Supporting guidance for Rural Sustainable Drainage Systems – Sediment Traps and Bunds

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A sediment trap is a containment area where surface water run-off is temporarily stored to allow sediment to settle out before the run-off is discharged. They can be constructed either by excavation or by creating an earth berm / bund or by a combination of both.

Generally they are relatively small features, typically less than one per cent of field area, and can be used as the first of a series of measures improving the longevity and functioning of the downstream structures, e.g. a retention pond.

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Benefits

Sediment traps and bunds can reduce pollution risk by intercepting run-off and allowing the soil carried in the run-off to fall out. They can also be useful in emergency situations to intercept any small slurry or chemical spills on the steading.

Steadings

In regards to steadings, sediment traps are useful for accepting run-off from clean yard areas. Preferably this would be as part of a treatment train approach where the sediment trap accepts run-off and then discharges to another feature such as a swale, pond, wetland or to a grassed area for further treatment.

They are most appropriate where run-off polluted with sediment is the main concern and are not appropriate for accepting more polluted types of run-off such as slurry.

In-field

Sediment traps or bunds can also be used in-field to help reduce soil erosion. For example sediment traps can be a useful method of collecting run-off from a particular area at higher risk of soil erosion, such as a gateway or used in combination with a swale to maximise the settlement of dissolved sediment.

Bunds are particularly useful on sloping fields where the run-off tends to exit the field at a particular point, such as a valley bottom, where slopes converge or the low corner of the field.

What needs to be done

Note: Where an assessment has been carried out as part of the diffuse pollution audit there is no need to carry out the assessments noted below.

Drainage from a steading

Where it is proposed that the sediment trap will take drainage from a steading the first step should be to carry out a drainage assessment. The aim of this is to illustrate which parts of the yard areas will be suitable to be drained to the trap. See the annex below for information on identifying different drainage types. It is important to note that steading areas which produce slurry or that are contaminated with slurry must not be conveyed to a sediment trap.

Field run-off

For arable situations, the principle aim of the sediment trap or bund will be to intercept overland run-off to allow sediment to drop out. In grassland situations the purpose of the trap may be to intercept run-off from a track or road used by livestock or machinery and to allow sediment or heavy material to drop out prior to discharge to grassland away from watercourses.

For in-field situations it will be necessary to carry out a simple risk assessment to determine where the traps or bunds should be created to be most effective and how they could be integrated with other rural sustainable drainage system features, such as swales or ponds.

Using a map, identify all ditches, burns and rivers on the farm or area of land in question.

The next step is to consider where the potential for soil erosion is greatest and where this can pose a risk to the water environment.

This assessment should consider the following:

- proximity to nearby watercourses – the closer the area is to a watercourse, the greater will be the risk
- slope of the land will be one of the most significant factors, the steeper the downward slope towards the watercourse the greater will be the risk. Slopes of over three degrees (1 in 14) should be considered moderate risk and those above eight degrees (1 in 7) considered high risk. Fields with slopes which tend to converge or fall to a specific low point or corner of the field near to a watercourse will have a particular high risk of causing pollution. Long, uninterrupted slopes are also of greater risk of erosion
- gateways and tracks – areas which are frequently used can be at increased risk of erosion. Gateways can also act as exit points for run-off from a field
- past experience – consider where it has previously been noted that surface run-off from entered a watercourse or soil erosion has occurred
- soil texture – light soils with a high sand content are at greater risk of erosion

Once the assessment has been completed, identify on the map those fields or areas which are at risk of soil erosion and which may potentially pollute a watercourse. Mark on the map where the sediment trap or bund would be best located to intercept the run-off and where it should discharge to.

Design guidelines

- bund height should be created from compacted subsoil and should not exceed 1.3 metres unless designed by an engineer [2]
- the slope of the sides should be less than 1 in 4 or gentler and vegetated. Where a bund is used to create a sediment trap (such as in a low corner of a field), the field side bank should be as gentle as possible, ideally no steeper than 1 in 20 [1], to provide a filter strip function
- ensure access is provided for dredging
- size will depend on run-off volumes to be intercepted however the greater the scale the greater the removal efficiency

Factors affecting performance

- it’s important to remember that sediment traps are not intended to treat slurry or effluents but to help to treat run-off which currently discharges directly to a watercourse
- minimise the volume or level of polluted run-off that the feature must deal with. On a steading, several localised features (or grass areas) may be a more practical option than creating one large feature on a steading. Within an arable field, steps such as running tramlines across slopes, relieving compaction etc will help to reduce the risk of soil erosion and enhance the effectiveness of rural sustainable drainage system features and reduce maintenance requirements

Sediment traps and bunds are best used as part of a treatment chain whereby the trap accepts the run-off and discharges to another RSuDS feature such as a wetland or pond. Just as in a natural catchment, drainage techniques can be used in series to change the flow and capture pollution from the surface water run-off in stages.

Additional benefits

- flood mitigation benefits – sediment traps and bunds can reduce the amount of run-off entering watercourses during peak flood flow by releasing at a slower rate
- the build-up of sediment within ditches and watercourses downstream is reduced by capturing sediment in a trap
- biodiversity benefits if the bund is planted with native vegetation

Maintenance

- periodic removal of accumulated sediment
- occasional cutback of vegetation on filter strip and bund, or light grazing
- check outlets are clear so that water level does not exceed design head and risk breach of bund
- check integrity of bund by visual inspection and for any erosion problems from outflow

Further information

- [1] The SuDS Manual CIRIA Report C697, CIRIA (2007)
- [2] Rural Sustainable Drainage Systems (RSuDS), Avery LM (2012), The Environment Agency, Bristol (pp. 17–18 and 50–51), ISBN: 978-1-84911-277-2
- Best Management Practice (BMPs) Manual
- Siting and Suitability of Best Management Practices
- Sedimentation in Small Constructed Wetlands. Retention of Particles, Phosphorus and Nitrogen in Streams from Arable Watersheds, Braskerud BC (2001), Doctor Scientiarum Theses 2001:10, Agricultural University of Norway, As, Norway, ISSN: 0802-3220
- Constructed Farm Wetlands – Treating Agricultural Water Pollution and Enhancing Biodiversity, Mackenzie SM and McIlwraith CI (2013), Wildfowl and Wetlands Trust with Natural England (May 2013)

Annex – Identifying run-off types

In general, farm steadings, particularly livestock farms, produce a wide range of run-off ranging from relatively clean roof water to highly contaminated run-off and slurry.

Roof run-off can be considered relatively clean and may already directly discharge to a watercourse. Exceptions may include poultry or pig house roofs with roof vents. Also, any buildings or areas constructed after 1 April, 2007 must be drained by a sustainable drainage system, and roof water can discharge to a closed soakaway or to a watercourse via an infiltration trench or swale.

Yard run-off tends to vary to a greater degree in its polluting load. Therefore, for the purpose of producing the plan for this option, run-off should be classified as:

Slurry

The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003 as amended (SSAFO) defines slurry as excreta produced by livestock while in a yard or building and includes a mixture of run-off containing excreta, bedding etc, from yards and buildings used by livestock and middens, weeping wall structures etc.

Run-off from such areas requires to be collected in a slurry storage system. However there is a provision to allow certain types of slurry to be conveyed to a constructed farm wetland that has been designed in accordance with the Constructed Farm Wetland Design Manual. The types of slurry that can be conveyed to such constructed farm wetlands for treatment includes run-off from:

- areas used by livestock occasionally, but excluding areas where livestock regularly move on and off to be milked, housed, fed or gathered
- silos within the period 1 November to 30 April, unless a crop has been added to the silo within this period. This excludes run-off from silos where livestock have access, such as self-feed silos

Lightly contaminated run-off

This could include drainage from yards and areas where livestock do not frequently have access, which are not contaminated with oils and pesticides. It is accepted that such areas will build up a degree of contamination from passing machinery and other activities carried on nearby. In the majority of cases this run-off would be suitable for treatment via a rural sustainable drainage system or alternatively could discharge to local grassed areas.

Dairy washings

This includes washings from the milking parlour and rinsings from the milk storage tank(s), milking machine and ancillary equipment. These types of effluent can be highly polluting and should be collected in a slurry storage facility or a dedicated storage tank.

Pesticide contaminated run-off

Drainage from pesticide handling and loading areas must not be allowed to discharge into a surface water drainage system or a rural sustainable drainage system. There is a capital item available for upgrading pesticide handling facilities.