

**Initial Pollution Assessment
And
Waste Management Recommendations**

Prepared for:

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Introduction

David Burns of Promar International has been instructed by Messrs Griffiths of Gunthwaite Hall Farm, to assess waste management issues to ensure the farm complies with the Nitrate Vulnerable Zone (NVZ) regulations and to recommend improvements to the farm waste storage, handling and management at the farm.

The Current System

All cows are currently housed on straw yards. All manure is collected as farm yard manure and as such does not pose a significant issue at present in terms of storage. FYM is collected in a midden in the middle of the farmstead, from which it is taken to field heaps or spread directly onto the land.

All parlour washings and some run off from the traditional farm buildings currently runs to a reed bed that is shared by a neighbouring farm. This is an unsatisfactory situation.

Since this report, this water is now diverted into a sump.

No slurry is collected from any calves. All weaned calves are taken to a contract rearer.

The Existing Problems

The main problems are as follows:

- There is a significant volume of clean water that is not separately drained and currently adds to the total volumes of dirty water
- There is no storage facility for any dirty water
- The reed bed does not cope well with the volumes of dirty water that flow through it
- This reed bed is shared by a neighbour
- The business at Gunthwaite Hall Farm is likely to expand further and cows are likely to be kept on cubicles in the future - this will exacerbate the current problems

Quantities of Wastes Produced

The production of wastes from the buildings and stock are summarised below. This takes into account the fact that the herd will expand from 155 cows to 180 and that the manure from these cows will be collected as slurry. As such, any new storage facility must make allowances for this.

Farm: Gunthwaite Hall Farm							
Farm Pollution Load				Volumes of Wastes m ³			
				1 Month	5 Months	6 Months	
Estimated rainfall figures mm				77	385	462	
Quantities Of Slurry and Manure							
	No. head	Vol./day					
Cows	180	51		286	1431	1716	
Quantities Of Dirty Water							
Parlour and dairy washings:							
Cows	160	18		89.3	446	536	
Dirty yard areas and un-separated roof water:							
Yard or building	length	width	area m ²				
Building A *	36	22.5	810				
Yard B	10.5	36	378				
Yard C	15	12	180				
Sub total of areas m ²			1368	105	525	630	
Sub Totals Of Dirty Water				194	971	1166	
Totals Of All Wastes				480	2402	2882	
Rainfall details mm (estimates only not site specific data)							
Winter monthly average 77							

The Proposed Solutions

It is proposed that the existing milking parlour to the north of the road becomes redundant. This will in turn be housed in building A. All roof water off building A will be collected and used to wash the parlour building and collecting yard. As such, this volume of water will be encompassed in the standard figure for parlour washings at 18 litres per cow. Any surplus rainwater is likely to run to a clean drain, however, in my calculations, I have worked on a worst case scenario and I have included the volume of rainfall that falls on building A in the total volume of dirty water produced.

All dirty water that is currently produced on the traditional buildings on the north of the road will become clean, and will run to a field drain.

- Covering any areas of open yards in the future e.g. collecting yards will further reduce the total volumes of dirty water.

Storage

There is currently insufficient total storage capacity. The proposal is to provide an earth banked slurry store that will hold 2,882 m³ of waste.

The slurry will be channelled by precast concrete into the lagoon some 100m away.

Lagoon Dimensions

An earth banked lagoon built for total containment and constructed to fill the space available could have dimensions as follows, either:

Depth	4m
Less statutory freeboard	0.75
Less rainfall on lagoon (estimated 180 days)	0.462
Working depth	2.788
(Internal)Width:	30m
(Internal)Length:	35m

Capacity of new store	2,927m³
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The lagoon will hold 6 months capacity which will allow Messrs Griffiths to use a contractor to spread when ground conditions allow in spring and summer.

Management Of The System and Contingencies

- Ensure the slurry and dirty water stores are emptied before the start of the winter period
- All systems can fail, always be prepared to use a contingency method of disposal if your regular system should fail e.g. your neighbours slurry tanker
- Ensure all staff or contractors spreading slurries or dirty water are familiar with the codes of practice for the protection of water. If the farm has a Farm Waste Management Plan, ensure the spreading risk maps are available to those spreading the farms wastes
- In the case of a pollution incident contact the Environment Agency helpline on 0800 807060

Summary Of Proposals

- Get in touch with a reputable company to conduct a soil permeability test:

Malcombe Wemyss (Tel: 01300 320326)
Newton Technology Ltd
Maiden Newton
Dorchester
Dorset
DT2 0AE

- Contact Jo Craig to organise a site visit to approve your proposal
- Apply for planning permission to construct a slurry store
- Get a number or quotes from registered contractors who will complete the work to the desired British Standards (appendix 2)
- Contact David Burns for further advice if required

Appendix I – Building Cost Calculator

Pollution Control	£/m ³	£/foot ³
Excavation of earth lagoon	5 - 7	0.14 - 0.20
Earthwalled, synthetic lined lagoon with fence	15 - 20	0.42 - 0.56
Concrete store	40-50	1.1 – 1.4
Steel slurry tower	30 - 35	0.85 – 0.99
Slurry bag	35-55	
Slurry channel £/run	200 -250	60 76
Slurry separator – screw press (Bauer):		
Basic separator	15,000	
Control panel	2,000	
Gantry	3,000	
Pipes and pumps	2,000	
Electric's	5,000	
Total (excludes reception pit)	27,000	
Hydraulic auto scrapers:		
Hydraulic power pump (to run up to 4 scraper)	2,750/unit	
Scrapers	365/unit	
Tracking	30/m run	

Appendix 2 - Guidance On Construction Repair And Maintenance Of An Earth Banked Lagoon

Guidance on Construction, Repair and Maintenance

Note No: CGN 002

July 2000

EARTH-BANKED SLURRY STORES

Prepared by ADAS National Building Design Team.
Funded by The Ministry of Agriculture, Fisheries and Food.

The soil used to construct an earth-banked store must have special properties to ensure stability and low permeability, usually a high clay content.

The site conditions must also be suitable. It is advisable to consult the Environment Agency and the local planning authority about the site at the initial planning stage.

Stores can be built below, above or part below/above ground level.

Dimensions of the store will depend upon the quantity and type of slurry to be stored and operational requirements.

When calculating the capacity at least 750mm must be added to the depth for freeboard (See References 6&7).



Earth-banked slurry store with access ramp

Site Suitability

- Avoid sites in a flood plain or sites with a high water table.
- Check proximity of water table and fluctuations in depth over a period of time.
- Avoid improperly filled ground or other unsuitable ground conditions.
- Investigate geology of the site:- sub-strata types, presence of faults or irregularities in substrata, evidence of mining.
- Use trial holes to sample soil properties and obtain soil profiles at various depths over the site.
- The outside edge of the embankment must be at least 10 metres from a water-course (See References 6 & 7).

An investigation to assess the suitability of the soils on site should be undertaken. The two most important factors to consider are:-

- **Permeability** – A maximum permeability of 10^{-9} metres per second extending to a depth of at least one metre over the whole of the site must be achievable.
- **Stability** – The soil must be suitable to form stable embankments while maintaining the required permeability under all conditions

The selection of a soil to meet the above requirements should only be entrusted to suitably qualified experts e.g. chartered civil engineers. It may be necessary to obtain samples over the whole site area at various depths and to carry out laboratory tests to determine the suitability of soils.

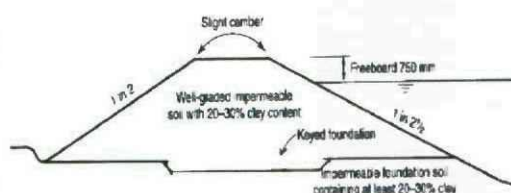
Design and Specification

The sketch shows a typical cross-section of an earth embankment built using an impermeable clay soil with uniform properties. It is keyed into, and built directly off, the impermeable subsoil base. This is the cheapest and simplest form of construction.

The slopes and width of the embankment shown may need to be varied for different site conditions and soil properties.

Non-uniform soils require more complex arrangements. Artificial impermeable liners can be used on certain sites but these require specialist design and construction.

CIRIA Report No 126 provides more detailed information on embankment design including the use of liners (See



Earth embankment cross-section

Reference 1)

- Slope the floor slightly towards the filling point. This allows slurry to float and spread over the whole area.
- If machines used to empty the store will operate from the top of the embankment, the banks must be designed to take their size and weight.
- Obtain the characteristics of the soils and substrata of the site in sufficient detail to enable designs to be prepared to BS 6031. Note that BS 6031 is not specific on design for impermeable construction. Soil specifications must conform to the required impermeable standards. (See Reference 3).
- Determine the correct geometry of the embankment cross-section and the particulars of its foundation.
- If necessary carry out tests to BS 1377 to determine soil strengths and permeability (See Reference 4).
- Determine by tests: relationship between compaction requirement according to soil density and moisture content for impermeable construction (See References 1 & 2).

Construction

- Ensure that the relevant Health and Safety Regulations including CDM Regulations are observed (See Reference 5).
- Prepare site by removing all trees, scrub, roots, other vegetation and unsuitable material.
- Remove topsoil from the site including the area of the embankments and set aside for re-use later.
- Relocate any drains to at least 10 metres away from the outside of the embankment, properly backfilling the old drain trench with impermeable material.
- Level and compact the sub-soil to impermeable standards.
- Level embankment areas and prepare the formation layer to provide a proper key for embankment construction.
- Using suitable impermeable soil-fill, place and compact in uniform layers using mechanical plant – all as described in Table 21 of CIRIA Report No 126.
- Ensure that the construction is fully in accordance with the detailed drawings and specification. A suitably qualified supervisor should carry out this duty.
- A permanent safety fence with lockable access gates should surround the site. This must conform to HSE requirements. It is recommended that the fence be at least 1.3 metres high and of un-climbable construction such as close spaced barbed wire, corrosion protected steel chain-link or mesh properly fixed to strainer wires and attached to hardwood or concrete posts with strainer posts and corner posts as required. More substantial fencing may be necessary in certain locations e.g. adjacent to a public footpath.
- Conform to requirements of the Control of Pollution Regulations and the Water Code (See References 6 & 7).

Repair and Maintenance

- Ask the designer and installer for operation and maintenance instructions.
- Do not fill above the 750mm freeboard level – periodically check levels to assess any leakage.
- Properly repair: any subsidence damage or damage caused by mechanical action or wind and waves, and other erosion damage.
- Repair rodent damage – a layer of wire mesh may give protection.
- Do not allow tree or shrub growth on embankments – roots may cause damage.
- Provide warning notices and rescue equipment.
- Maintain safety fences and rescue equipment.
- Vulnerable areas requiring special attention include: the foot of the embankment, joints with other forms of construction, integral pipework.

Further advice is provided in CIRIA Report No 126 – Farm Waste Storage and CIRIA Report No 164 – Design of Containment Systems (See References 1 & 2).

References

- 1 CIRIA Report No 126: Farm waste storage - guidelines for construction.
- 2 CIRIA Report No 164: Design of containment systems.
- 3 British Standard BS 6031 Code of Practice for earthworks.
- 4 British Standard BS 1377 Methods of tests for soils for civil engineering purposes.
- 5 Health and Safety Executive: Construction (Design and Management) Regulations.
- 6 The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991 (as amended).
- 7 The Code of Good Agricultural Practice for Water; MAFF Free publication.



Appendix 3 – Guidance For Farmers Fact Sheet 5 – Earth Bank Slurry Stores And Tanks



Guidance for farmers Fact sheet 5

Earth bank slurry stores and tanks

Are you planning to substantially alter your earth bank stores or tanks, or install a new one?

If so, this fact sheet will help you meet the requirements of The Water resources (Silage, Slurry and Agricultural Fuel Oil) Regulations 2010. These are commonly referred to as SSAFO.

We suggest you seek specialist advice on the design, construction and installation of the system. We also recommend you choose a contractor who is fully conversant with the regulations, and that you receive written confirmation that the design, construction and installation will meet the legal requirements.



If after reading these notes you are still unsure about your slurry management – or any other aspect of your farming operation which may be affected by these regulations – please contact us before starting any works. Mistakes can be expensive, or result in additional works being required.

When are earth bank stores and stores suitable?

Where the soils are suitable and stable, they are appropriate for storing slurry or semi-solid manure, or as a series of tanks or lagoons to settle dirty water.

Soils with a clay content of between 20-30 per cent to a depth of at least one metre below the bottom of the store are generally ideal. However, the suitability of the material should be confirmed by analysis in a soils laboratory and verified by a civil engineer.

Where the in-situ soils are not fully suitable, you could import appropriate material or use an impermeable synthetic liner. These options add significantly to the cost, however.

Site selection

It is important to avoid sites in a flood plain or with a high water table and ground that has been previously made up or disturbed.

Trees, scrub, roots, etc need to be removed.

customer service line

08708 506 506

www.environment-agency.gov.uk

incident hotline

0800 80 70 60

floodline

0845 988 1188

You must relocate any land drains to at least 10 metres away from the outside of the embankment, and carefully back-fill the trench with impermeable material.

How are the systems affected by the regulations?

- The regulations set design and construction standards for slurry systems built or substantially enlarged or altered since 1991. The key aspects of the regulations are:
- You must notify us in writing about any new, substantially enlarged or substantially reconstructed system at least 14 days before it is first used, but we encourage you to contact us at the design stage. The notification must include the type of structure and where it is to be used. We can provide a form to help you do this.
- The system(s) must be impermeable. Soil permeability should be confirmed by a qualified civil engineer or soil scientist.
- No part of the system can be within 10 metres of inland freshwaters or coastal waters that slurry could enter.
- Note that "inland water" includes any stream, ditch or land drain, even if it flows for only part of the year.
- Where the store has a gravity-fed outlet or connection to another store it must be fitted with two lockable valves in series, unless the receiving store is larger or at the same height as the outlet store.
- Each valve must be capable of completely shutting off the total flow of slurry from the store. The design and positioning of the valves should take into account the possibility of a single piece of debris obstructing both valves. The space between the valves must be at least one metre.
- The valves must be locked shut when not in use. They must only be used under close supervision and never left unattended while open or partly open.
- All parts of the system must comply with the regulations whenever it is used. Proper maintenance is therefore essential. For example do not allow tree growth on the embankment and repair rodent damage frequently.

Deciding on the size of the store or tank

You should size the slurry store (in conjunction with any other slurry storage on the farm) to accommodate the maximum quantity of slurry likely to be produced and directed to this system in any continuous four-month period. You should use rainfall figures that predict the quantity that will occur once in every five years over a 120 day period (known as the M5 120 day rainfall). This will usually occur during the months November to February inclusive, and it will be a higher volume than just using annual average rainfall figures.

If the store is part of a slurry/dirty water irrigation system, you should refer to our fact sheet 4

Earth bank stores must be designed and constructed to include a freeboard of at least 750mm, and must never be filled above this level.

What happens after I submit proposals to the Environment Agency?

We will assess your proposals and the site. In most cases we will visit the site, and meet with you or your agent.

We will make our assessment clear to you in writing.

customer service line

08708 506 506

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incident hotline

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What happens if pollution occurs?

The responsibility for preventing pollution falls to the person with custody or control of the installation. Normally that is you, the farmer.

If pollution occurs you may be liable, even if we have agreed to the system installed.

Great care is therefore essential in the construction, operation and maintenance of the system to ensure it continues to perform properly.

Where can I find further help?

You can find further information in the Guidance Notes for Farmers documents we have prepared with Defra and Welsh Assembly Government. We can provide you with a free copy on request, or you can download them from our website.

If you are still unsure please contact your local Environment Agency office.

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Appendix 4 - Rough Site Map

