Manure Management Plan

Donaldsons Dairy Ltd
Threapthwaite Farm
Bowthorn Road
Cleator Moor
CA25 5JF

(January 2021)

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Introduction

This plan has been prepared to help reduce the pollution risks associated with spreading livestock manures, slurries and organic wastes on your farm. This plan will help you to minimise the risk of causing water pollution. The background to the plan is described in the Code of Good Agricultural Practice for the Protection of Water which is available free of charge from: https://www.gov.uk/government/publications/protecting-our-water-soil-and-air. The Water Code also gives advice on the handling and storage or solid manures and slurries.

Reducing the Risk of Pollution from Land

Step-by-step guide to preparing a risk map for your farm

This systematic guide will help you produce a risk map for your farm that highlights areas where you should never spread organic manures and areas where you may need to vary how you apply organic manures during the year to avoid causing water pollution.

The four steps you will need to follow are:

1. Collect your information

2. Identifying land where organic manures must not be spread

3. Identifying land where organic manures should not be spread under certain conditions or where rates should be restricted

4. Identifying other areas that you must consider to comply with the NVZ rules. As you are aware, at present, none of your current farmed area is in an NVZ. The NVZ rules invariably go beyond the basic cross compliance rules, so implementing them is not a statutory requirement for your farm, though they are generally best practice toward improving nutrient management and reducing pollution risks.

Note: The guidance provided here is similar to the Defra Manure Management Plan step-by-step guide for farmers. You may have prepared a risk map (in your manure management plan) for a stewardship agri-environment scheme or for farm assurance schemes or compliance with an environmental permit. These will be suitable, but you may need to add to it any further information required by the Regulations (see Step 4).

Step 1: Collect your information

To draw up the risk map you will need a map or maps of the farmed land that clearly shows:

- every field and watercourse (including all ditches)
- field areas in hectares (1 hectare = 2.471 acres)
- any boreholes, springs or wells, including any on neighbouring land within 50m of your boundary

If these features are not marked on your map, please draw them in.

Notes:

If you use a 1:2,500 scale map: 1 grid square = 1 hectare and 1 side of a square = 100 metres.

If you use a 1:10,000 scale map: 1 grid square = 100 hectares and 1 side of a square = 1,000 metres.

Step 2: Identifying areas where organic manures must not be spread

- Identify where the following areas occur on your farm and colour them on your map in **red** (see Figure 1 below). Where an area is an unusual shape, for example circular areas around wells mark off a square or 'practical' shaped area of the field.

For the purposes of the nitrates rules, areas on which organic manures must not be spread are:

Within at least 10 metres of either side of any surface water including ditches, temporary dry ditches and piped ditches. This will avoid direct spreading into the surface water and reduce the risk of run-off reaching the surface water. Include surface waters that form the boundary of your farm.

- Within at least 50 metres of any spring, well, or borehole.

Other non-spreading (red) areas are:

- Very steep slopes (slopes steeper than 1 in 5 (20% or 12 degrees)) where run-off is a high risk throughout the year.
- Any areas where you may not be allowed to spread for reasons such as a tenancy agreement, an abatement notice due to smell, Sites of Special Scientific Interest, agri-environment agreement or other reason.
- The surface is rocky or uneven so that your equipment cannot be used effectively or safely.

You need to mark these because they are important for the calculation of the area on which you can spread organic manure.

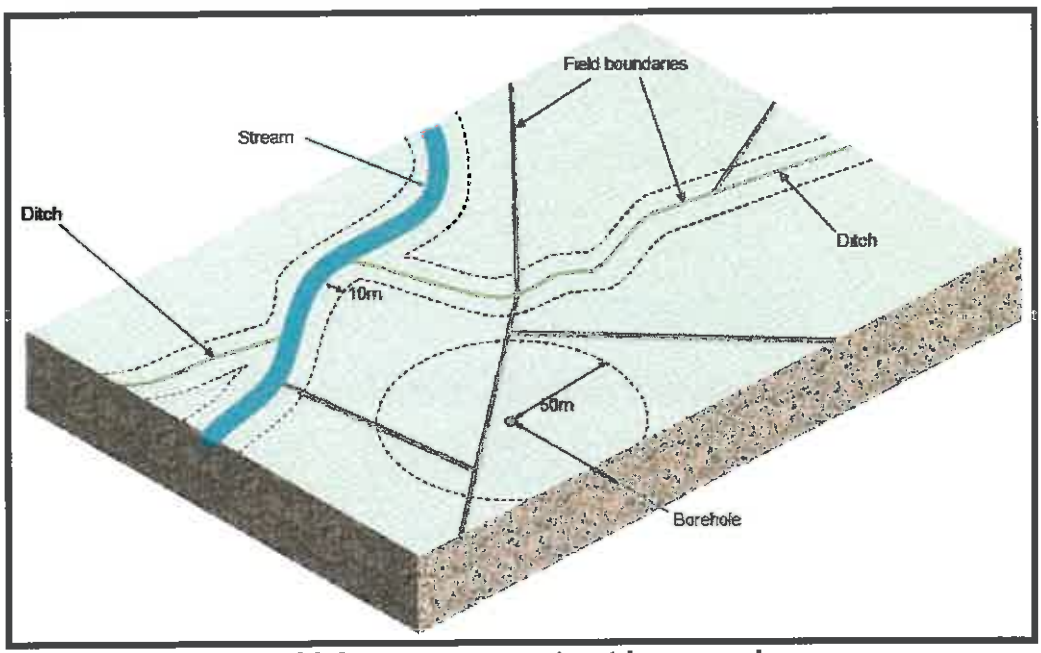


Figure 1: Areas on which manures must not be spread

Identifying areas where organic manures should not be spread under certain conditions or where rates should be restricted

- You should identify other areas (fields or parts of fields) where you do not normally spread organic manures and leave these areas **white** on your map.

This may be because of:

- non-farmed areas - buildings, roads, tracks,
- particular land use such as woodlands, etc.,
- location, e.g. they are too far from the farmstead

Step 3: Identifying areas where organic manures should not be spread under certain conditions or where rates should be restricted

Some areas of the farm will be unsuitable for spreading at certain times of the year, particularly in winter, or under certain conditions. These will vary from year to year. Other areas may receive organic manure at any time of the year, but you may need to adjust the rate and frequency of application to avoid causing pollution.

1. Identify areas, which meet the conditions in the table below and mark them on your map. The colour scheme given here and below is not compulsory, but you may find it a helpful way to distinguish the different categories of risk on your farm. We suggest you use **orange** (very high risk) or **yellow** (high risk) as indicated.

    - **Orange areas** cannot be used when certain conditions apply, but they will usually be available at sometimes of the year.
    - **Yellow areas** may be used for spreading at most times of the year, but application rates should be no more than 30m3/hectare of slurry in a single application when certain conditions apply.

2. Number the orange areas on your map using the reasons and number key from the Table 1 below. Number the map with all the conditions affecting it.

3. Colour the remaining areas of crops and grass green (lower risk). Green areas do not have effective pipe or mole drains and may be used for spreading at most times of the year. Remember you may need to leave some areas white.

Table 1: Identifying very high risk (Orange) and high risk (Yellow) areas

Conditions leading to very high and high risk areas	Colour Map	Numbers for orange areas
Fields or part fields next to a watercourse, spring or borehole when the surface is severely compacted (note a) or waterlogged.	Orange	1
Fields or part fields that are likely to flood sometime in most winters.	Orange	2
Field or part fields next to a watercourse, spring or borehole when the soil is at field capacity (in winter) (note b) and there is: a) a steep slope,	Orange	3
b) a moderate slope and a slowly permeable soil (ie a clay soil or one through which water passes only slowly).	Orange	3
c) a moderate slope and a well-drained soil. d) a slight slope and a slowly permeable soil	Yellow	4
All fields or part fields with effective pipe or mole drains (but see extra limitations below (note c))		
Very shallow soils (less than 30 cm) over gravel or rock, eg limestone, chalk, slates and shales.		

(a) 'Severely compacted': rain stays on the surface after rainfall.
(b) 'Field capacity': fully wetted soil where more rain would cause water loss by drainage. Normally occurs from autumn and lasts until spring.
(c) Fields or part fields which in the last 12 months have been pipe drained, mole drained or sub-soiled over drains should not be used for spreading.

Step 4: Identifying other areas required by the NVZ rules

1. Identify and mark land with a **slope of more than 12 degrees** (equivalent to 20% or 1 in 5) which is not included in your existing non-spreading (red) areas. You must not spread manures to these areas when there is a significant risk of run-off to surface water.
2. Identify any **sandy or shallow soils** on your map by cross-hatching. 'Closed periods' for sandy and shallow soils are different from those for other soil types. The cross-hatching will help you distinguish the relevant closed periods. Note: sandy soil and shallow soil is defined (see Appendix 4).
3. 3. Identify and mark **low run-off risk land**. Low run-off risk land is land with an average slope of less than 3 degrees, does not have land drains, and is at least 50 metres from a watercourse or conduit leading to a watercourse. Not all green (lower risk) areas are low run-off risk land. You only need to mark this land if you want to apply slurry or poultry manure to it to reduce your storage need.
4. Identify sites **used for field heaps**, if any. Where possible, these should be located in green areas. They must never be situated in red areas, nor (from 16 May 2014) in areas within 30m of surface water if the land has a slope of 12 degrees or more. You should also record the dates of when the field sites were used.

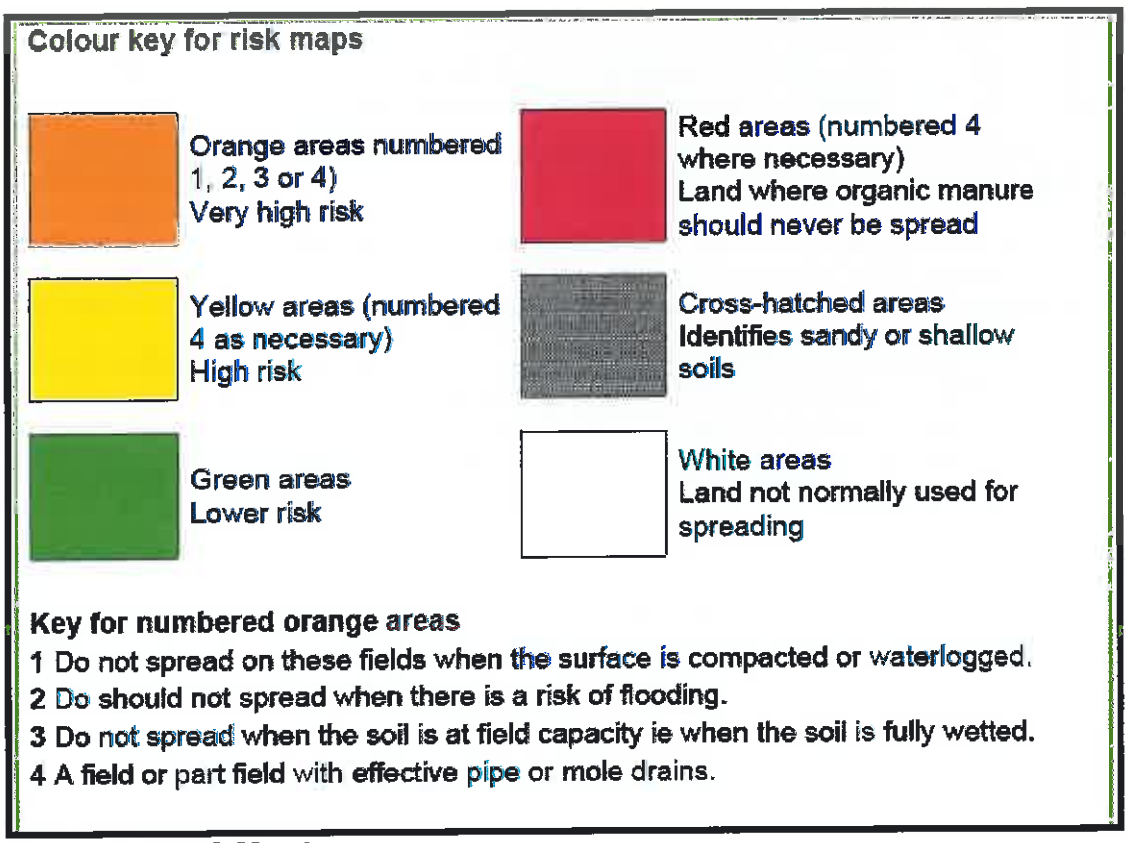


Figure 2: RAMS Map key

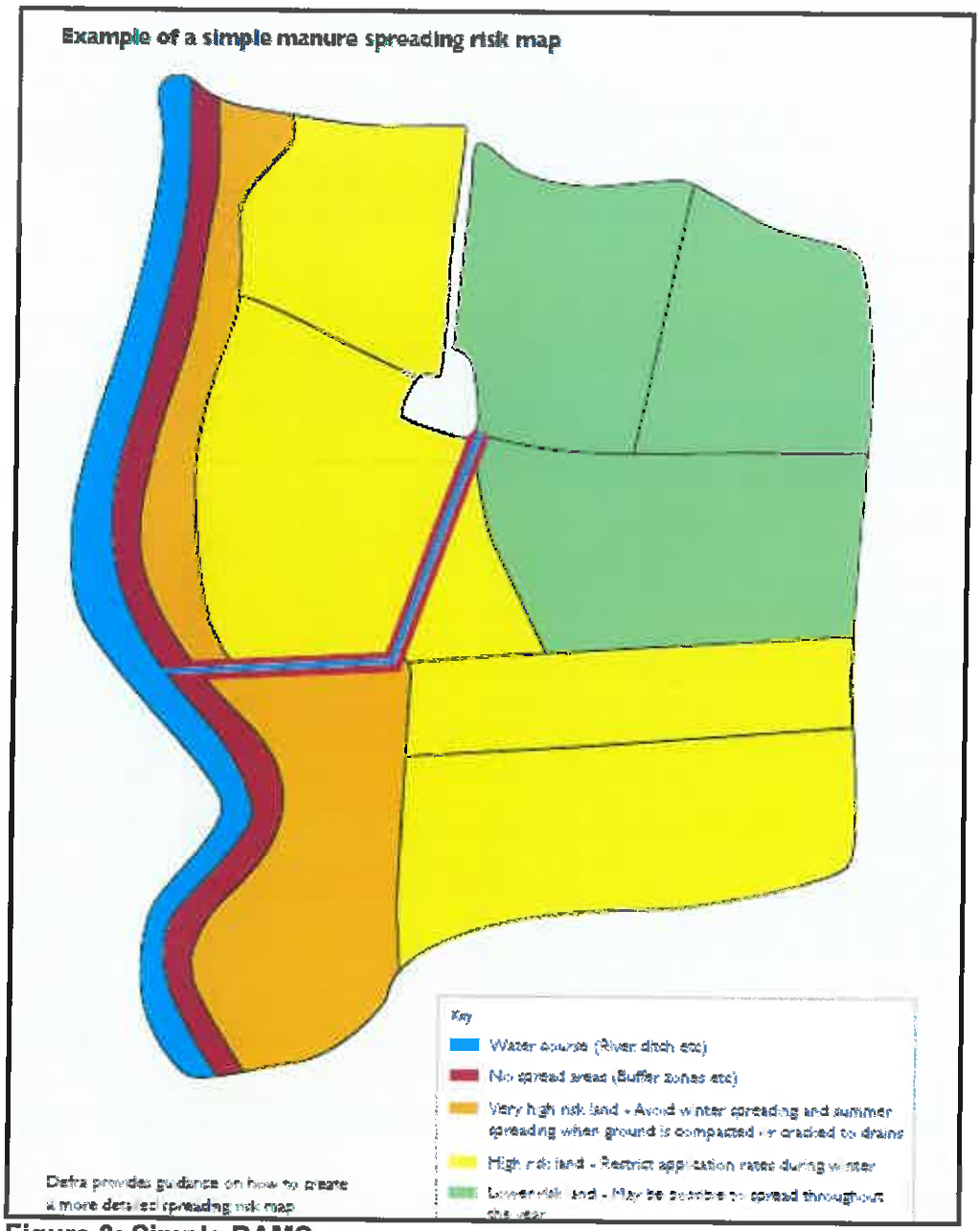


Figure 3: Simple RAMS map

Table 2: Calculated areas not available for manure spreading

Field Name	A) Field name or number	B) Whole field area in hectares (ha)	C) Ditches and Watercourses	D) Other red areas (ha)	NVZ ACTION	E) Maximum application in any 12 month rolling period. (Column B-Cb*250)
	NY0115 9898	2.6	0.3		NOT IN AN NVZ	575
	NY0116 1667	2.2	0.4		NOT IN AN NVZ	450
	NY0116 2013	2.72	2.72		NOT IN AN NVZ	0
	NY0116 2733	4.09	4.09		NOT IN AN NVZ	0
	NY0116 2855	5.09	1.9		NOT IN AN NVZ	797.5
	NY0116 3618	5.24	0.6		NOT IN AN NVZ	1160
	NY0116 4468	3.15	3.15		NOT IN AN NVZ	0
	NY0116 4946	4.51	0.35		NOT IN AN NVZ	1040
	NY0116 5208	4.43			NOT IN AN NVZ	1107.5
	NY0116 5601	1.81			NOT IN AN NVZ	452.5
	NY0116 5722	2.01			NOT IN AN NVZ	502.5
	NY0116 6563	2.46	0.15		NOT IN AN NVZ	577.5
	NY0116 6572	1.84	0.1		NOT IN AN NVZ	435
	NY0116 8049	2.81	0.2		NOT IN AN NVZ	652.5
	NY0116 8305	2.99	0.25		NOT IN AN NVZ	685
	NY0116 9030	4.26	0.4		NOT IN AN NVZ	965
	NY0116 9363	2.68	0.2		NOT IN AN NVZ	620
	NY0116 9375	3.45	0.5		NOT IN AN NVZ	737.5
	NY0215 1474	4.08	0.5		NOT IN AN NVZ	895
	NY0215 2372	1.15	0.15		NOT IN AN NVZ	250
	NY0215 2681	2.33	0.1		NOT IN AN NVZ	557.5
	NY0215 3189	3.82	0.1		NOT IN AN NVZ	930
	NY0216 0147	4.18	0.4		NOT IN AN NVZ	945
	NY0216 0403	2.85	0.3		NOT IN AN NVZ	637.5
	NY0216 1030	4.18	0.2		NOT IN AN NVZ	995
	NY0216 1372	5.7			NOT IN AN NVZ	1425
	NY0216 1505	1.96	0.25		NOT IN AN NVZ	427.5
	NY0216 3356	10.28			NOT IN AN NVZ	2570
	NY0116 9514	0.29			NOT IN AN NVZ	72.5
	NY0114 2748	3.23			NOT IN AN NVZ	807.5
	NY0114 3309	0.2	0.2		NOT IN AN NVZ	0
	NY0114 3325	5.69	1.5		NOT IN AN NVZ	1047.5
	NY0114 3971	1.74			NOT IN AN NVZ	435
	NY0114 4868	9.45			NOT IN AN NVZ	2362.5
	NY0016 6620	3.44			NOT IN AN NVZ	860
	NY0016 6943	2.17	0.35		NOT IN AN NVZ	455
	NY0016 7806	4.12			NOT IN AN NVZ	1030
	NY0016 8428	5.43			NOT IN AN NVZ	1357.5
	NY0016 8762	0.26	0.26		NOT IN AN NVZ	0
	NY0016 9604	3.76			NOT IN AN NVZ	940
	NY0016 9656	4.81			NOT IN AN NVZ	1202.5
	NY0116 0331	3.16			NOT IN AN NVZ	790
	NY0116 1048	2.91			NOT IN AN NVZ	727.5
	NY0018 4868	3.56	0.3		NOT IN AN NVZ	815
	TOTAL	**153.09**	**19.92**	**0**		**33292.5**

Total Farm Area (Ha)	153.09	
Area not available to spread (Ha)	19.92	
Total Area for spreading (Ha)	133.17	
Total Organic N level (Kg/N/Year)	33292.5	NOT IN NVZ
N produced as Livestock Excreta (Kg/N/Year)	28305	NOT IN NVZ
Total minimum area of land needed (Ha)	80.385	
Area available for spreading (Ha)	133.17	

Table 3: Illustrates an example calculation used to populate the table above

Field name or number	Whole field area in hectares (ha)	Ditches & Watercourses		Other red areas (ha)	White areas (ha)
		Total length in metres (m)	L x Metres ÷ 1,000 = ha		
NY3951 6654	5.68	250	0.25	0	0

Summary

Total Field Area:	153.09 Hectares
Total Cropped Area:	10 Hectares
Total Non-Spreading Area:	19.92 Hectares
Total Manure Spreading Area (B):	133.17 Hectares

Note: If you use a 1: 2,500 scale map; 1 grid square = 1 hectare, 1 side of a square = 100 metres
If you use a 1:10,000 scale map; 1 grid square = 100 hectares, 1 side of a square = 1,000 metres

Table 4: Calculating minimum area of land needed

Stock Units	A Number of Stock Units	B Months Housed	C Hectares Needed per Sock Unit	D Total Area Needed
1 dairy cow (650kg) Winter	235	7	0.039	64.2
1 dairy cow (650kg) Summer	30	5	0.039	5.9
1 dairy cow (550kg)			0.032	
1 dairy cow (450kg)			0.025	
1 dairy heifer replacement over 24 months (500kg)	10	6	0.019	1.1
1 suckler cow			0.019	
1 grower/fattener over 24 months (500kg)			0.019	
I follower/young stock 12-24 months	40	6	0.016	3.8
1 follower/young stock 6 to 12 months	50	6	0.008	2.4
1 bull beef cattle 6 to 14 months			0.012	
1 calf (to 6 months)	50	12	0.005	3.0
1 bull for breeding (1,350kg)			0.019	
1 breeding sow place, including piglets			0.078	
1 weaner place			0.012	
1 grower pig place			0.024	
1 light cutter pig place (35 to 85kg)			0.038	
1 bacon pig place (35 to 105kg)			0.042	
1 maiden gilt place			0.052	
1 boar place			0.064	
1,000 laying hens			2.64	
1,000 free range laying hens			2.32	
1,000 broiler places			1.98	
1,000 broiler breeders			3.9	
1,000 replacement pullets			0.5	
1,000 male turkey places			5.56	
1,000 female turkey places			2.6	
1,000 fattening duck places			3.6	
1 sheep			0.003	
1 fattening lamb (to 6 months)			0.001	
1 fattening lamb (6 to 12 months)				

Total = Minimum Hectares Needed (C): **80.4**

Transfer C to next page

Enter C from previous page into box

Total = Minimum hectares needed (C): **80.4**

Area available for spreading manure (B): **133.17**

If C was bigger than B:

Extra area would be needed to spread livestock manures (C minus B): 0 Ha (no extra needed)

- You may also wish to consider if some of the white areas on your map which are used for cropping could be safely used for spreading to increase the available area.
- If your available area reduced in the future, you should arrange to spread the excess manure on another farm or dispose of it in other ways. You should always follow the advice in the Water Code.

If in future, you have <u>any</u> land in a Nitrate Vulnerable Zone or are a <u>registered</u> organic farmer:

- You **<u>must</u>** check that you can comply with the farm-based limits for nitrogen from organic manure loadings.
- The farm-based limits may mean that you have to spread excess manure on another farm, even if **C is less than B**. In addition, you may need more area than the 'extra area' calculated (C minus B). **Organic farmers <u>must</u>** use another organic farm.
- In an NVZ, you **<u>must not</u>** apply more available nitrogen than the crop requires.

Step 4: Guidelines for spreading sewage sludge or other organic wastes

You only need to read this page if you spread sewage sludge or bring other organic wastes onto your farm – You do not

The Manure Management Plan you have drawn up should also be used to guide you when spreading sewage sludge or other organic wastes. The risk of causing pollution is very similar to the risk that occurs when spreading livestock manures.

The recommended annual limit of 250 kg/ha N in organic manures applies to the total organic nitrogen applied during the year from all sources (*for NVZs and organic farms see below*). Therefore, you should only spread sewage sludge and other organic waste if you have more land suitable for spreading than you need for livestock manures.

Before deciding whether you wish to spread these materials check that, there will be some land available for spreading after you have spread all your livestock manures. The amount of land remaining will be given by:

Areas available for spreading		**Area needed to spread livestock manures**		**Amount of land remaining for spreading sewage sludge or other organic wastes**
133.17 Ha	**Minus**	80.4 Ha	=	52.77 Ha

If you have <u>any</u> land in a Nitrate Vulnerable Zone or are a <u>registered</u> organic farmer:

- You **<u>must</u>** check that you can comply with the farm-based limits for nitrogen from livestock manure loadings and from imported organic wastes.
- In NVZs, you **<u>must not</u>** apply more available nitrogen than the crop requires.
- You **<u>must not</u>** import sewage sludge or other organic wastes if it would breach these nitrogen limits. For operation reasons you should allow a safety margin.
- **<u>Organic farmers must not</u>** use sewage sludge; and other organic wastes may be restricted or prohibited. If in doubt – consult your Certifying Body.
- **<u>Do not</u>** spread liquid digested sewage sludge to sandy and shallow soils in NVZs (crosshatched areas on your map) during closed periods.

The simplest way to avoid applying excess nitrogen (to each field) is to avoid spreading sewage sludge or organic wastes on fields where you plan to spread livestock manures. A single application of sludge commonly contains at least 250 kg/ha N. To help you avoid applying more than 250 kg/ha N, the rate of application should not be more than that given in Appendix 2. However, sludge from a particular source may contain more or less nitrogen than the average analyses on which these figures are based. The supplier should provide you with an analysis and interpretation. All other organic wastes should be spread at rates, which take account of their nitrogen content and polluting potential.

These pages help you use your plan to avoid pollution

Red Areas

These should never be used for spreading livestock manure or organic wastes as it may cause water pollution, damage natural habitats or break a legal obligation (e.g. in NVZs).

White Areas

You have judged these unsuitable for various reasons. It may be possible to spread livestock manure or organic waste safely at some time in the future.

Maximum annual applications to all spreading areas

- The amount of livestock manure or organic waste applied to a given area in a 12-month period should not contain more than 250kg/ha total N (200 units/acre). Appendix 2 shows typical annual application rates for livestock manures and sewage sludge that supply this amount of total N. You may not be able to use these rates if you have any land in NVZs or if you are a registered organic farmer (see Appendix 4: PB5505 and Booklet 4).

- All applications of livestock manure and organic wastes should follow the plan, take account of soil and weather conditions, and be subject to frequent checks to ensure pollution does not occur.

For all risk areas (orange, yellow and green) – remember:

- **Slurry, solid manure and organic wastes should never be spread on any areas which are frozen hard, snow covered, waterlogged or flooded.**

- **Risks can be reduced by applying at lower rates than those recommended above.**

- **Do not spread when the soil is so wet that tractor-drawn machinery will damage the soil.**

- **The maximum annual application also applies to land used for growing maize.**

- **In Nitrate Vulnerable Zones – do not apply slurry, poultry manure or liquid digested sewage sludge to sandy or shallow soils during closed periods, or to steeply sloping fields.**

Using orange areas
Do not apply to these areas in the winter or when severely compacted or in summer if cracked over drains.

Using yellow areas
Provided your machinery does not damage the soil these areas can be used for spreading at most times of the year. When the soil is at field capacity, you should follow the guidelines below:

Do not	apply more than $30m^3$/ha (2,700 gallons/acre) of slurry or other effluent at any one time
Do not	apply more than $30m^3$/ha by travelling irrigators at any one time
Do not	apply more than 5mm/hour ($^1/_5$"/hr) dirty water with sprinklers
Do	move sprinklers regularly to suit conditions - on drained soils take particular care that polluting material does not pass into a watercourse
Do	leave an interval of at least 3 weeks between applications

These rules also apply to drained and very shallow soils throughout the year.

- **Risks can be reduced further by applying at lower rates than those recommended above.**
- **Remember that some drained fields which are high risk (yellow) in winter may crack in summer. They should not be used for spreading when in this condition.**

Using green areas
Provided your machinery does not damage the soil, these areas can always be used for spreading, with a lower risk of causing pollution.

Drained soils
In orange and yellow areas, drained soils may be used provided the limiting rates given above for yellow areas are observed – but check drain outfalls to ensure no pollution occurs.

You should not use any drained fields when they are cracked in summer, or within 12 months of installation of drains or of moling or sub soiling.

Silage effluent
The amount of effluent produced will vary from year to year according to the moisture content of the grass when it is ensiled. **Silage effluent is highly polluting and should be diluted with the same amount of water before application to land. Do not apply more than $50m^3$/ha of diluted effluent.** Apply according to the criteria for different areas above.

Avoid drained land wherever possible to reduce the risk further. Take account of its nitrogen content in your fertiliser policy.

Using manures
Use your map together with your cropping plan and grazing schedule to decide when to apply to a particular field. The fertiliser value of livestock manures and organic wastes should be maximised by applying according crop need and making adjustments to your inorganic fertiliser applications. For further guidance – see the publications at Appendix 4.

Step 5: Calculating the slurry storage requirement

It does not apply to farms where only solid manures are produced.

You should identify how to keep clean roof water and yard water out of slurry and dirty water stores to reduce the need for storage; this will reduce you field spreading costs.

Using the assessment of spreading risks made in steps 1 to 4, together with your experience of spreading over winter, step 5 enables an estimate of whether extra storage of slurry and dirty water will be needed to minimise the risk of causing pollution.

It is assumed that solid manures will remain in buildings or be stored at a suitable outside location if you do not have enough land available for winter spreading.

Threapthwaite Farm Manure Calculations

The calculations for Threapthwaite Farm slurry storage requirement and actual slurry storage capacity have been undertaken using standard values and 10-year average rainfall data and do account for 0.3m of freeboard. The detailed reports can be found on the following pages including monthly production for slurry and dirty water at the end of this report.

Slurry

The farm produces 5780m³ of slurry between October and April, which includes all parlour washings and rainfall. Approximately 51% is slurry, 26% wash water and 24% is rainfall collected from silage clamps and the slurry tank.

Livestock type on slurry or part-slurry based system	Number of livestock units on slurry or part-slurry based system	Proportion of excreta collected as slurry e.g. Half = 0.5, All = 1.0	Volume per livestock unit (or place) per month (m^3)	Volume produced each month (m^3)
1 calf (all categories up to 3 months	50	0.00	**0.21**	**0**
1 dairy cow from 3 months and less than 13 months	50	0.00	0.6	**0**
1 dairy cow from 13 months to first calf	50	0.58	1.2	**34.8**
1 dairy cow after first calf (over 9,000 litres)	235	0.85	1.92	**383.52**
1 dairy cow after first calf (6,000 to 9,000 litres)	0	0.96	1.59	**0**

1 dairy cow after first calf (under 6,000 litres)		1.00	1.26	0
1 beef cow or steer (castrated male) from 3 months and less than 13 months		1.00	0.6	0
1 beef cow or steer (castrated male) from 13 months and less than 25 months		1.00	0.78	0
1 female of steer for slaughter 25 months and over		1.00	0.96	0
1 female for breeding 25 months and over and weighing up to 500 kg		1.00	0.96	0
1 female for breeding 25 months and over and weighing over 500 kg		1.00	1.35	0
1 non-breeding bull 3 months and over		0.00	0.78	0
1 bull for breeding from 3 to 25 months		1.00	0.78	0
1 bull for breeding 25 months and over	0	1.00	0.78	0
Total				**418.32**

Month	**Rainfall**
Oct	120
Nov	115
Dec	110
Jan	100
Feb	75
March	75
Total	595
Average	**99.16667**

Area of slurry store plus concrete surface	length	width	area m2
Slurry Stores			200
Silage Clamp 1	0	0	221
Silage Clamp 2	0	0	0
Dirty Yard	18	15	270
Area E	50	10	500
Area F	14	8	112
Area G	40	14	560
Area H			0
Total			**1863**
Average rainfall entering store per months			**185**

Number of Dairy Cows	235
Washwater used per months	0.9
monthly washwater	211.5

0.9 m3 high volume washer
0.6 m3 low volume washer

Current Capacity	length (m)	width (m)	circumference (m)	Working Height or Depth (m)
Slurry Store Tower			42	3
Slurry Store Tower	0	0	0	0
Other reception pits	10	10		2.7
Slurry Pit 1	70	1.5		2
Slurry Pit 2	0	0		0

Store 6				
Total				

Slurry Production and Storage	Total per month (cubic metres)	%
Total volume of slurry produced	418	51%
Rainfall entering slurry store	185	23%
Wash water entering slurry store	212	26%
Total volume of slurry to be stored	815	100%
Number of months storage required for	7	
Total volume of slurry produced during the five month period	5702	
Total Slurry Storage capacity*	901	16%
Additional slurry storage required	4801	

Existing slurry storage is 901m³ which is only 16% of slurry produced between October and April (the winter period), so the farm would need an additional 4,801m³ (1,016,000 gallons) **to provide 7 months storage (5,702m³ or 1,248,738 gallons)** based on average rainfall data and before any future expansion plans. However, the trend is for herds to expand so I recommend any additional storage provides a little more than required today. The cheapest option would be a lagoon to provide a further 4801m^3 to allow for future expanson, an example size to provide this plus 0.75m freeboard would be 44m x 44m x 4m. Typical costs are £10-£15m³, £18-£25m³, £35-£45m³, and £27-£50m³ for earth bank, lined lagoons, circular metal tanks, and concrete stores respectively; this depends on size, site conditions, and design. **This would provide 7-months+ storage for the herd (7744m³ or 1,695,936 gallons inc freeboard).**

Threapthwaite Farm only has 22% of the minimum amount required to (theoretically) avoid slurry spreading from 1st October to the end of February (5mths) and in this wet area over 7 months would be recommended. **The Code of Good Agricultural Practice recommends 4 months storage (3,333m³ or 730,000 gallons).**

Please consider any missing or leaking gutters can result in significant additional roof water entering the slurry system. On average each square metre of roof or yard area collecting rainfall to the slurry store adds one cubic metre per annum to the slurry store and spreading costs - it pays to keep clean and dirty water separate. There are water capital grants available through the Countryside Stewardship Scheme – Mid Tier.

Threapthwaite Farm produces approxiametly 1000 tonnes of FYM per annum which is spread directly to the land. This is largley from youngstock and dry cow bedding with only 20% from milk cows.

Appendix 1

Estimating minimum areas needed for spreading imported livestock manure

Minimum area needed for spreading imported solid manure and slurry

This calculation allows you to estimate the minimum spreading area using your knowledge of the number of spreader loads received during the year.

Follow these steps in **Table 5.**

- For each type of solid manure/slurry, fill in a typical spreader capacity in column **A.**
- Enter the number of loads per year in column **B.**
- Carry out the multiplication using the figures in columns **A, B** and **C** and record the result in column **D.**
- Finally add up the column **D** to get the total minimum area needed.

Table 5: Calculating the minimum areas needed for spreading imported solid manure and slurry

Type of solid manure or slurry	**A** Typical spreader capacity (m^3 or tonnes	**B** Number of loads per year	**C** Factor to limit nitrogen loading	**D** Minimum area needed (ha)
Solid Manure				
Cattle (25% dry matter)		X	X 0.024	=
Pig (25% dry matter)		X	X 0.028	=
Laying hen (30% dry matter)		X	X 0.064	=
Broiler (60% dry matter)		X	X 0.120	=
Slurry				
Cattle (6% dry matter)		X	X 0.012	=
Pig (4% dry matter)		X	X 0.016	=

Total = minimum land needed Ha

Manure Spreaders

Typical spreader capacities

4.5 m^3 spreader (1,000 gallons)
6.8 m^3 spreader (1,500 gallons)
9.1 m^3 spreader (2,000 gallons)

Appendix 2

Typical maximum annual livestock manure and sewage sludge application rates

Table 6: Typical maximum annual application rates to supply 250 kg/ha (200 units/acre) of total nitrogen

Manure or sludge type	Metric	Imperial	Total N kg/m^3 or kg/t
Cattle farmyard manure	42 tonnes/ha	17 tons/acre	6.0
Pig farmyard manure	36 tonnes/ha	14.5 tons/acre	7.0
Sheep farmyard manure	42 tonnes/ha	17 tons/acre	6.0
Duck manure	38 tonnes/ha	15 tons/acre	6.5
Poultry layer manure	16 tonnes/ha	6.5 tons/acre	16
Poultry broiler litter	8 tonnes/ha	3.2 tons/acre	30
Turkey litter	8 tonnes/ha	3.2 tons/acre	30
Dairy cattle slurry, 2% dry matter	167 m^3/ha	14,900 gallons/acre	1.5
Dairy cattle slurry, 6% dry matter	83 m^3/ha	7,400 gallons/acre	3.0
Dairy cattle slurry, 10% dry matter	63 m^3/ha	5,600 gallons/acre	4.0
Beef cattle slurry, 2% dry matter	250 m^3/ha	22,300 gallons/acre	1.0
Beef cattle slurry, 6% dry matter	109 m^3/ha	9,700 gallons/acre	2.3
Beef cattle slurry, 10% dry matter	71 m^3/ha	6,400 gallons/acre	3.5
Pig slurry, 2% dry matter	83 m^3/ha	7,400 gallons/acre	3.0
Pig slurry, 4% dry matter	63 m^3/ha	5,600 gallons/acre	4.0
Pig slurry, 6% dry matter	50 m^3/ha	4,500 gallons/acre	5.0
Dirty water, less than 1% dry matter	833 m^3/ha	74,400 gallons/acre	0.3
Strainer box cattle slurry	167 m^3/ha	14,900 gallons/acre	1.5
Weeping-wall cattle slurry	125 m^3/ha	11,200 gallons/acre	2.0
Mechanically separated cattle slurry	83 m^3/ha	7,400 gallons/acre	3.0
Sewage sludge: digested liquid	125 m^3/ha	11,200 gallons/acre	2.0
Sewage sludge: digested cake	33 tonnes/ha	13 tons/acre	7.5

Sewage sludge: thermally dried	7 tonnes/ha	3 tons/acre	35
Sewage sludge: lime stabilised	42 tonnes/ha	17 ton/acre	6.0

Appendix 3

Estimating minimum areas needed for spreading slurry and dirty water

Minimum area needed each month for spreading slurry when all livestock are housed

Transfer from **Table 4** (page 11) any **Cattle stock units** that produce slurry and the corresponding figures at Column C, and place them in **Table 7 below.**

Transfer from **Table 4** (page 11) any **pig stock units** that produce slurry but divide the hectares needed in Column C of (Page 11) by **12** and enter the result in Column **C** below.

Complete Column **A** and Column **B** below, and then calculate the area in Column **D.**

Table 7: Calculating the areas needed to spread slurry each month

Stock Unit on slurry based system	**A** No. on slurry or part slurry based system	**B** Proportion collected as slurry e.g. *half = 0.5 All = 1.0*	**C** Hectares needed per stock unit per month	**D** Area needed for **month (ha)**
e.g. 1 dairy cow (650kg)		X	X 0.039	=
		X	X	=
		X	X	=
		X	X	=
e.g. 1 bacon pig place (35-105kg)		X	X 0.00035	=
		X	X 0.00035	=
		X	X 0.00035	=
		X	X 0.00035	=

Total minimum area needed per month = F _____ Ha

Calculating dirty water production (six months winter period)

To estimate likely production of dirty water you will need:

1. A rough plan of the open yards and silage clamps with dimensions to enable calculation of the total dirty yard area from which run-off is collected.
2. The average annual rainfall for your farm.
3. A calculator.

You should identify how to keep clean roof and yard water out of slurry and dirty water stores to reduce the need for storage; this will reduce your field spreading costs. Use your plan of open yards to work out the total dirty area in square metres. Then **exclude** covered areas if rain falling on these roofs is collected and discharged to a clean drain. Where rainfall onto roofs or clean concrete does unavoidably mix with dirty water, and then **include** this roof or yard area. Also, **include** the area of uncovered silage clamps and dungsteads and weeping wall stores if the liquid drains to the dirty water store.

In the calculations below, parlour washings are based on a standard figure of 18 litres (4½ gallons) per cow per day. If you know the total amount of parlour washings (litres) on a daily basis multiply by 0.18* and enter directly into box **H.**

For **pig units**, make use of box **G** and box **I** only.

	Total yard area in m^2		Typical winter rainfall (annual rainfall x 0.6)			
Run-off:	m^2	**x**		**divide 1,000 ****	**= G**	m^3
			Number of cows			
Parlour washings:				**x 3.24 *****	**= H**	m^3

Estimate any other foul run-off in the winter 6 months, e.g. use of Hosepipe or pressure washer **I** m^3

Total winter volume of dirty water **= G + H + I** **= J** m^3

1 square yard = 0.84m^2; 1 inch = 25.4 mm; 220 gallons = 1 m^3

* **multiplying by 0.18 converts litres per day into cubic metres per 6 months**
** **dividing by 1,000 converts rainfall from millimetres into metres**
*** **multiplying by 3.24 gives the volume of parlour washings over 6 months**

Minimum area needed for spreading dirty water in winter

Six-month (winter) volume of Dirty water (transfer **J** from above)		Minimum area needed for spreading dirty water in winter
J m^3	**÷ by 833* =**	**K** Ha

* **÷ by 833 because up to 833 m^3 of dirty water may be applied to a hectare without applying more than 250kg/ha N. Dirty water contains 0.3kg N/m^3 (on average), 250 ÷ by 0.3 = 833**

The nitrogen concentration of dirty water is increased if you add to it the liquid that drains from weeping-wall stores or strainer boxes. If this is the case, you will need to increase the area for spreading. To do this multiply the figure in box **K** by 4 **L** Ha

and enter into box **L.**

The minimum area is related to nitrogen content and spreading on **green** areas. The area will need to be increased when spreading on **yellow and orange** areas to take account of hydraulic loading limits.

Appendix 4

Further information and guidance

- Fertiliser Recommendations for Agricultural and Horticultural Crops (Defra, RB 209)

Comprehensive reference booklet on use of manures and inorganic fertilisers.
Available from: https://ahdb.org.uk/nutrient-management-guide-rb209

The following publications are available free of charge:

From ADAS Gleadthorpe Research Centre (Tel: 01623 844331)

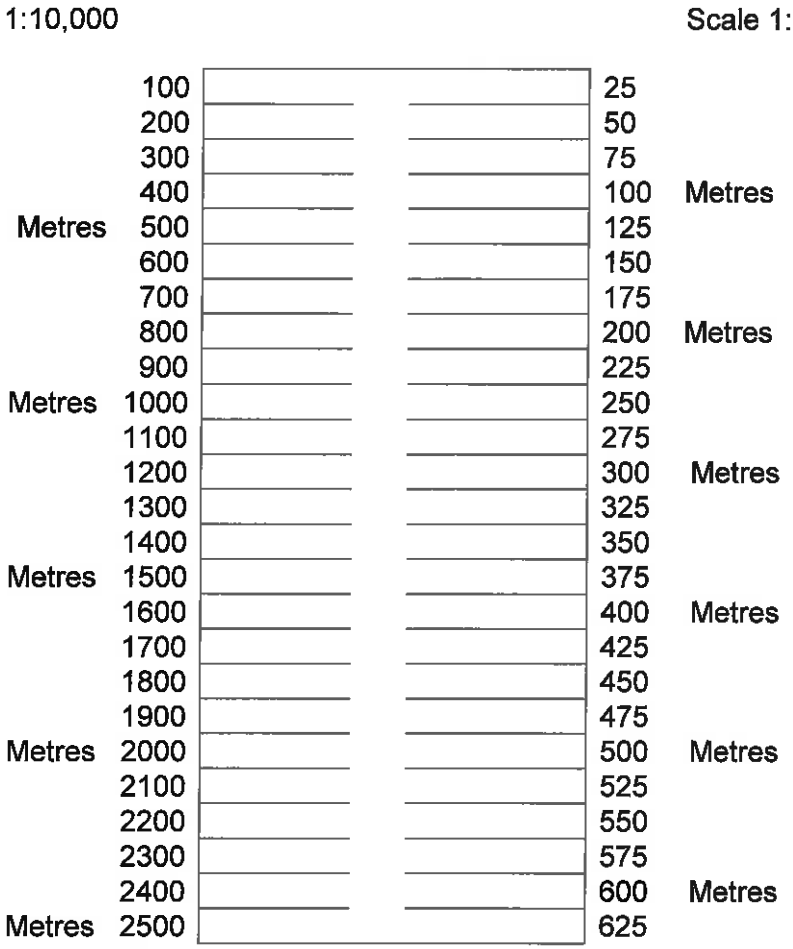
- Managing Livestock Manures: Booklet 1 – Making Better Use of Livestock Manures on Arable Land *(ADAS, IGER, SRI)*
- Managing Livestock Manures: Booklet 2 – Making Better Use of Livestock Manures on Grassland *(IGER, ADAS, SRI)*
- Managing Livestock Manures: Booklet 3 – Spreading Systems for Slurries and Solid Manures *(SRI, ADAS, IGER,)*
- Managing Livestock Manures: Booklet 4 – Managing Manure on Organic Farms *(ADAS, Elm Farm Research Centre)*
- MANNER (ADAS MANure Nitrogen Evaluation Routine) is a simple, personal computer based decision-support system, supplied on CD-ROM or disk, with full instructions and a User Guide. It predicts the nitrogen content of organic manures.
- Your Farm and NVZs – *do you comply?* This software can be used to calculate monthly slurry and dirty water production and storage needs.

From Defra Publications

- The Water Code: https://www.gov.uk/government/publications/protecting-our-water-soil-and-air
- Guidelines for Farmers in NVZs: https://www.gov.uk/government/collections/nitrate-vulnerable-zones
- Planet & Manner: http://www.planet4farmers.co.uk/Manner.aspx

Most of the publications are available on the internet at: **www.defra.gov.uk**

This scale ruler is for guidance only. It is sufficiently accurate for estimating lengths of ditches and watercourses



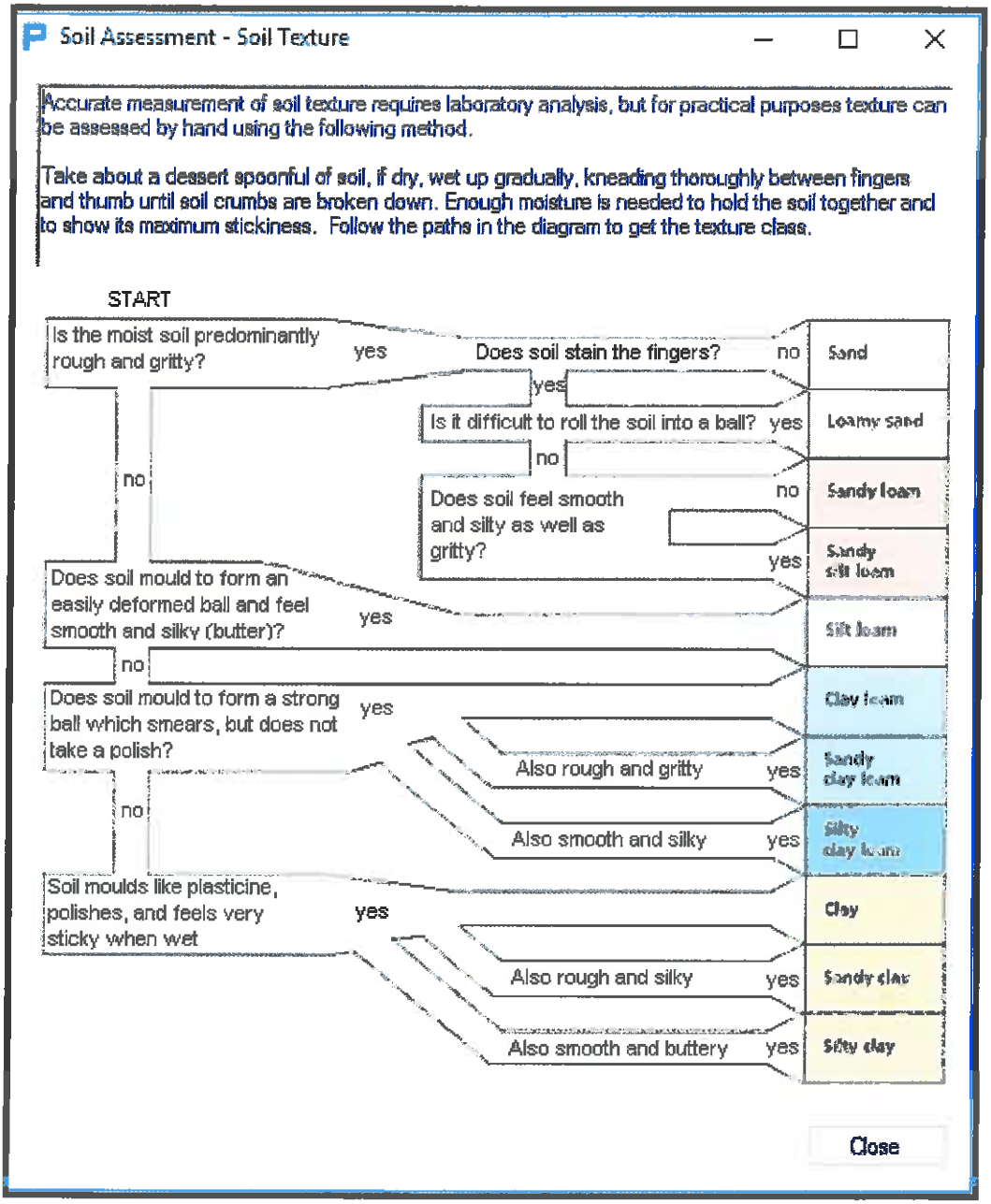
No spreading zones: Areas where manure or slurry should never be spread such as areas close to water sources

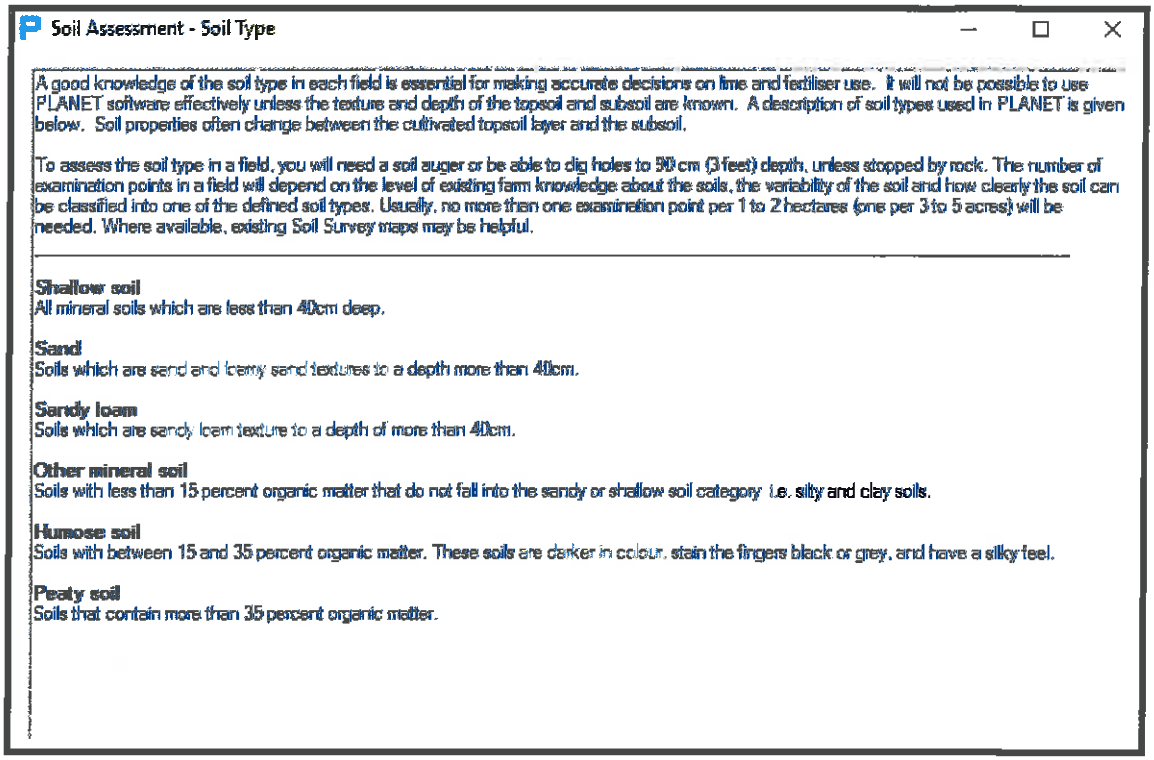
High risk: Spreading should only take place in ideal conditions.

Moderate risk: Spreading OK, except in adverse conditions such as high rainfall

Low risk: Spreading may be possible all year

Soil Identification




Soil Assessment - Soil Type
A good knowledge of the soil type in each field is essential for making accurate decisions on lime and fertiliser use. It will not be possible to use PLANET software effectively unless the texture and depth of the topsoil and subsoil are known. A description of soil types used in PLANET is given below. Soil properties often change between the cultivated topsoil layer and the subsoil.
To assess the soil type in a field, you will need a soil auger or be able to dig holes to 90 cm (3 feet) depth, unless stopped by rock. The number of examination points in a field will depend on the level of existing farm knowledge about the soils, the variability of the soil and how clearly the soil can be classified into one of the defined soil types. Usually, no more than one examination point per 1 to 2 hectares (one per 3 to 5 acres) will be needed. Where available, existing Soil Survey maps may be helpful.
Shallow soil
All mineral soils which are less than 40cm deep.
Sand
Soils which are sand and loamy sand textures to a depth more than 40cm.
Sandy loam
Soils which are sandy loam texture to a depth of more than 40cm.
Other mineral soil
Soils with less than 15 percent organic matter that do not fall into the sandy or shallow soil category i.e. silty and clay soils.
Humose soil
Soils with between 15 and 35 percent organic matter. These soils are darker in colour, stain the fingers black or grey, and have a silky feel.
Peaty soil
Soils that contain more than 35 percent organic matter.