S104 SuDS Guidance Document

Ponds & Wetlands

Version 3 (October 22)

(This document should be read in conjunction with S104 SuDS Technical appraisal form for Ponds & Wetlands)

Comment no.	Technical Guidance
High level considerations, location & layout	
1	**Wetlands** can be considered for adoption where they form part of a wider SuD system. We will not adopt wetlands that are only designed to deliver a water quality benefit Wetlands are bodies of water with larger proportions of the surface area covered by aquatic planting. They also tend to have greater depth variations and may include shallow islands.
2	**Topography:** The surface should be level to allow distribution of flows across it. **Shape, location & maintenance considerations:** Length / width ratio for online detention basins should be between 3:1 and 5:1. However, the location and shape of the component should be agreed with the local planning authority but where the component is not located in a verge, other public open space or the boundary between the highway and a private garden, provision should be made for access including any specific features that are likely to pose maintenance difficulties and any associated mitigation measures that have been put in place – see chapter 32 of CIRIA C753 for guidance. Consideration should be given to planting of trees etc. which may hinder access for the maintenance particularly around ancillaries and access points
3	**Flood risk to existing features**: No surrounding properties or features should be at risk – see chapter 36 of CIRIA C753 for guidance
Design requirements	
4	**Hydraulic assessment information criteria;** **Representing component for hydraulic calculations**: For conveyance it must be represented as part of the online piped network. If labelled as a storage component then it must be explained how this is linked in the model as part of the online network. **Inflow velocities** must be acceptable and the designer should provide suitable flow spreading and energy dissipation to prevent disturbance to the permanent pool volume – see CIRIA C753 23.8.1 for guidance. For ponds, it would need to be proven that the depth of permanent water level manages any incoming velocities and removes any risk of erosion to the base of the component, if this is a risk then further considerations need to be made. Where incoming inverts are above permanent water levels, erosion protection may be required. Any erosion protection must be reflected in the hydraulic model by applying a **headloss** of 0.5 at the point of outfall. The same headloss value of 0.5 needs to be applied for catch pits where applicable. **Permanent water depth:** The top water level for the permanent pool is not related to a particular storm event and should be at the invert level of the outfall structure. For planted ponds the depth can vary as long as there's areas of deeper water between 0.6-1.0m and no deeper than 1.2m to avoid stratification and anoxic conditions. For non-planted ponds the max depth of water must not exceed 1.2m. Shallow non-planted ponds will be more susceptible to naturally occurring vegetation, therefore the requirement for increased frequencies for certain maintenance activities need to be taken into consideration. **Temporary storage depth:** Where wetlands are used for flow attenuation, the maximum depth of temporary storage above the permanent pool should be limited; 0.5m is usually acceptable for small/medium sized ponds so that the risk to plant damage is low. The critical duration is the length of rainfall event that results in the greatest flow rate, flood volume or flood level. Return periods from 1 in 1yr to 1 in 100yr and durations from 15 minutes to 48hrs are often required to be assessed – see CIRIA C753 chapter 24.2.3 for further guidance. The maximum water level must be at least 500mm below the lowest FFL of any adjacent properties. Ponds should have a **freeboard** of 300mm to the top of the bank – see CIRIA C753 section 23.4.5 for further guidance

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	Flow control diameter should usually be a minimum of 100mm, however if the flow control has robust upstream protection which prevents debris this could be reduced to a minimum of 50mm **Designing for exceedance & considering overland flow** Overland flows from surrounding land must be considered particularly if adoptable components are designed to accept surface inflow. Flow routes for significant offsite flow paths must be provided as part of the overall site design and should be separated from any new adoptable network design See chapter 36 (table 36.1) of CIRIA C753 for guidance on acceptable velocities for exceedance.
5	The **side slopes** confirmed to be no greater than 1 in 3 between the aquatic bench and safety bench and no greater than 1 in 4 where mowing access is required. A 3.5m safety bench must also be provided with a slope of less than 1:15 although this will depend on land availability, designated access and the type of maintenance equipment required for the pond.
6	**Pre-treatment / Sediment control** must be provided on any open SuDS component. For systems with multiple inlets distanced apart, pre-treatment should be provided at or upstream of each inlet. Adoptable pre-treatment can be provided in the form of forebays and catch-pit details, or in the case of infiltration systems proprietary treatment systems such as vortex separators. If a forebay is chosen see chapters 23 & 28.4.8 of CIRIA C753 for further guidance. The forebay area must be at least 10% of the total component. If the area is <10m2 then the depth of the forebay should be 200mm deep, if the area is >10m2 it should be 300mm deep – see CIRIA C753 chapter 18.8.1 (EQ.18.2). The top of the permeable berm for the forebay must be set at the 30yr level. Each forebay should be accessible and easily maintained. A fixed sediment depth marker is recommended to monitor silt levels over time. For planted ponds, further considerations will be required regarding maintenance access (i.e. sediment removal) to avoid damage to any planting. Consideration can be given to a concrete lined forebay as this would also protect from erosion and can facilitate desilting (without damage to a liner for example). If using catch pit manholes, they must be sufficiently sized and representative of the upstream catchment with sump depths between 300-500mm. Suitable access should be provided for maintenance and the management and maintenance document must consider potential increase for maintenance activities.
7	**Erosion protection** will be required for any outfall to a SuDS component and should extend to the permanent water level of the component. It can be in the form of a gabion mattress, rip rap, large stone spillway or can be incorporated into a forebay design if applicable.
8	**Inlet and outlet connections** There are various point inlet details within the DCG and CIRIA SuDS manual which can differ based on pipe size, component type and application, if discharging via piped network inlets up to 350mm diameter, are to be constructed as per the standards set out in the Design & Construction Guidance (DCG) or our inlet headwall details drawing located within our SuDS technical library on our website Inlets greater than 350mm diameter, are to be constructed as per our inlet headwall details drawing or our standard detail drawings which can be found within our S104 technical library on our website. Outlet construction details can be based on the inlet details above. For dry features the outlet invert level should be set to the base of the headwall detail.
9	**Lining considerations:** Below is a list of information/considerations required when lining is proposed; Unlined components should not be used on brownfield sites unless it has been demonstrated that the risks posed by leaching of contaminants is managed to acceptable levels. Specification of chosen liner will be required. Geosynthetic barriers should be designed in accordance with BS EN 13361 or BS EN 13362 (see section E2.45 of Design & Construction Guidance), this includes tensile load, tear resistance and puncture resistance. These should have welded joints, taping would not be acceptable.
10	The **full design detail** should show all individual components which may include; inlet, forebay, permeable berm, vegetation/planting, aquatic pool, outlet etc. as applicable. **Materials** should be shown on the **sectional drawing** i.e. subsoil, topsoil, geotextile membrane, geosynthetic barrier, permeable berm etc. as applicable. See CIRIA C753 chapters 23 (Ponds & Wetlands), 30 (Materials including specification for liners – see 30.5.4) and 31 (Construction) along with chapters 21 (Soils) & 22 (Materials), of CIRIA C768 for further guidance.

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Construction

Construction of Ponds & Wetlands should be in accordance with the guidance provided in the appropriate chapters of CIRIA C753 (23.11) and CIRIA C768 chapter 36 along with CIRIA C753 Appendix B: Construction assessment checklist.

Figure 23.4 provides a typical design of a pond in plan view and profile. Figure 23.5 shows typical planted pond edge details and Figure 23.6 shows equivalent details for a typical non-planted pond.

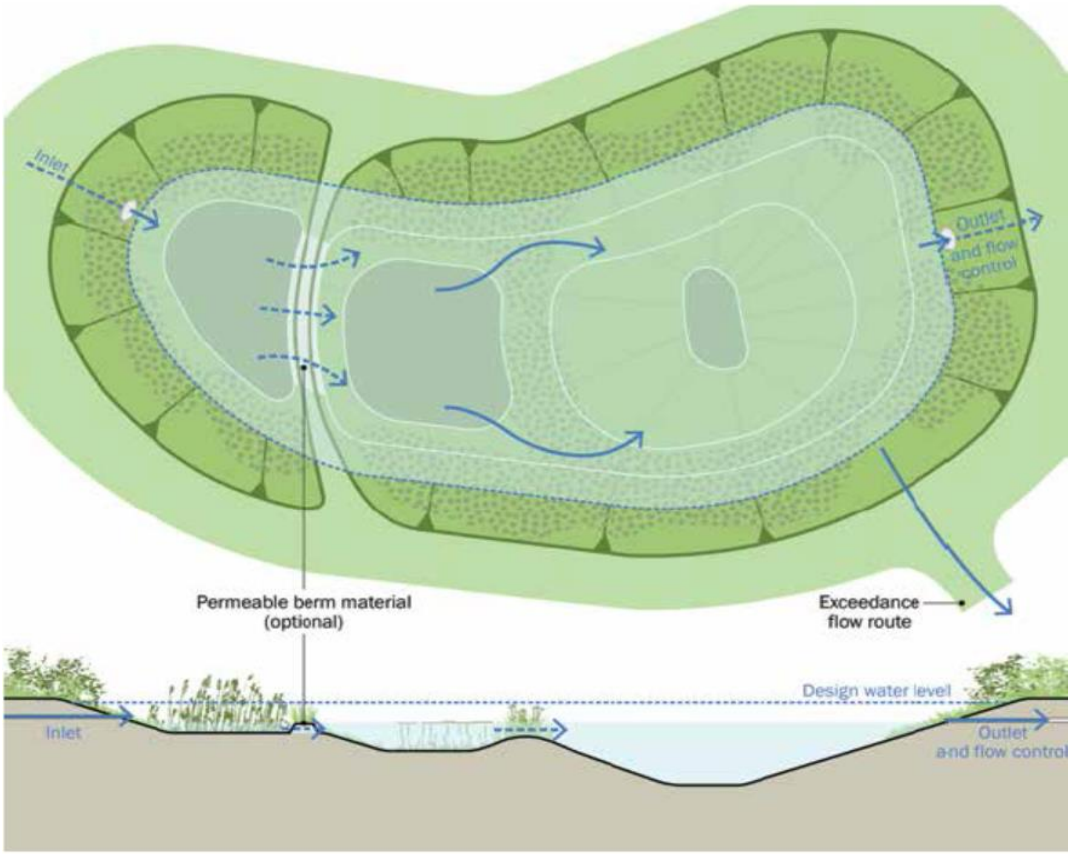
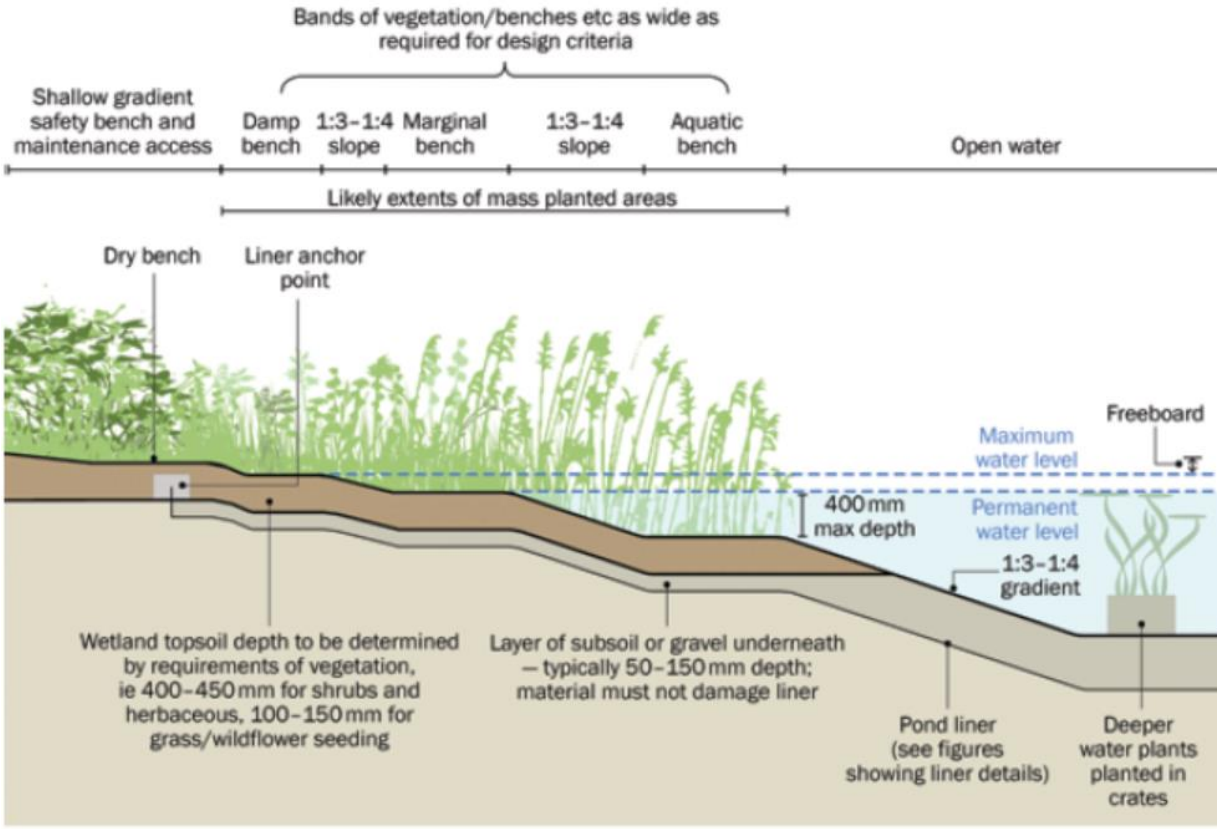
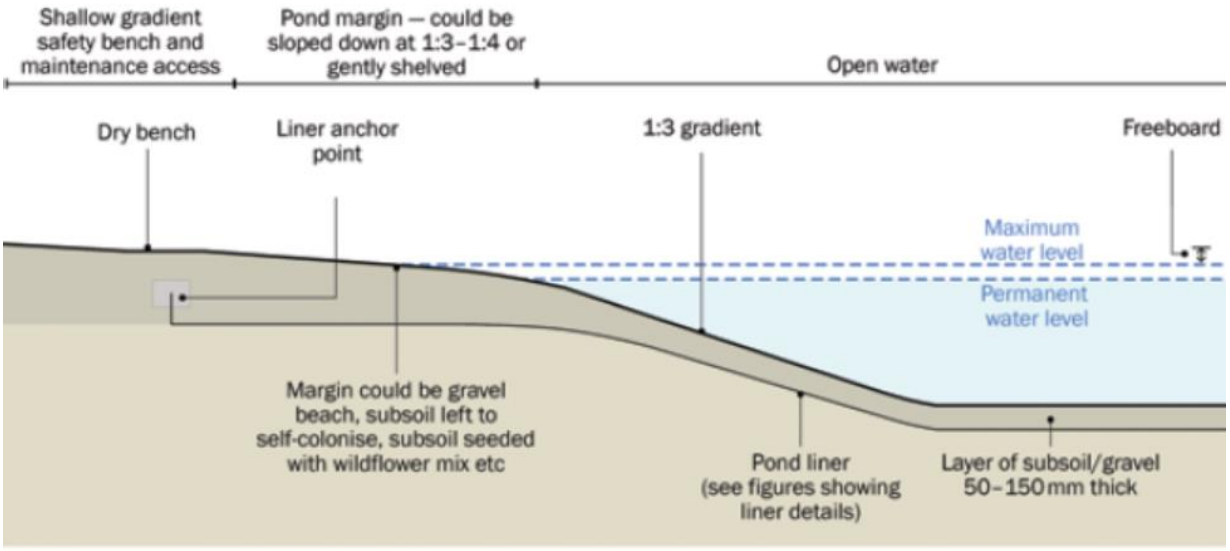


Figure 23.4 Plan view and profile of pond details



Notes: Width, surfacing and extent etc of safety bench and maintenance access all dependent on site, size of pond, maintenance requirements etc

Figure 23.5 Typical planted pond edge details



Notes: Width, surfacing and extent etc of safety bench and maintenance access all dependent on site, size of pond, maintenance requirements etc

Figure 23.6 Typical non-planted pond edge details

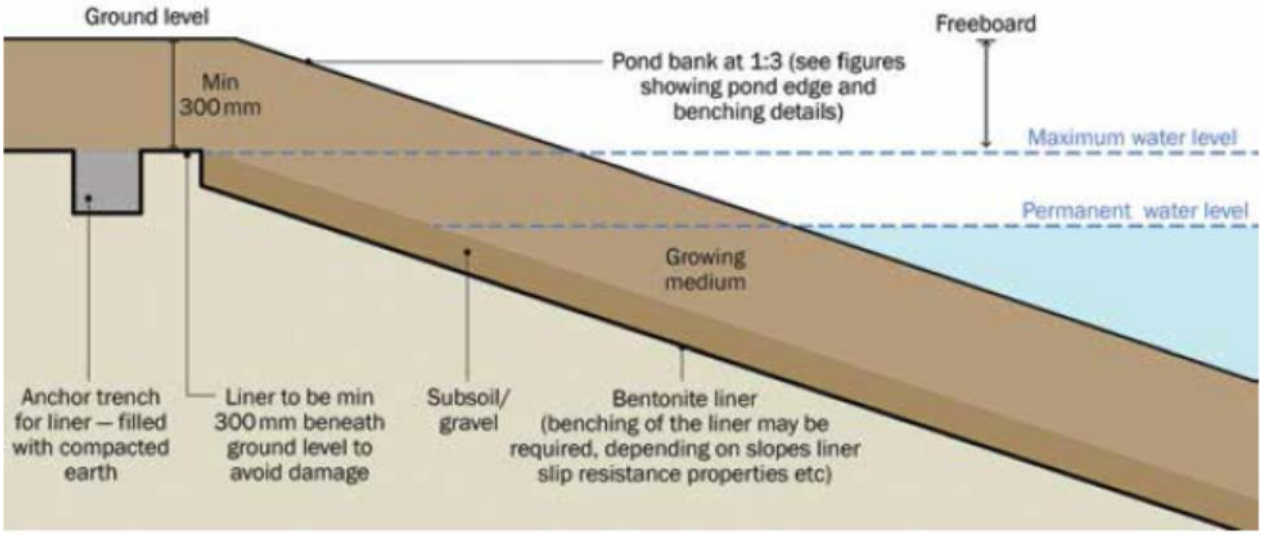


Figure 23.13 Details for a typical geosynthetic liner

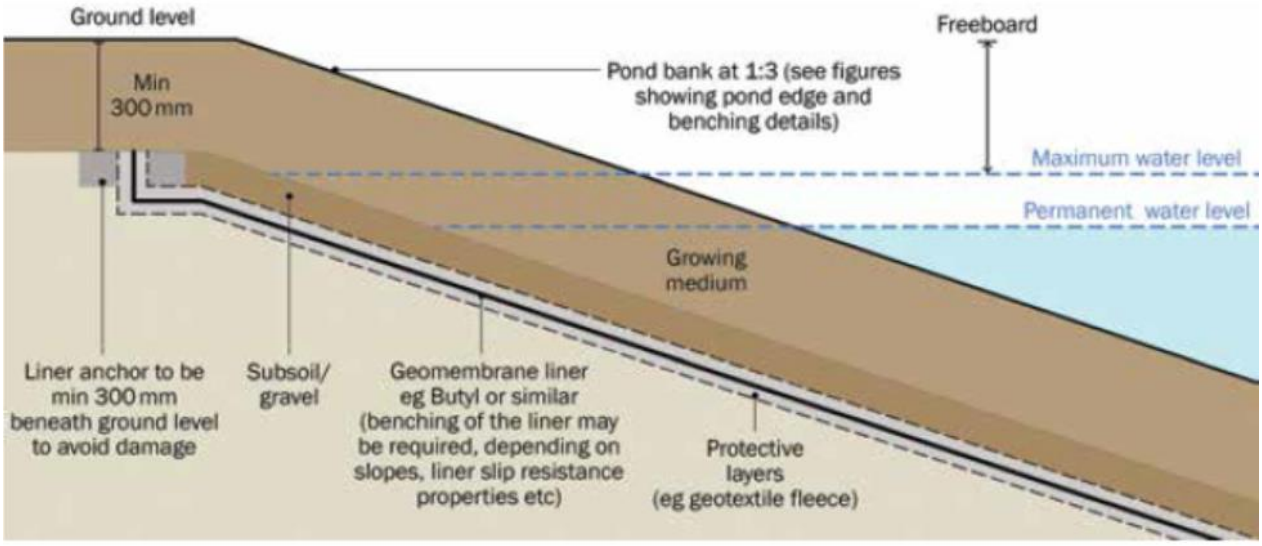


Figure 23.14 Details for a typical geomembrane liner

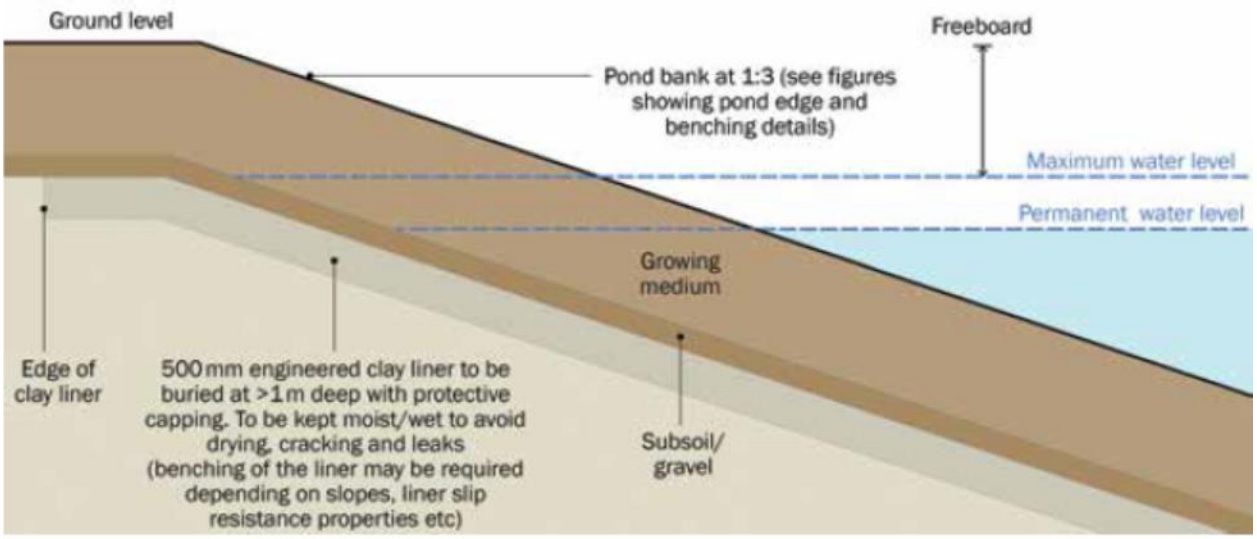


Figure 23.15 Details for a typical clay liner