Tel: 01377 236010
Fax: 01377 236584
mail@ldcl.co.uk
www.ldcl.co.uk

LDC
Land Drainage Consultancy Ltd

Cowslip Offices
Fimber
Driffield
East Yorkshire
YO25 9LY

SLURRY LAGOON DESIGN

POPLAR HOUSE FARM
LEPPINGTON, NORTH YORKSHIRE

July 2014

Submitted to:

Stuart Wood
Poplar Farm
Leppington
Nr Malton
North Yorkshire
YO17 9RL

Prepared by:

David Royle BSc (Hons)
Miles Flather MSc, BSc (Hons)
Land Drainage Consultancy Ltd.
Cowslip Offices
Fimber
Driffield
East Yorkshire
YO25 9LY

Table of Contents

	PAGE NO.
1.0 BAC KGROUND	1
2.0 AIMS AND OBJECTIVES	1
3.0 SITE SURVEY AND INVESTIGATION	2
4.0 FINDINGS	2
5.0 PROPOS ED SYSTEM DESIGN	4
6.0 LAGOON CONSTRUCTION	6
7.0 SYSTE M MANAGEMENT	9
8.0 ADDITI ONAL CONSIDERATIONS	9

Appendices

1. Topographical survey 1:500.
2. Contours and mean site ground level 1:500.
3. Proposed platform construction 1:500.
4. Site aerial photograph representation 1:500.
5. Lagoon dimensions and capacities 1:250.
6. Typical embankment construction 1:100.
7. Trial pit descriptions.
8. Soil analysis results.
9. Flood risk assessment map.
10. Groundwater assessment map.
11. Rural designation site check report.
12. Environment Agency form WQE3.
13. ADAS/Acorus CGN002 - Guidance for earth bank slurry stores.

1.0 BACKGROUND

Land Drainage Consultancy Ltd. has been asked to provide an assessment and design option for a proposed slurry lagoon at Poplar House Farm, Leppington, Malton, North Yorkshire.

Poplar House Farm is a mixed livestock and arable enterprise, incorporating a 200 head diary herd and is managed and farmed by Mr Stuart Wood The business has continuing plans for expansion and improvement , necessitating a review of current farm waste production and infrastructure.

Integral to these plans is the provision of an adequate farm waste storage facility for the dairy unit. The storage site is required to accommodate both the needs of the business and to ensure compliance with environmental legislation, notably the NVZ Regulations. The location of the proposed storage area together with design considerations means that planning permission will need to be secured for its construction.

The construction of a slurry lagoon is proposed to allow a sufficient quantity of slurry to be temporarily held at the farm pending its use.

2.0 AIMS AND OBJECTIVES

This report provides the following:

- A review of current farm waste production, storage and recycling for the enterprise.
- A whole farm NVZ assessment to assess storage requirements and land availability for spreading of liquid manures.
- An assessment of ground conditions in the area proposed for slurry storage.
- A design specification for the lagoon in terms of location, dimensions, capacities and construction.
- Recommendations for compliance with relevant regulations.

3.0 SITE SURVEY AND INVESTIGATION

The following has been undertaken:

- A detailed survey of the proposed lagoon site has been completed by LDCL and is shown on the plans at Appendix 1-6.
- A site meeting has been held between the Environment Agency and the farmer, to determine the feasibility of installing an earth banked slurry lagoon at the site and whether the Agency would foresee any issues, in particular with regard to site location, groundwater, odour potential and environmental permitting. It is understood that no significant issues were raised by the Environment Agency with regard to these issues.

- A design and specification have been prepared for a proposed earth banked slurry store.

- Trial pits have been excavated in the site area and samples of superficial geological strata collected. These have been subjected to particle size distribution, permeability and compaction testing, at a suitably accredited laboratory, to determine the ground characteristics and suitability for slurry storage.

4.0 FINDINGS

4.1 Farm area

The farm holding comprises 124 hectares in mixed arable and grass production which is directly owned by the farm A further 140ha of land is farmed under farm business tenancy agreements. This is shown below in Table 1.

4.2 Cropping

Cropping on the holding is a mixed rotation of winter combinables, primarily winter wheat, winter oilseed rape and winter barley together with a smaller proportion of spring combinables.

Table 1 Poplar House Farm - Land use 2014

Land Use	Area (approx ha)		Area (approx acres)	
o	wned	Tenanted	Owned	Tenanted
Grass	60	70	148	173
Arable	64	70	158	173
Sub Total	**124**	**140**	**306**	**345**
Total 264			**650**	

4.3 Current stocking

Current stock numbers are shown in Table 2 together with predicted farm waste arisings (5 month and annual). These have been derived using standard manure production and cropping figures detailed in NVZ guidance leaflet No 3.

Slurry is produced from dairy cows housed in cubicles with remaining stock on straw. The volume of arisings is shown in Table 2.

Table 2 Poplar House Farm – Stock numbers and slurry arisings 2014

Stock type and waste arisings	Total number/ annum	Volume per livestock unit per month	Slurry/Excreta volume produced each month	Slurry volume produced in 5 months
Slurry				
Dairy cow after first calf (6,000 - 9,000 litres)	200	1.59	318	1,590
Dirty water from yard areas	-	-	-	75
Parlour washings	-	-	-	250
Rainwater on lagoon area (1,100m^2)	-	-	-	360
Total potential storage requirement (m^3)				**2,275**
Solid FYM				
Dairy heifer (13 months to first calf)	50	1.20	60	300
Dairy heifer (3 – 13 months)	50	0.60	30	150
Total	**260 -**		**254**	**1,272**

4.4 Solid farmyard manure (FYM)

Solid FYM is produced from housing of young stock and heifers and is all straw based. This is removed from the buildings after shed cleaning and placed into temporary field heaps pending spreading.

4.5 Slurr y

Approximately 1,600m^3 of slurry will be produced during the recommended 5 month storage period.

This slurry is currently removed and recycled via tanker to both arable and grassland at the farm together with remote land not currently subject to NVZ requirements.

Given recent fertiliser price increases, and the 5 month slurry storage requirement of the NVZ Regulations, the business recognises the value of its slurry and the need to store material to make the best use of the nutrients and organic matter that it contains.

4.6 Dirty water and parlour washings

Dirty water, consisting of rainwater contaminated with FYM, from two small outside yards, collects via concrete yards and gutters and will be directed to the lagoon. This material could currently be applied to land during the NVZ closed period but, with increased storage capacity, will be stored for the closed period. Approximately 75m^3 of dirty water from open yard areas will be produced and 250-300m3 of parlour washings, which are currently stored in a separate tank.

It is possible that yard areas will increase in the foreseeable future with site development and dirty water arisings may therefore increase.

4.7 Roof water

Roof water is kept separate from dirty water. Downpipes are currently directed either to land drain and/or piped direct to suitable drains/ditches

5.0 PROPOSED SYSTEM DESIGN

It is proposed that slurry be stored through construction of an earth banked slurry lagoon. The rationale and design for this scheme are described below.

5.1 Poplar House Farm - rainfall data (Met Office data & calculations)

Table 3 Climate data

Site OS Grid Reference	SE 76273 61300
Altitude (AOD m)	72
Annual Rainfall (approx mm)	729
5 months excess winter rainfall (approx mm)	330

Table 4 Poplar House Farm- proposed slurry and rainfall arisings

Waste Type	**(m^3)**
Slurry + dirty water + parlour washings	1,915
Rainfall (Excess winter x internal surface area)	360
Total	**2,275**

5.2 Lagoon site

It is proposed that the lagoon be located to the west of Poplar House Farm, centred over OS National Grid Reference SE 76273 61300

The site is located approximately 100m to the west of the nearest dwellings in Leppington Village. A location plan of the proposed site is shown at Appendix 1 together with a levels survey and site plan at Appendix 2 and 3.

The site slopes gently with a fall of approximately 1.4m southeast-northwest. There are no ditches or watercourses present and no known drainage systems other than for roof water from the building to the south. It is possible that old clay tile systems will be encountered during the proposed construction.

Farm buildings lie to the south and southeast of the site which provide a degree of visual screening from the village and road to the east. An aerial photograph showing the lagoon site location is shown at Appendix 4.

Access to the site will be direct from the rear of the farm buildings and dairy.

It is understood, from the farmer, that there are no other buried services at the site. The appointed earthworks contractor is advised to seek confirmation of services through an appropriate site service search prior to build.

5.3 Lagoon capacity

The aim will be to provide as large a lagoon as the site will permit to allow maximum flexibility with slurry recycling, particularly to avoid the need to spread when crop, weather or ground conditions are unsuitable and to provide sufficient storage for spring application to adjacent land.

The lagoon is proposed to be sufficiently large to accommodate 2,500m^3 of slurry including rainfall and approximately 10% additional capacity if future expansion were proposed. The design will provide a gross capacity of 2,460m^3. The lagoon dimensions and capacities are shown at Appendix 5 and below in Table 5.

The net capacity in Table 5 should be considered as a minimum since no allowance has been made for evaporation. Cattle slurry, particularly containing rainfall, will be subject to summer evaporation depending on prevailing weather conditions. The result being that the effective volume of the lagoon will be slightly greater than the net capacity shown.

There are 125 ha of land available for spreading at Poplar House Farm which can be accessed by either umbilical spreading equipment or farm tanker. At a typical annual application rate of 80m^3/ha the capacity of the proposed lagoon can easily be accommodated within the land area available and would require around 32 ha of land to service the slurry stored, or about one quarter of the land area owned, or one eighth of the land area available.

5.4 Lagoon design

Drawings of the proposed lagoon embankment and construction details are shown at Appendices 5 and 6 and detailed overleaf in Table 5.

5.5 Lagoon filling

Slurry and dirty water will be directed from the buildings to the southeast of the lagoon site. Liquids should ideally be introduced into the lagoon via a concrete spillway extending from bank top and flumed at the base to reduce potential bank erosion on the internal wet slope.

5.6 Planning permission

The proposed lagoon will require planning permission from Ryedale District Council and it is understood that this will be sought during 2014.

Table 5 Summary of lagoon dimensions and capacities

Capacity and Dimensions	Lagoon
Gross capacity (m^3)	2,457
Freeboard (m)	0.75
Bank height (m)	1.52
Bank top width (m)	4.00
Dry slope	1:2
Wet slope	1:2
Liquid depth (m)	4.00
Depth of dig (m)	3.23
Overall dimensions (m)	55x40
Slurry line (m)	41x26
Base dimensions (m)	25x10
Rainfall – (m^3)	360
Capacity minus rainfall (m^3)	2,097
Volume excavated (m^3)	1,717
Embankment volume (m^3)	1,704
Volume above ground level (m^2)	747
Access Ramp minimum gradient (if required)	1:10
Cut and fill volume (m^3 approx)	1,000
Assumed formation datum (m AOD after strip)	71.90

6.0 LAGOON CONSTRUCTION

6.1 Construction method

The lagoon should be constructed using a 'cut and fill' method whereby excavated soil is used to form the embankments. The design ensures that, as far as possible, excavated soil equals soil required for embankments. The construction detail for the embankments is shown at Appendix 6.

The success of the lagoon relies upon achieving impermeable banks and base. This can only be achieved if the excavated clay and shale material is thoroughly compacted using a vibrating roller. Alternative forms of compaction – e.g. wheeled or tracked vehicles - will not ensure even compaction and tracked vehicles do not compact since they are designed to apply low ground pressure. The overburden and clay subsoil at this site has a high clay content and might be prone to cracking during very dry periods and for this reason it should be re-worked prior to compaction to produce a homogenous mass. Below 1.5m all stones above 75mm diameter must be removed, and the sides scarified for a depth of 300mm, stones removed and then re-compacted. .For the basal area it is recommended that 500mm of the mudstone be excavated, the lower layer reworked and compacted to 500mm and then the original 500mm be re-laid and compacted as above.

The lagoon can be constructed using tracked excavators and/or dumper and dozer, with the latter being used to finish shaping the banks, and in conjunction with a vibrating roller. Selection of equipment is the responsibility of the contractor excepting that a vibrating roller of the minimum weight (2,300kg/m) specified must be used.

The design assumes that the lagoon will be constructed off a level subsoil platform and that a graded site has been prepared in terms of cut and fill. Embankment heights are estimated to be 1.52m from a level platform and a small amount of bulkage (10% or thereabouts) will occur following excavation and placement. If the contractor elects to build without a cut and fill operation then it will be essential to set an appropriate site datum in terms of height and location. This should be based on the mean height of the site proposed under the cut and fill (71.90m). This will avoid any shortfall of excavation arisings relative to embankment volumes.

The recommended method of working is:-

6.1.1 Install a 100mm (minimum size) interceptor drain as required keeping the drain at least 10m from the outside of the internal slurry line. This drain would be best located on the upslope field side (west) of the safety fence and running northeast with the fall of the land. If agricultural underdrainage systems are encountered it will be important to ensure that all laterals are picked up and connected/junctioned into the new main.

6.1.2 Strip and store topsoil to a depth of 300mm from whole of working area, with the exception of those areas that are to remain completely undisturbed or are to be used for topsoil storage. Level the build formation through a cut and fill operation using a dozer from southeast to northwest and east-west.

6.1.3 Excavate cut off (or key) trench and remove any drains within 10m of the embankment. This trench should be excavated to seal any land drains and pores and fissures in the better structured upper subsoil. The clay excavated from the cut off trench can be used in the adjacent embankment. Excavated clay from the lagoon site should be re-laid into the trench in 150-200mm layers and compacted as below.

6.1.4 Scarify or plough and compact embankment areas to provide a key for construction working along the line of the embankment.

6.1.5 Construct embankments with clay deposited in 150-200 mm layers - each layer compacted with a minimum of 6 passes of a vibrating roller with a minimum weight of 2,300 kg/m width.

6.1.6 Soil layers to be fully overlapped/interlocked and compacted at corners

6.1.7 Scarify wet slope to a depth of 300mm, remove stones and re-compact as (6.1.4) above. Dig out any land drains to 1.5m and recompact using clay from excavation.

6.1.8 Grade the base formation with a slight fall north-south (or as preferred) to allow slurry to migrate towards the filling/emptying point.

6.1.9 Excavate 500mm from base, scarify below to a depth of 500mm, remove stones and re-compact as (6.1.4-5) above, replace 500mm in two/three layers, scarify and recompact.

6.1.10 Respread topsoil on dry slope, top and wet slope to slurry level to a depth of 150mm and seed with a suitable low maintenance grass seed mixture. Make provision with farmer for re-using, or relocating, surplus topsoil on site.

6.1.11 Erect safety fence, install egress points and warning notices as required by Health and Safety Regulations.

6.2 Seeding

On completion the banks should be seeded at a rate of 5g/m^2.with a low maintenance grass seed mix, a typical mix is shown in Table 5.

Table 6 Typical grass seed mixture

Grass species	Composition
Strong Creeping Red Fescue	40
Slender Creeping Red Fescue	30
Sheeps Fescue	20
Browntop Bent	5
Chewings Fescue	3
Smooth Stalked Meadow Grass	2

6.3 Safet y

The site of the lagoon must be fenced, and approved notices warning of the risks of entering the lagoon displayed at each entry point and on the lagoon (see Appendix 5). The fence must be of the 'child restraint' type - close spaced mesh allowing no hand or footholds - topped with at least 2 strands of barbed wire to give a minimum height of 1.3m. Gates must be lockable and climb proof or be sheeted/solid. An impenetrable hedge – Hawthorn/Blackthorn can be planted alongside the fence which will afford some screening, and help to restrict access and prolong fence life. There should be no tree or shrub planting on the embankments or lagoon top.

Egress or climbing points are recommended at 15m intervals around the lagoon sides. These can consist of rope ladders or tyres fitted to ropes/chains anchored to a steel pin assembly on the bank top.

7.0 SYST EM MANAGEMENT

Access to the lagoon will be via the concrete pad in the southeast corner of the field.

The system must be operated using the guidelines contained in DEFRA's Water Code (1998 as amended). It is imperative that a minimum freeboard of 750mm is maintained at all times.

Slurry may separate with liquid on the surface and sludge on the bottom when stored for prolonged periods. Before emptying, the slurry should be thoroughly agitated/mixed. Agitation is normally by PTO driven propeller type agitators, but floating or submerging electric types are also available.

Periodically, the lagoon may need to be de-silted using an excavator or a tracked shovel hence the need for less severe internal banks for access and a 4.00m bank width to allow 360° excavator access. Care must be taken not to disturb the base or sides during de-silting.

Slurry directly to the lagoon should make use of a channel constructed from GRC units should be used on the internal slope to minimise the risk of erosion during discharge.

Earth embankments must be inspected regularly for signs of deterioration particularly after heavy rain. Embankments must be kept clear of trees and shrubs, grass cover kept short and vermin controlled. Wet slope erosion can be caused by wave action and dry slope erosion by rainwater and should be monitored regularly together with drainage outfalls from the field.

The lagoon should be inspected each year when full, for signs of leakage. Inspection should involve a close examination of the embankments and ground up to 3m away from the external foot of the embankment. The most vulnerable areas are the foot of the embankment and points where it is pierced by pipework (which are not proposed).

8.0 ADDITIONAL CONSIDERATIONS

8.1 Geology and soils

A total of five trial pits (TP1-TP5) were excavated in the location of the proposed lagoon. The location of trial pits is shown on the plan at Appendix 1 and they are described at Appendix 7.

The Geological Survey of Great Britain (BGS Website, 1:50,000) shows that solid geology consists of the Penarth and Redcar Mudstone Formations. These are sedimentary bedrocks formed approximately 183 to 200 million years ago in the Jurassic Period in a local environment previously dominated by shallow seas. These rocks were formed mainly with siliciclastic sediments (comprising of fragments or clasts of silicate minerals) deposited as mud, silt, sand and gravel.

There is no recorded superficial drift in this area.

The site is not in a zone of influence from deep mine workings and is unlikely to be affected by subsidence.

Soils at the site were relatively consistent. They consist of a mean depth of 23cm (range: 20-25cm) of slightly stony (<2% sandstone and shale/coal) medium to heavy clay loam topsoil. This directly overlies heavy textured and slightly silty clay to 80-120cm depth grading into darker clay or grey/black weathering mudstone to a depth of more than 4.00m.

Profile stone contents were generally low to moderate containing few small and medium soft weathering sandstones and mudtones. Subsoils were generally slightly stony to 1.00m depth. Below this depth the proportion of soft weathering mudstones increased. This material was moderately compact and was neither significantly fissured or contained any water bearing layers. All of the materials below 1m depth had a high degree of plasticity and easily deformed in the presence of water.

8.2 Particle size distribution, permeability and compaction test results

Samples of clay subsoil (sample 1 – 0.50-2.00m) and mudstone (sample 2 - 2.00-3.50m) were collected and submitted for analysis for PSD, plastic limit, permeability, compaction and soil strength tests in unconsolidated and consolidated states. The results are shown at Appendix 8 and are summarised in Table 7.

The results demonstrate that the materials proposed for lining the lagoon and for embankment construction had a satisfactory slightly elevated clay content of 26-44% compared to the 20-30% recommended in CIRIA 126. The primary lining material (i.e. 2.00-4.00m) fell within the required optimum and had a medium clay loam texture.

Following compaction and testing in a triaxial cell, the permeability of the samples was 7.4×10^{-11} (sample 1) and 1.9×10^{-10}(sample 2). These materials therefore have the potential to be compacted with a resultant permeability at least 10 times lower than the $1x10E^{-9}$ permeability required for a lined construction of this type. It can be concluded that, providing appropriate compaction is undertaken, the superficial deposits underlying the lagoon will provide an acceptable and extremely low permeability media for its construction.

Plastic limit and index results are within the recommended optimum detailed in CIRIA 126. Maximum density results and shear strengths (natural and consolidated) indicate that these materials will be suitable for the provision of stable embankments.

The optimum moisture content for maximum compaction was 19% (sample 1) and field moisture content was 20%. This indicates that the excavated material will be broadly at the optimum as excavated and there should be no requirement to augment the clay with water prior to embankment construction unless conditions are extremely dry during construction.

Table 7 Summary of analysis results – subsoil and mudstone deposits

Sample Reference & Depth	Sample 1 (0.50-2.00m)	Sample 2 (2.00-3.50m)	Recommended Optimum (CIRIA 126)*
Stones > 2mm	2	33	
Sand (%)	3	1	-
Silt (%)	51	40	-
Clay (%)	44	26	20-30
Texture	Clay	Medium clay loam	clay loam
Liquid Limit (%)	50	-	<90
Plastic Limit (%)	24	-	-
Plasticity Index (%)	26	-	<65
Permeability ((kv) m/s)	$7.4x10^{-11}$	$1.9x10^{-10}$	$1x10^{-9}$
Compaction achieved (dry Mg/m^3)	2.60	-	-
Maximum bulk density (Mg/m^3)	1.68	-	-
Optimum moisture (%)	19	-	-
Field Moisture (%)	20	-	-
Shear strength field (kpa)	>146	-	-

* CIRIA report 126 'Farm waste storage - guidelines for construction.

8.3 Surface water and flood risk assessment

There are no field ditches or watercourses adjacent to the lagoon site.

Interrogation of the Interrogation of the Environment Agency's flood risk map (shown at Appendix 9) shows that the proposed site does not lie within a flood risk zone. The risk that the lagoon might affect flood water, or be subject to flood incidence, is considered low.

The field in which the lagoon stands may contain old drainage systems. All header and lateral drains will need to be severed and picked up by a 100mm cut off drain with permeable fill connected into the existing underdrainage scheme running to the west and north of the site. All laterals should be appropriately connected to the new main Drainage should be completed prior to or during lagoon construction and sufficient space retained between the outer lagoon batters and drains for construction work to proceed without affecting the newly installed drains.

8.4 Groundw ater

Interrogation of the Environment Agency's groundwater vulnerability maps (shown at Appendix 10a and 10b) indicates that the proposed lagoon site does not lie within a sensitive aquifer designation. The site area has been reviewed with the Environment Agency who have agreed that the location of the site is suitable.

The site overlies a non sensitive aquifer with generally low permeability, described as having geological formations which do not have a high primary permeability. Provided the lagoon is constructed to appropriate standards, the risk posed to groundwater is considered low.

8.5 Farm waste management plan and NVZ Regulations

The farm is located in an NVZ and a whole farm assessment for the proposed slurry application is shown in Table 8.

Table 7 NVZ Summary (Whole Farm Basis)

Details	**Total**
Land area available (ha) (owned/rented)	264
Nitrogen from farm wastes	
200 Dairy cows after first calf (6,000 - 9,000 litres)	20,200
50 Dairy heifers (13 months to first calf)	3,050
50 Dairy heifers (3 – 13 months)	1,750
Total nitrogen produced (kg)	**25,000**
Whole farm organic nitrogen limit (kg/yr @ 170kg/ha)	**44,880**
Field based organic nitrogen limit (kg/yr @ 250kg/ha)	**66,000**
Land area required for spreading @ 170kg/ha/nitrogen field limit (ha)	**147**
Land area required for spreading @ 250kg/ha/nitrogen field limit (ha)	**100**
Whole Farm NVZ nitrogen balance for farm (kg/N/yr)	**-19,880**

The farm currently has approximately 264ha of land on which to apply the slurry. The slurry and other farm wastes can be comfortably accommodated within the existing land area at the farm without exceeding the 170kg/ha whole farm NVZ limit or the individual 250kg/ha field limit.

Poplar House Farm has been advised to maintain records of all slurry spreading and to reconcile this with their NVZ records.

8.6 Site designations and sensitive receptors

The lagoon is located in a grass field in a field corner with a limited ecological status.

A rural designation site check report has been produced using DEFRA's MAGIC website. This is shown at Appendix 11 and demonstrates that there are no sensitive environmental designations with a 1,000m radius of the site.

The nearest residential housing/receptors to the site lie 100-150m to the south and east.

8.7 Other environmental issues

8.7.1 Odour

The production and storage of slurry has the potential to generate odour. It is recommended that slurry storage and spreading be undertaken in accordance with the 1998 MAFF Codes of Good Agricultural Practice for the Protection of Air, Water and Soil.

Stored slurry has a tendency to form a crust or to cap at the surface which helps to mitigate odour potential during the storage. The lagoon is sited to the northwest of Leppington Village and, with a prevailing southwesterly wind, odours will usually be carried away from housing.

The period of filling for the lagoon (October-February) is generally a lower risk period for odour generation. Lagoon filling will tend to be passive and will not involve significant agitation or disturbance of the stored slurry. The mixing of slurry with other farm effluents (e.g. silage effluent), which may be antagonistic, will be avoided.

Activities of lagoon emptying, spreading and agitation should take careful account of prevailing weather conditions and particularly wind strength and direction. Sensitive periods should as weekends or bank holidays should be avoided wherever possible. Similarly, the location and use of recipient field sites must be considered carefully.

The use of high capacity umbilical injection or dribble bar systems for spreading is recommended, as opposed to higher trajectory spreading equipment. This will reduce the frequency and duration of spreading to a few days in spring and possibly Autumn. .

Application to spring arable crops and silage aftermath is recommended to maximise the efficacy of the nutrients in the slurry and also to avoid warmer periods of the year.

8.8 Notification of construction to Environment Agency

Subject to approval by the Local Planning Authority, the Environment Agency must be notified of the intention to commence lagoon use and that it has been constructed to the appropriate design standard using the application form WQE3 shown at Appendix 12. A further notification of 14 days prior to the build must be undertaken according to 2013 NVZ Regulations Guidance.

8.9 Guidance and standards

The following are relevant documents for the construction and maintenance of the lagoon.

- CIRIA report 126 'Farm waste storage - guidelines for construction'.
- BS 5502 Buildings and Structures for Agriculture.
- Specifications Part 50: 1989 Code of Practice for design, construction and use of reception pits and storage tanks for slurry Part 41.
- ADAS/Acorus CGN002 - Guidance for earth bank slurry stores – See Appendix 12.
- DEFRA Codes for Air, Water and Soil (1998 and 2009).
- Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations1991. SI. 1991, No 324, HMSO (ISBN 0 11 013324 2) as amended 1997 SI 1997, No 547.
- The NVZ Regulations (2002 as amended) and associated guidance