface areas (where a single span roof is not an option):

Permeable covers

Type	Description	Advantage	Disadvantage
 <p>Lightweight Expanded Clay Aggregate (LECA) or foam glass</p>	<ul style="list-style-type: none"> Applied in a layer 100 – 150 mm deep. Moderate capital cost. 	<ul style="list-style-type: none"> Easy to install on existing stores and lagoons, regardless of shape and is effective. No problems reported with pumps etc. 	<ul style="list-style-type: none"> Approximately 10% of the cover needs to be replaced annually. These covers do not prevent rainfall from diluting the slurry.
 <p>Floating plastic plates</p>	<ul style="list-style-type: none"> Free floating plastic plates, generally hexagonal in shape. Moderate cost, can be recovered and reused. 	<ul style="list-style-type: none"> Easy to install on existing stores and lagoons, regardless of shape and is effective. Up to 95% reduction in gas emissions can be achieved. 	<ul style="list-style-type: none"> These covers do not prevent rainfall from diluting the slurry.

Impermeable covers

Type	Description	Advantage	Disadvantage
 <p>Lagoons – fixed floating plastic membrane</p>	<ul style="list-style-type: none"> A large plastic sheet with integral floats and gas vents. The edges of the cover are buried into the lagoon banks to retain it. Moderate to high cost 	<ul style="list-style-type: none"> Rainwater can be pumped off the top. Stirring is possible if design allows. 	<ul style="list-style-type: none"> Requires lagoon to be initially empty and embankments to be suitable for fixing. Access for de-sludging is difficult.

These have varying levels of effectiveness in reducing ammonia emissions, and investment costs are currently high - up to half the lagoon construction cost.

Handling considerations and durability for lagoon covers are still being addressed; and practical solutions for covering large lagoons continue to be developed.

In the coming years, more durable and cost-effective manufactured covers should become available, and it is likely that grant aid for covering slurry stores could be provided on a National scale.

Given the information above, my advice would be to regard the provision of 5 months storage and natural slurry crusting as a significant improvement on current ammonia emissions from daily handling at Nansmerrow. As the regulations and grant options associated with Defra's Clean Air Strategy evolve, further investment decisions can be made on covering the lagoon.

7 NEXT STEPS

You have already sent the soil samples for **laboratory testing**. Results usually come back within 2-4 weeks.

On receipt of this report you plan to contact the **Environment Agency** immediately and discuss the earth-lined lagoon proposal with them.

You plan to submit a **Prior Notification** to the local planning authority. The detail in this report should satisfy most of the requested information

If the EA are able to supply a letter explaining why additional storage is necessary, you can send it to your local Planning Authority with this report and your planning application.

You now have an example lagoon capacity and dimensions, based on level sites, and a **local contractor** who has dug the test pits, is willing to take on the construction project, and is now familiar with what is involved in lagoon construction to CIRIA 759b standard.

Experience from 65 lagoon appraisals and builds has shown that paying machinery and labour costs on an hourly rate can cut costs considerably, as contingency costs do not have to be added to a tender price.

If you feel that you would like **site visits** during the build, then I can make these, taking photos, discussing aspects of the build with the contractor, and providing a written summary of discussions and recommendations made.

The best times to make these site visits could be:

- once the site is stripped of topsoil and an area of around 20 x 20 metres of good liner soil has been excavated
- during construction, should groundwater become apparent (this can be drained away and construction can continue above the drained area)
- at, or near-to completion of the lagoon

Whether or not you find that the above input is required, I would still urge you to **photograph every stage of the build** (20-30 photos per day, at least). This will give a detailed record of construction, should it be questioned over the coming decades.

You must notify the Environment Agency in writing about any new, substantially enlarged or substantially reconstructed system at **least 14 days before any construction begins**. If, by this stage, you have not previously discussed your plans with the EA, and/or a full planning application not been made, they are likely

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to request details of the proposed design and construction. The detail in this report should satisfy this, if requested.

Finally, remember that you also need to notify the EA that you intend to use the new structure, **14 days prior to its' first use.**

8 CONSENTS AND LEGISLATION

If pollution control works have to be installed or enlarged, then legislation has to be complied with, and consents must be sought. If you intend to proceed with any building work, it is in your best interest to ensure that all necessary consents have been obtained before starting work and incurring expenditure. The following authorities should be contacted for guidance:

8.1 Environment Agency

Any proposals for the installation, improvement or enlargement of existing waste disposal facilities need the consent of the Environment Agency.

You must notify the EA at least 14 days before construction commences, and again 14 days before you use any new, substantially enlarged or reconstructed pollution control facilities. Forms are available for this procedure from local EA offices.

8.2 Planning

Any new building, structure, tank or excavation for the storage of manure, slurry and dirty water which is to be built within 400 metres of the curtilage of a 'protected' building requires planning permission.

A 'protected' building is one that is occupied by people on a regular basis, such as a private dwelling or school. The definition excludes a dwelling or other buildings that are used for or in connection with agriculture.

The 400 metre rule is in addition to other restrictions on permitted development for agriculture, such as that of 'within 25 metres of the metalled portion of a road'.

Since January 1992, even if full planning permission is not required, the local planning authority requires to be informed of the siting, construction and size of any planned agricultural buildings and any engineering operations on any size of agricultural unit.

Therefore, it is recommended that you contact your local Planning Authority to establish whether you need to submit a Notice of Intention or a full application for Planning Permission.

8.3 Health And Safety

The handling and storage of waste material, including organic wastes, carries the possible risk of exposing employees and members of the public to substances and/or factors affecting their health and safety.

All existing and proposed structures must comply with relevant Health & Safety legislation. Guidance on health and safety matters is available from your local Health & Safety Executive office.

9 USEFUL INFORMATION

Protecting our water, soil and air

A Code of Good Agricultural Practice for farmers, growers and land managers was published in 2009. This has comprehensive information on pollution laws, causes of pollution from farms, and ways to reduce pollution risks - including how to draw up a Farm Waste Management Plan.

The Code is published by The Stationery Office (TSO) and available from their office via PO Box 29, Norwich, NR3 1GN, telephone 0870 600 5522. Quote reference number ISBN 978 0 11 243284 5 if ordering a copy. It can also be downloaded from Defra's website at:

<http://www.defra.gov.uk/foodfarm/landmanage/cogap/documents/cogap090202.pdf>

NVZ requirements

Details of how to comply with the NVZ minimum storage requirements can be found in the Defra NVZ Guidance. Additional clarification is provided by the EA through their technical Q&A. All this material can be accessed through the GOV.UK website: <https://www.gov.uk/nitrate-vulnerable-zones>

CIRIA reports C759; Livestock manure and silage storage infrastructure for agriculture

This report provides up-to-date information on the selection, sizing, costs and risks associated with farm waste storage as well as on the issues that may arise during the design, construction and operation phases.

The guide is divided into two parts:

Part 1 Selection guide C759a (60 pages) describes the legislative context and presents the characteristics of farm wastes and principles of waste treatment and disposal. Also, it summarises the main features of the most widely used storage systems, thus helping select the most appropriate store or narrow down the choice to the suitable options. This part is intended for those people who are seeking an overview of the topic and/or advice on the selection of the store (e.g. the farmers).

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Part 2 Design and Construction guide C759b (150 pages) covers the general design, construction and installation aspects and provides specific details on the storage facilities, including, but not limited to, earth-banked lagoons, concrete stores, weeping walls, slurry bags and anaerobic digestion systems. This part also provides guidance on the maintenance and repair of structures, and health and safety considerations. It is aimed at a more technical audience, such as designers, consultants, material suppliers and contractors.

The guides can be downloaded free of charge from CIRIA's website at https://www.ciria.org/resources/free_publications/farms.aspx

Soil Suitability and Testing for Earth Lined Slurry Lagoons

This two page leaflet was posted on the Environment Agency website in April 2011 and outlines the necessary soil characteristics and tests for constructing an unlined earth lined slurry lagoon.

Research/review paper on Slurry Store Crusting

Natural crusting of slurry storage as an abatement measure for ammonia emissions on dairy farms

by K. Smith (ADAS), T. Cumby, (Silsoe Research Institute) J. Lapworth (ADAS), T. Misselbrook (IGER), A. Williams (Silsoe Research Institute)

published in Biosystems Engineering 97 (2007) 464–471

Manufactured covers for slurry stores.

Covering Slurry Stores - Benefits, Practicalities and Available Options

This 2-page leaflet was produced by BPEX (Best Available Techniques for intensive rearing of poultry and pigs) in 2007

Farming Rules for Water

Since 2 April 2018 new rules for all farmers in England have been introduced to help protect water quality. They apply to field storage of organic manures, application of organic and manufactured manures to land, livestock management near to watercourses, and soil nutrient testing for cultivated land.

More details and the policy document can be found at

<https://www.gov.uk/government/news/new-farming-rules-for-water>

Appendix 5

Environmental Risk Assessment

Slurry Lagoon, Nansmerrow Farm,
Tresillian, Truro

Version 2

Data and information				Judgement				Action (by permitting)	
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. Domestic dwellings within 1000m range of the facility as identified in the ESSD p6 and the sites DEMP p7-8	Releases of particulate matter (dust)	Harm to human health - respiratory irritation and illness.	Air transport then inhalation.	Low	Low	Low	The activities may produce dust from movement of vehicles, tipping operations and during the construction process in placing materials. The risk will be elevated in dry and windy weather.	The site activities will be stopped in windy and dry conditions where the potential for particulate to migrate and have an adverse effect on local dwellings. Control measures and monitoring are outlined in the DEMP p14. The ESSD concludes that there will be no adverse effects on local receptors.	Low

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Members of the public using Public Rights of Way (Public Footpath) 375m and 990m As identified p6	Releases of particulate matter (dust)	Harm to human health - respiratory irritation and illness.	Air transport then inhalation.	Low	Low	Low	The activities may produce dust from movement of vehicles, tipping operations and during the construction process in placing materials. The risk will be elevated in dry and windy weather.	Local knowledge of the landowner states that the footpaths are little used during working hours through the week and that they are mainly used in evenings and weekends when the facility won't be operating.	Low
Local human population.	Releases of particulate matter (dust).	Harm to human health - respiratory irritation and illness.	Air transport then inhalation.	Medium	Medium	Medium	Permitted waste types are mainly inert and have a low potential to produce bioaerosols. The activities may produce dust from movement of vehicles and tipping operations especially in dry and also windy weather.	Activities are not permitted within a specified air quality management area (AQMA) for particulate matter of 10 microns or less (PM10). Activities shall be managed and operated in accordance with a management system that includes measures to prevent and reduce risk of dust being produced and where it is produced from leaving the site boundaries. Rules can be invoked to require a particulate management plan.	Low
Local human population.	Releases of particulate matter (dust).	Nuisance - dust on cars, clothing etc.	Air transport then deposition.	Medium	Low	Medium	Permitted waste types are mainly inert. The activities may produce dust from movement of vehicles and tipping operations especially in dry and also windy weather.	Activities shall be managed and operated in accordance with a management system that includes measures to prevent and reduce risk of dust being produced and where it is produced from leaving the site boundaries. Rules can be invoked to require a particulate management plan.	Low
Local human population.	Litter.	Nuisance, loss of amenity and harm to animal health.	Air transport then deposition.	Low	Low	Very low	Waste types if compliant with the rules should have a low risk of litter from contraries in the waste.	There are rules in place to control waste acceptance. The management system should have procedures to remove and contain any litter to prevent it being deposited at the site or to leave the site boundaries. Rules can be invoked to require a litter management plan. Any contaminants such as light plastics, wood and litter will be picked and stored in a skip container before disposal at a licenced facility	Very low

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Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

Local human population.	Mud and waste on road.	Nuisance, loss of amenity, road traffic accidents.	Tracked on tyres of vehicles entering and leaving the site and from loads which are not properly contained.	Medium	Medium	Medium	Waste types are typically ones that will produce mud especially during wet weather.	The management system will contain procedures to minimise the risk of mud and waste being tracked out onto the highway. This may include wheel-cleaning facilities where appropriate. All vehicles should have adequate containment such as sheeting to prevent waste spillage. The facility is situated along a private road owned by the operator who has adequate equipment on site to clean metal roads before reaching the Public Highway.	Low
Local human population.	Odour.	Nuisance, loss of amenity.	Air transport.	Very low	Very low	Very low	Permitted waste types are mainly inert and therefore should not be odorous.	The management system should contain procedures to prevent non-permitted wastes being deposited at site and to deal with rogue loads if they do occur. There is a dormant Rule that can be utilised if odour should be a problem.	Very 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 but there is usually low potential for exposure.	Noise and vibration shall be minimised and not cause nuisance. A noise and vibration management plan may be required.	Low
Local human population.	Scavenging animals and scavenging birds.	Harm to human health from waste carried off site and faeces. Nuisance and loss of amenity.	Air transport and over land.	Low	Low	Very low	Wastes are limited to mainly inert wastes that are not normally attractive to animals and birds.	Risk limited by permitted waste types and good onsite management practices detailed in management system of non-conforming wastes.	Low
Local human population and local environment.	Pests (e.g.) flies.	Harm to human health. Nuisance, loss of amenity.	Air transport and overland.	Low	Medium	Medium	Wastes are limited to mainly inert wastes that are not normally likely to encourage pest infestations.	Risk limited by permitted waste types and good onsite management practices detailed in management system of non-conforming wastes.	Low

Waste Recovery Plan

Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

Local human population and local environment.	Flooding of site.	If waste contaminated water is washed off site it may contaminate buildings, gardens, watercourses and natural habitats.	Flood waters.	Low	Medium	Medium	Permitted waste types are mainly inert so any waste washed off site will add to the volume of local post-flood cleanup workload rather than the hazard. However, they may cause increased siltation and need for dredging in water courses. Increased suspended solids.	Activities are not permitted within 10 metres of a watercourse or to be deposited sub-water table. The written management system should identify and minimise risks of pollution, including those arising from operations, maintenance, accidents, incidents and non-conformances.	Low
Local human population and /or livestock gaining unauthorised access to the waste operation.	All on-site hazards, wastes, machinery and vehicles.	Bodily injury.	Direct physical contact .	Low	High	Medium	Permitted waste types are inert therefore only a low risk from the actual waste. However, there could be stockpiles that people could climb or void spaces that people could fall into and wastes have a higher risk in wet conditions where deep mud could form.	The written management system will identify and minimise risks from unauthorised access and site security measures identified to prevent such access. Site visitors will be informed of the Site Rules all staff working or using the site will be adequately trained in accordance with the sites EMS.	Low
Local human population and the environment.	Arson and/ or vandalism causing the release of polluting materials to air (smoke or fumes) and firewater or spillage of polluting liquids to water or land.	Respiratory irritation, illness and nuisance to local population. Injury to staff, fire fighters or arsonists/ vandals. Pollution of water or land.	Air transport of smoke. Spillages and contaminated firewater by direct run-off from and via surface water drains and ditches.	Low	Medium	Low	Permitted waste types are inert so very low-risk of combustion. Site machinery and fuels and oils are more of a risk but quantities would typically be low.	The written management system will identify and minimise risks from unauthorised access and site security measures identified to prevent such access. The system should also describe how any polluting liquids or materials will be stored safely.	Very Low
Local human population and local environment.	Accidental fire causing 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. Pollution of water or land.	Air transport of smoke. Spillages and contaminated firewater by direct run-off from and via surface water drains and ditches.	Low	Medium	Low	Permitted waste types are mainly inert so very low-risk of combustion. Site machinery and fuels and oils are more of a risk but quantities would typically be low.	The written management system will identify and minimise risks. The system will describe how any polluting liquids or materials will be stored safely. Staff to be adequately trained in the event of.	Very low

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Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

All surface waters close to and downstream of site.	Spillage of liquids, including oil.	Acute effects: fish and invertebrate kill.	Direct run-off from site across ground surface, via surface water drains, ditches etc.	Low	Medium	Medium	Wastes are solid and mainly inert. Potential for spillage from any fuel and oil storage for machinery or directly from machinery operating on the site.	The Rules do not allow any point source discharges of contaminated water to controlled waters. Distance criteria of 10 metres from watercourse. All liquids shall be provided with secondary containment. The written management system will identify and minimise risks. The system should describe how any polluting liquids or materials will be stored safely and how machinery/plant will be maintained to prevent liquids from leaking. A Spill Kit will be stationed on site with a spill procedure. Staff will be trained in the event of a spill. A specialist contractor is readily available in the event of a larger spill.	Low
All surface waters close to and downstream of site.	Leachate from waste and contaminated rainwater run-off from waste e.g. suspended solids.	If waste contaminated water is washed off site it may contaminate watercourses and natural habitats leading to chronic effects: and deterioration of water quality.	Surface waters, leachate from infiltration through the waste	Medium	Medium	Medium	Permitted waste types are mainly inert so any waste washed off site will not be chemically hazardous however they may cause increased siltation and need for dredging in water courses. It will also reduce water quality and may smother fish breeding grounds and invertebrate populations. The waste will not produce liquid in itself but rainwater percolating through the waste will produce a waste leachate which should still be very low in contamination.	Risk limited by waste acceptance rules and limits to permitted waste types. Good onsite management practices must be detailed in the management system for controlling and containing water and leachate generated on the site. The Hydrogeological Risk Assessment conclusion on page 20 summarised the potential risk as "very low".	Low
Groundwater	Leachate from waste and contaminated rainwater run-off from waste e.g. Suspended solid	Chronic effects: contamination of groundwater, requiring treatment of water or closure of borehole.	Transport through soil/groundwater then extraction at borehole.	Medium	Medium	Medium	Permitted waste types are mainly inert with limited uses of road planings and organic wastes so any waste should not contain hazardous substances or non-hazardous pollutants in quantities that pose a risk to groundwater.	The management system will set out any additional stringent waste acceptance procedures to ensure only waste listed in the Rules are deposited on site. The procedures will also set out how to deal with rogue or non-conforming loads. Waste Acceptance Procedure included in the Waste Recovery Plan. The Hydrogeological Risk Assessment conclusion on page 20 summarised the potential risk as "very low".	Low

Waste Recovery Plan

Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

Protected Habitat under the Biodiversity Framework within 50m.	Dust, noise, vibration contaminated run-off leachate etc.	Harm to protected sites through contamination, smothering, disturbance etc.	Any	Low	Medium	Medium	Emissions to air may cause harm to and deterioration of nature conservation sites. Vehicles moving on and around site causing disturbance through noise. Potential for run-off and siltation of habitats etc.	Written Management System (EMS) to incorporate monitoring and surveillance of the habitat area. Environmental Policy Statement setting out operations commitment to the environment. Staff are trained to identify and monitor any such occurrence.	Low
Protected nature conservation sites - European sites and SSSIs.	Dust, noise contaminated run off of leachate etc.	Harm to protected sites through contamination smothering etc	Any	Low	Medium	Medium	Emissions to air may cause harm to and deterioration of nature conservation sites. Vehicles moving on and around site causing disturbance through noise. Potential for run-off and siltation of habitats etc.	Written Management System (EMS) to incorporate monitoring and surveillance of the habitat area. Environmental Policy Statement setting out operations commitment to the environment. Staff Training.	Low

	Very low (1)	Low (2)	Medium (3)	High (4)
High (4)				
Medium (3)				
Low (2)				
Very low (1)				

Waste Recovery Plan

Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

Appendix 6

Quotation for the supply of alternative construction materials



Maen Karne Quote

FAO: P George

Company:

RE SITE: Nansmerrow, Truro

Date: 17/03/2022

Dear P George

Following your recent enquiry, we have pleasure in enclosing a quotation for the supply of material reference the above site.

BS3882 Topsoil (>1000 Tonne Rate)	£9.75 Per Tonne
-----------------------------------	-----------------

Prices are based on full 8 Wheeler loads and are exclusive of VAT @ 20%.

Different size loads may be charged at an additional rate. Prices are subject to contract and based on standard working hours with no time restrictions on site or at the quarry or tip end.

Prices may change without notice due to circumstances beyond our control.

Subject to availability.

If you need any other information, then please feel free to contact us and we will be more than happy to help

Kind Regards

Jo Farrar

Commercial Manager

Maen Karne Aggregates Ltd

Maen Karne Concrete Products Ltd

Maen Karne Aggregates Limited and Maen Karne Concrete Products Ltd

Melbur Works, Summercourt, Newquay, Cornwall TR8 5UA

Sales: 01726 862881 Accounts: 01726 862881 Fax: 01726 860786



Waste Recovery Plan

Slurry Lagoon Nansmerrow Farm, Tresillian, Truro



Maen Karne Quote

FAO: P George

Company:

RE SITE: Nansmarrow, Truro

Date: 25/03/2022

Dear P George

Following your recent enquiry, we have pleasure in enclosing a quotation for the supply of material reference the above site.

SHW Clause 6/1 Type 2 Fill (a,b or c as required)	£12.50 /tonne (or £9.50/tonne backhauled)
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Prices are based on full 8 Wheeler loads and are exclusive of VAT @ 20%.

Different size loads may be charged at an additional rate. Prices are subject to contract and based on standard working hours with no time restrictions on site or at the quarry or tip end.

Prices may change without notice due to circumstances beyond our control.

If you need any other information, then please feel free to contact us and we will be more than happy to help

Kind Regards

Jo Farrar

Commercial Manager

Maen Karne Aggregates Ltd

Maen Karne Concrete Products Ltd

Maen Karne Aggregates Limited and Maen Karne Concrete Products Ltd

Melbur Works, Summercourt, Newquay, Cornwall TR8 5UA

Sales: 01726 862881 Accounts: 01726 862881 Fax: 01726 860786



Waste Recovery Plan

Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

Appendix 7

Waste Information Form

CJ & PH George

W I F (Waste Information Form)

TO BE COMPLETED BY WASTE CARRIER AND/OR WASTE PRODUCER

Waste Producer: Please tick box if person completing the form		Contact Name: Telephone No. Fax. No.	
Waste Carrier: Please tick box if person completing the form		Contact Name: Telephone No. Fax. No.	
Anticipated Volume of Waste:	m ³	Anticipated Date(s)	
Indicate whether estimate is in -	loose/solid	of Disposal:	
Address of Source of Waste			
Process from which waste arises			
Standard Industrial Classification (SIC) Code		Type of Waste	Inert <input type="checkbox"/> Non Hazardous <input type="checkbox"/> Hazardous <input type="checkbox"/>
Will the waste being delivered to the landfill have been treated (e.g. crushed or screened)			YES/NO
If NO give reason:			
Description and/or composition of Waste (as detailed as possible):			
EWC Code: (Circle one)			
Can the waste be recycled or recovered?			
Details of Existing and/or Previous Use of Site (if known): (Identify any known previous potentially polluting uses. Contact Waste Producer for information)			
Is waste being generated as a result of site decontamination works?			YES/NO
Does waste contain any biodegradable material? (e.g. Wood, paper, grass, etc.)			YES/NO
Has a Site Visit/Inspection been carried out by IV Ltd?			YES/NO
Has a Site Investigation been carried out? (If yes, attach ALL available information)			YES/NO
Are Chemical Analyses available? (If yes, attach ALL available analyses) ‡			YES/NO
Is a Site Plan available? (If yes, attach site plan)			YES/NO
Proposed Disposal Site:			
‡ Where 'YES', I/we confirm that to the best of our knowledge the information given above and the chemical analyses provided with this form are: a) representative of the material to be disposed of and b) the analyses were carried out by a UKAS accredited laboratory using accredited analytical methods.			This section to be signed by Waste Producer or Carrier
.....for			
N.B. Any liability arising from the provision of false or misleading information will be passed on to the Producer of the waste.			

Date WIF sent to Assessor:	Sent by:.....
TO BE COMPLETED BY WASTE ASSESSOR (e.g. IV or advisor)	
Do any determinands exceed Waste Management Licence criteria?	
THE WASTE IS SUITABLE FOR DISPOSAL AT	
THE WASTE IS NOT SUITABLE FOR DISPOSAL AT	
Signature of Waste Assessor:	Date Returned:

NOTE: Please complete all parts of upper section of form – refer to Waste Producer for any missing information

Waste Recovery Plan

Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

Appendix 8 - Farm Budgets**George Outline Budgets - Apr 22**

	Current System 300 Cows	Current System 350 Cows	Changes
Number of Cows	300	350	+ 50
Yield/ Cow	12,000	12,000	0
Acres Farmed	590	640	+ 50
Income			
Dairy Gross Margin	727,600	818,600	91,000
Youngstock Gross Margin	-260	0	260
Beef Gross Margin	1,500	1,500	0
Other Income	24,200	24,200	0
Total Farm Gross Margin	753,040	844,300	91,260
Expenditure	222,000	244,000	22,000
Labour Costs			
Power Costs	221,740	228,900	7,160
Other Overheads	44,100	44,100	0
Land, Building & Finance	132,515	136,910	4,395
Total Fixed Costs	620,355	653,910	33,555
Profit	132,685	190,390	57,705
Basic Payment	20,900	20,900	0
Profit After Basic Payment	153,585	211,290	57,705
Loan & HP Payments	100,295	100,295	0
Drawings & Tax	23,520	23,520	0
Surplus or Deficit	29,770	87,475	57,705
Milk Price + / - 1 p/1	36,000	42,000	0

Waste Recovery Plan

Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

Current System Outline Budget Year to Mar 23 - 300 Cows

Table 1 Dairy Herd Gross Margin

Average Number of Cows		300
Average Yield (litres)		12,000
Total Yield (litres)		3,600,000
Average Milk Price (ppl)		39.7
	£/cow	£
Milk Sales	4,759	1,427,598
Calf Sales	90	27,000
Calf Transfers	60	18,000
Cull Cow Sales	140	42,000
OUTPUT	5,049	1,514,598
Livestock Purchases/Replacement Cost (95@ £1200)	380	114,000
Valuation Change	-77	-23,000
Purchased & Home Grown Concentrates	1,440	432,000
Forage	550	165,000
Vet&Med	100	30,000
AI&Bull Hire	70	21,000
Straw & Bedding	40	12,000
Misc	120	36,000
VARIABLE COSTS	2,623	787,000
GROSS MARGIN	2,425	727,598

Table 2 Dairy Youngstock Gross Margin

Average Number of Heifers		100
	£/heifer	£
Transfer Charge (95 x £1,200/heifer)	1,140	114,000
OUTPUT	1,140	114,000
Livestock Purchases/Replacement Cost (90 @ £200)	200	18,000
Valuation Change	200	4,800
Purchased & Home Grown Concentrates	350	40,000
Forage	150	26,460
Vet&Med	60	6,000
Straw & Bedding	80	10,000
Misc	50	9,000
VARIABLE COSTS	1,090	114,260
GROSS MARGIN	-3	-260

Waste Recovery Plan

Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

Table 3 Gross Margin Summary

Enterprise	Acres/ Number	Total	GM/unit
Dairy Herd Gross Margin	300	727,600	2,425
Dairy Youngstock Gross Margin	100	-260	-3
Beef Gross Margin	115	1,500	
Total		728,840	
Other Income			
Countryside Stewardship		4,000	
Other Income		20,200	
Total Farm Gross Margin		753,040	
Farm Size (acres)=	590	Total	£/acre
Labour	Sub total	222,000	376
Power Costs	Depreciation	42,700	72
	Motor Expenses	7,200	12
	Repairs & Fuel	90,000	153
	Contract & Hire	33,840	57
	Electricity	48,000	81
	Sub total	221,740	376
Other Overheads	Insurance	21,600	37
	Water	6,000	10
	Misc	6,900	12
	ProfFees	9,600	16
	Sub total	44,100	75
Land Building & Finance	Rent	37,605	64
	Rates	5,000	8
	Finance Charges	77,910	132
	Building Repairs	12,000	20
	Sub total	132,515	225
Total Fixed Costs		620,355	1,051
Profit - Before Basic Farm Payment		132,685	225
Basic Farm Payment (Estimate)		20,900	35
Profit - After Basic Farm Payment		153,585	260
Cap Exp Difference		2,400	

Waste Recovery Plan

Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

Loan Repayments		53,715	
HP Payments		29,200	
Other Repayments		19,780	
Drawings		23,520	
Balance After Drawings		29,770	

Waste Recovery Plan

Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

Current System Outline Budget Year to Mar 23 - 350 Cows

Table 1 Dairy Herd Gross Margin

Average Number of Cows		35
Average Yield (litres)		12,00
Total Yield (litres)		4,200,00
Average Milk Price (pp!)		39.
	£/cow	£
Milk Sales	4,758	1,665,300
Calf Sales	90	31,500
Calf Transfers	62	21,60
Cull Cow Sales	140	49,000
OUTPUT	5,050	1,767,400
Livestock Purchases/Replacement Cost	391	136,800
Valuation Change	0	0
Purchased & Home Grown Concentrates	1,440	504,000
Forage	550	192,500
Vet&Med	100	35,000
AI & Bull Hire	70	24,500
Straw & Bedding	40	14,000
Misc	120	42,000
VARIABLE COSTS	2,711	948,800
GROSS MARGIN	2,339	818,600

Waste Recovery Plan

Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

Table 2 Gross Margin Summary

Enterprise	Acres/ Number	Total	GM/unit
Dairy Herd Gross Margin	350	818,600	2,339
Dairy Youngstock Gross Margin	100 0	0	0
Beef Gross Margin		1,500	
Total		820,100	
Other Income			
Countryside Stewardship		4,000	
Other Income		20,200	
Total Farm Gross Margin		844,300	
Farm Size (acres)=	590	Total	£/acre
Labour	Sub total	244,000	414
Power Costs	Depreciation Motor	42,700	
	Expenses Repairs & Fuel	7,200	72 12
	Contract & Hire	92,000	156
	Electricity	35,000	59
		52,000	88
	Sub total	228,900	388
Other Overheads	Insurance Water Misc Prof	21,600	37
	Fees	6,000	10
		6,900	12
		9,600	16
	Sub total	44,100	75
Land Building & Finance	Rent Rates	42,000 5,000	71
	Finance Charges	77,910	8
	Building Repairs	12,000	132
			20
	Sub total	136,910	232
Total Fixed Costs		653,910	1,108
Profit - Before Basic Farm Payment		190,390	323
Basic Farm Payment (Estimate)		20,900	35
Profit - After Basic Farm Payment		211,290	358

Waste Recovery Plan

Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

		2,400	
Cap Exp Difference		53,715	
Loan Repayments		29,200	
HP Payments		19,780	
Other Repayments		23,520	
Drawings			
Balance After Drawings		87,475	

Waste Recovery Plan

Slurry Lagoon Nansmerrow Farm, Tresillian, Truro

Appendix 9 – Pre-App Advice



CJ&PH George
Nansmerrow Farm
Tresillian
Truro
Cornwall
TR2 4AP

Our reference: EPR/KB3506UU/A001
Date: 01/07/2021

Dear Mr Richard Farmer

Pre-application advice – Basic service

Site: Nansmerrow Farm, Tresillian, Truro, Cornwall, TR2 4AP

Thank you for your pre-application enquiry submitted on 21/06/2021 and for taking the time to speak with me on 28/06/2021.

You confirmed:

That you are looking to construct a storage lagoon for farm slurry, using approximately 40,000 tonnes of material, and due to which wish to seek a Standard Rules 2015 No. 39 Deposit for Recovery (DfR) permit.

A search against this standard rules location criteria has been performed based on the National Grid Reference provided within the original request and the location plan provided by email on 29/06/2021.

Based on this search, this location is not suitable for the Standard Rules 2015 No 39 permit. To be granted a DfR permit in this location you will need to apply for a bespoke DfR permit.

It should also be noted that your scheme may fall under DoW:CoP, which if the criteria are met, a waste permit for the construction of the lagoon may not be required.

More information can be found here: [DoW:CoP \(claire.co.uk\)](http://DoW:CoP(claire.co.uk))

Furthermore, as you have indicated the storage lagoon for farm slurry, the amount and its use may also require a waste permit. If the slurry is used for land spreading for example a Standard Rules 2010 No. 17 may be appropriate.

There are also multiple storage exemptions available, see here; [Storing waste: waste exemptions - GOV.UK \(www.gov.uk\)](http://Storing waste: waste exemptions - GOV.UK (www.gov.uk))

customer service line 03706 506 506

floodline 03459 88 11 88

incident hotline 0800 80 70 60

LIT 55347 7/4/2021