

General Notes for Lagoon

The lagoon will fully comply with the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003 (SSAFO), CIRIA Guide C759 part 1 and CIRIA Guide C759 part 2 Design and Construction.

The lagoon will fully comply with the Water Environment (Controlled Activities) (Scotland) Amendment Regulations 2021 which amalgamated the requirements of the SSAFO which are now revoked into CAR. These are now GBR 32-The storage of slurry. In addition, GBR 34 was introduced to control the storage of liquid digestate where not already covered by regulations.

SEPA have to be notified at least 30 days before works start. Before the Certificate of Completion is submitted to building control a copy of the compliance from SEPA for the SSAFO will require to be submitted to building control.

The proposed lagoon is over 225m from the closest non agricultural dwelling (Craighead). Please note the farm (North Bankend) has existing slurry storage approx 180m from Craighead with no odour or other complaints relating to slurry storage.

Groundworks

The base of the lagoon should be free from ground water all year round, test holes should be dug to ascertain ground water levels, if the ground water is within 1.5m of the proposed base of the lagoon this must be immediately recorded and reported to Agri Design, Drainage cannot be used to de-water the excavations as this is against SEPA regulations.

Existing perforated drainage pipes within 10m of lagoon to be fully grubbed out and filled with impermeable fill. If pipe work or services within 10m of lagoon are still required it should be rerouted around site.

The below notes are based on a minimum ground bearing capacity of 100kN/m² if soft spots, high water table, peat/low bearing material, evidence of fill or evidence of hard spots (old foundations or rock) are encountered contact the structural engineer. To be designed to provide minimum 100kN/m² below structures, aprons and roads.

Safe digging practices should be used. Excavation work should be carried out carefully and follow recognised safe digging practices. Once a locating device has been used to determine cable positions and routes, excavation may take place, with trial holes dug using suitable hand tools as necessary to confirm this. Excavate alongside the service rather than directly above it. Final exposure of the service by horizontal digging is recommended, as the force applied to hand tools can be controlled more effectively. Insulated tools should be used when hand digging near electric cables.

All topsoils, vegetable matter and loose sub soil must be removed down to firm sub soil prior to construction. Topsoil shall wherever practicable be used immediately after its stripping and if not shall be stored in stockpiles of heights not exceeding 2m. Ground levels around lagoon should prevent pooling and divert surface water away the lagoon.

The embankment slopes should be as designed by an engineer following soil investigation. Generally however; internal slope should be 1 in 1.5 max formed by cut & fill material. External slopes should be max 1 in 2 but the shallower the slope the better.

The embankment width at the top should be at least 2.5m with an additional 250mm of width for every meter over 2 meters deep. eg 5 meter deep tank should have an embankment width at the top of 3.25 meters wide.

The base of the embankments should be terraced flat into the existing ground in a stepped fashion with all fill material rolled and compacted in shallow layers to ensure no movement or settlement of the banks as designed by an engineer. The lagoon embankments should be designed, formed and suitably compacted to withstand the loads as shown in BS 5502-50.

The top of the embankment should be sloped away from the lagoon.

Spoil will be used to create banks with excess banded and spread within low lying ground in the surrounding fields to increase levels. The external banks should be covered evenly with 150 mm of topsoil and seeded with grass to prevent erosion. Creeping bent and rough stalk meadow grasses are suitable. This grass cover has to be kept short.

Liner

The liner will be SEPA approved and suitable for 20 years use with appropriate maintenance. The liner has to be fitted in accordance with the manufacturers recommendations to satisfy SEPA & Health & Safety.

Plastic liners (LDPE, HDPE and PVC) are widely used for lining slurry lagoons. PVC liners may be supplied prefabricated in one piece to fit a lagoon so that the need to join sheets on-site is avoided. Alternatively, sheets may be joined on-site using solvent or heat-welding methods. Polyethylene deteriorates on exposure to ultraviolet (UV) light, so protection is essential. Although, generally, PVC is not affected to the same extent, it must also be protected to ensure a reasonable life. Polyethylene and PVC liners have a high coefficient of thermal expansion and must therefore be laid loosely to prevent stretching (and possibly tearing) as the temperature drops. Plastic liners are available in various thicknesses from 0.3 mm to over 3 mm. The thicker grades provide a more robust lining, particularly with respect to tearing and puncturing. A minimum thickness of 1.5 mm is recommended in slurry lagoons. It is important that the area to be lined is free from sharp stones and other objects that could cause punctures, and laying the liner on a non-woven geotextle (minimum 300 grams/m²) is therefore recommended.

Where the liner requires protection from UV light on the internal face of the lagoon, This is typically covered with topsoil and grass to the area above the high slurry level as detailed above for the external bank. Due to the safety issues cutting the internal bank a liner that requires UV protection shouldn't be used with this protection method.

Synthetic rubber liners (Butyl and EPDM) are generally more expensive than plastics. They have a number of advantages, including:

- higher resistance to UV light degradation
- higher resistance to weathering
- higher elasticity and greater resistance to tearing
- manufacturers claim that EPDM can have a life of 40 years, even when exposed to sunlight
- EPDM liners can be joined on site relatively easy.

EPDM rubber liners should be protected against damage from the underlying soil as previously described. It is not necessary, however, to provide an UV protection layer with some synthetic rubbers, and the manufacturers' advice should be followed. Butyl and EPDM liners can be supplied in preformed sheets up to about 1000 m²

There are three forms of EPDM all displaying the same characteristics, but encompassing subtle variations of thickness, surface finish and company specific manufacturing systems. A minimum thickness of 1.00 EPDM is recommended in slurry lagoons.

- Different joining methods are available according to the type of EPDM, its origin and the application, but include.
- Joined by overlapping the edges by 75 mm using splice tape and rolling the join with a hand-held 'wallpaper' roller. An additional 150 mm wide cover strip could be placed over each seam to provide further protection of the initial joint.
 - Sheets are joined using a bonding machine on site or using hot air welders.

A wide range of reinforced plastic and synthetic rubber membranes is available. Reinforcement usually takes the form of synthetic fibres embedded in the impermeable sheet. The advantage of reinforced membranes is their increased resistance to tearing and, to a lesser extent, puncturing. They are susceptible to weathering and UV light degradation in the same way as un-reinforced membranes. A disadvantage of reinforced membranes is that they are often more difficult to join effectively.

At mixing and fill - emptying points a reinforced concrete spillway should be installed to prevent damage to the liner.

Slurry pipe

Slurry pipe work will be a minimum of 10 bar grey PVC 300mm and 150mm with all joints electro fusion welded. Pipes that pass through the liner need to be installed so that the liner can be fixed to the pipe to form a seal and any liquid cannot seep between the outside wall of the pipe and the liner. The seal can be achieved by either bonding the liner to the pipe, or using a two-part mechanical flange connecting the liner to the pipe.

Two valves must be fitted in the pipes to minimise the risk of overflow should a blockage occur preventing closure of one valve. These valves must be kept locked when not in use and should be spaced at least 1m apart to minimise the risk of both valves becoming jammed open at the same time. Valves should be checked regularly and maintained in full working order. Pipes to be fitted with suitable connectors at outlets likely a Bauer coupler. Pipe work and valves should be protected from impact damage, likely with a concrete surround and wheel stops. It is recommend that at the outlets a sign is erected to remind users of the importance of locking the valves as well

as a contact number in case of emergencies.

Lagoon Fence

The lagoon should be fenced to prevent people from falling in, in accordance with Section 8 of BS 5502: Part 50: 1993. A fence should be erected around the slurry storage facility to prevent the access of children and animals. The fence should provide no accessible hand or foot holds to children, It should be at least 2000mm high consisting of a mesh fence with 2 rows of barbed wire. Any gates or access point should be designed to the same standard providing the same level of security from children and animals and be locked to secure the enclosure. From the edge of liner to 300mm past fence (outside) to be lined with a weed control fabric and covered with gravel to reduce maintenance required within the safety fenced area. Tire ladders should be provided at the four corners of the lagoon fixed to the fence posts.

Road construction

All top soil, vegetable matter and loose sub soil must be removed down to firm sub soil prior to road construction. Roads to be topped with a minimum of 300mm of compacted type 1 or 6F2 compacted engineering fill to be placed in 150mm max layers.

Surface blinded and all layers compacted as layers are placed, 1 in 20 camber on road surface. After the road is formed 300mm of topsoil shall be deposited on the verges and spread in layers not exceeding 150 mm. Each layer shall be firmed before spreading the next to be proffled to the verges to aid the removal of water from the road surface, verges to be 50mm below road surface.

Compacted type 1 or 6F2 compacted engineering fill to be place on Geo-textile membrane, Membrane specification to be selected for sub-grade & sub-base properties. For example over the cut it may be T1000 GT and over fill it may need to be T3000 GT to comply with BS EN 13251.

All external aprons and roads to be suitable for a minimum axle loading of 14 tonnes and there will be route past the lagoon.

General

The lagoon should not be sited within a source protection zone (SPZ) or with in 10m of surface water and 50m of a borehole. Consideration should be taken for proximity to any possible future planned boreholes.

Prepare and implement a Manure Management Plan (also known as a Farm Waste Management Plan). This is mandatory if specified by SEPA in the terms of a Notice served under the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003.

Regularly check effluent tanks, slurry tanks, slatted tanks & lagoons to avoid overflow. Ensure proper maintenance and repair of all slurry storage facilities, pipework, valves & fences for the lifetime of the structure.

Earth embankments must be inspected regularly for signs of deterioration, particularly after heavy rain. To allow proper inspection, embankments must be free from trees and shrub growth and the grass cover kept short. Any damage that occurs, such as rutting must be filled and grassed over as soon as practicably possible.

No trees will be cut back or felled.

Don't enter a slurry storage facility unless all recommended safety procedures have been followed.

The mixing of silage effluent and slurry can release toxic gases and odours very quickly.

Bacterial decomposition of wastes especially slurry produces a range of gases including hydrogen sulphide methane and carbon dioxide. These can be flammable, toxic or replaced oxygen in the air leading to an atmosphere that will not support life.

Signs should be displayed in a prominent position on the structure & should be placed at or near all access points to the slurry lagoon. These warnings that the structure may contain

- The class of structure and date of erection
- Slurry Lagoon
- Toxic gases
- No smoking and no naked flames signs.
- Danger of drowning
- Children must not play on this site,
- What3word and OS Grid Ref of site.

GBR32: The storage of slurry

Rules:

- a. Where slurry is produced on the farm by housed livestock, the slurry must be stored in a slurry storage system, liquid digestate storage system, or slurry bags which have sufficient capacity to store the total quantity of slurry likely to be produced in—
- (i) 26 weeks by housed pigs, or
 - (ii) 22 weeks by housed cattle, taking account of any additional inputs to or exports from the storage as described in paragraph (c),

- b. the total quantity of slurry referred to in paragraph (a) is to be calculated by adding up the figures produced for each type of livestock, as applicable, in accordance with the formula for housed pigs or housed cattle, contained in regulation 7(2) of the Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2008,
- c. in calculating the minimum storage capacity necessary to comply with paragraph (a), the following figures must be included in respect of the relevant 26 or 22 week period—
- (i) the quantity of any rainfall (including any fall of snow, hail or sleet) that is likely to enter the system (directly or indirectly) including from dungsteads, silage pits or dirty yards,
 - (ii) the quantity of any cleaning water that is likely to enter the system or slurry bag,
 - (iii) the likely quantity of any imported slurries and liquid digestate added to the system or slurry bag,
 - (iv) the quantity of any slurry exported off farm,

- d. where slurry is imported onto the farm, there must be sufficient storage capacity on the farm to store the quantities imported during periods when application is not authorised under GBR18 or would not comply with the requirements of the Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2008,

- e. the capacity of any facility used for the temporary storage of slurry before it is transferred to a slurry storage tank must be the equivalent of at least 1.5% of the minimum on farm storage capacity in accordance with paragraph (a),

- f. the slurry storage system must—
- (i) comply with paragraphs (g) to (l)
 - (ii) where constructed, or substantially reconstructed or enlarged, on or after 1 September 1991, comply, in addition to paragraph (f)(i), with paragraphs (m) and (n),
 - (iii) if new (including systems constructed from used materials), substantially reconstructed or enlarged, on or after 1 January 2022, have a life expectancy of at least 20 years with proper maintenance, from its construction, reconstruction or enlargement,

- g. the base and walls of any slurry storage tank, any channels and reception pit, and the walls of any pipes, must be impermeable (except where the conditions in paragraph (j) are complied with) and free from any cracks or structural defects,

- h. where slurry flows into a channel before discharging into a reception pit, and the flow is controlled by means of a sluice or valve, the capacity of the reception pit must be sufficient to store the maximum quantity of slurry which can be released by opening the sluice or valve,

- i. the slurry storage tank, channels, pipes, valves, and reception pit must be operationally maintained to be free of any structural defects during their lifecycle,
- j. where the walls of the slurry storage tank are not impermeable—
- (i) the base of the tank must extend beyond its walls and be provided with channels designed and constructed so as to collect any slurry which may escape from the tank,
 - (ii) the tank must have adequate provision to collect, drain and store slurry from the channels to a slurry storage system,

- k. where the slurry storage tank or reception pit is fitted with a drainage pipe—
- (i) there must be two valves in series on the pipe and each valve must be capable of stopping the flow of slurry through the pipe and must be kept shut and locked in that position when not in use,
 - (ii) sub-paragraph (i) does not apply in relation to a slurry storage tank which drains through the pipe into another slurry storage tank of equal or greater capacity or where the tops of the tanks are at the same level,

- l. where a slurry storage system has walls which are made of earth, the system must not be filled to a level which allows less than 750 millimetres of freeboard, and in all other cases the slurry storage tank must not be filled to a level which allows less than 300 millimetres of freeboard,

- m. the base and walls of any slurry storage tank, channels and reception pit, valves, and the walls of any pipes, constructed, or substantially reconstructed or enlarged, on or after 1 September 1991 must be protected against corrosion in accordance with paragraph 7.2 of the Code of Practice on Buildings and Structures for Agriculture published by the British Standards Institution and numbered BS 5502- 50:1993+A2:2010,

- n. the base and walls of any slurry storage tank and any reception pit constructed, or substantially reconstructed or enlarged, on or after 1 September 1991, must be capable of withstanding characteristic loads calculated on the assumptions and in the manner as set out in paragraph 5 of the Code of Practice on Buildings and Structures for Agriculture published by the British Standards Institution and numbered BS 5502-50:1993+A2:2010,

- o. any slurry storage system, constructed, or substantially reconstructed or enlarged, on or after 1 January 2022, which has walls made of earth, must be lined with an impermeable sheet material which, with proper maintenance, slurry cannot permeate for a period of at least 20 years, a slurry storage system constructed on or after 1 January 2022 must not be situated within 10 metres of any surface water or opening into a surface water drain which slurry could enter into if it were to escape,

- p. a slurry bag may only be used to store slurry if—
- (i) the bag is constructed of impermeable material of sufficient strength and structural integrity such that it is unlikely to burst or leak in its ordinary use, and
 - (ii) it is situated in a bund which complies with the following requirements—
- 1) the bund must be of at least equivalent capacity to the slurry bag,
 - 2) the bund must be lined with an impermeable sheet material which, with proper maintenance, slurry cannot permeate for a period of at least 20 years,
 - 3) the bund must have a means of removing rainwater, and
 - 4) other than as necessary to allow rainwater to be removed, the base and walls of the bund must not be penetrated by any valve, pipe or other opening,

- r. where a slurry storage system (including a reception pit or channels) is to be constructed or to be substantially rebuilt or enlarged—

- (i) the operator must notify SEPA no later than 30 days prior to commencing the works,
- (ii) the notification under sub-paragraph (i) must be accompanied by an engineering plan for the works to be carried out,
- (iii) the operator must retain the engineer's final sign-off certificate for the works for the lifetime of the slurry storage system, for inspection by SEPA on request,

- s. slurry may be stored in a liquid digestate storage system which complies with GBR34 in relation to the storage of liquid digestate.

In relation to GBR32

- (A) a slurry storage system which was exempt under regulation 5 of the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003 immediately before 1 January 2022 is not required to comply with the rules specified in paragraphs (e) to (l) until 1 January 2026
- (B) a slurry storage system constructed before 1 January 2022, to which paragraph (A) does not apply, is not required to comply with the rules specified in paragraphs (e) to (n) until 1 January 2024,
- (C) a slurry storage system in respect of which planning permission was granted before 1 January 2022, but which is not constructed before that date, is not required to comply with the rules specified in paragraphs to (n) until 1 January 2024.
- (e) (D) the rules specified in paragraphs (a) to (c) do not apply where the activity takes place outside a nitrate vulnerable zone until 1 January 2026.

Notes

- SKETCH DWG
- PLANNING DWG
- BUILDING WARRANT DWG
- TENDER DWG
- AS BUILT DWG

Rev	Revision Description	By	Date
A	Notes updated	DM	04-24

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Contract

SLURRY LAGOON WILLIAM GEMMELL NORTH BANKEND FARM LESMAHAGOW LANARK

Drawing Title

NOTES

Drawing No.	Revision	Scale	
202403-10	A		
Drawing	Date	Paper Size	Plot Date
D.MAIR	FEB 2024	A2	9-APR-24

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