



HIGH SPEED TWO PHASE ONE INFORMATION PAPER

E17: BALANCING PONDS AND REPLACEMENT FLOOD STORAGE AREAS

This paper outlines the approach and background to balancing ponds and replacement flood storage areas, which are used to mitigate the impact on water resources and flood risk of Phase One of High Speed 2.

It will be of particular interest to those potentially affected by the Government's proposals for high speed rail.

This paper was prepared in relation to the promotion of the Bill for Phase One of the scheme which is now enacted. Although the contents were maintained and updated as considered appropriate during the passage of the Bill (including shortly prior to the enactment of the Bill in February 2017) the contents are now historic and are no longer maintained.

If you have any queries about this paper or about how it might apply to you, please contact the HS2 Helpdesk in the first instance.

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1. Introduction

- 1.1. High Speed Two (HS2) is the Government's proposal for a new, high speed north-south railway. The proposal is being taken forward in two phases: Phase One will connect London with Birmingham and the West Midlands and Phase Two will extend the route to Manchester, Leeds and beyond.
- 1.2. HS2 Ltd is the non-departmental public body responsible for developing and promoting these proposals. The company works to a Development Agreement made with the Secretary of State for Transport.
- 1.3. In November 2013, HS2 Ltd deposited a hybrid Bill¹ with Parliament to seek powers for the construction and operation of Phase One of HS2 (sometimes referred to as 'the Proposed Scheme'). The Bill is the culmination of nearly six years of work, including an Environmental Impact Assessment (EIA), the results of which were reported in an Environmental Statement (ES) submitted alongside the Bill. The Secretary of State has also published draft Environmental Minimum Requirements (EMRs), which set out the environmental and sustainability commitments that will be observed in the construction of the Proposed Scheme.
- 1.4. The Bill is being promoted through Parliament by the Secretary of State for Transport (the 'Promoter'). The Secretary of State will also appoint a body responsible for delivering the Proposed Scheme under the powers granted by the Bill.
- 1.5. This body is known as the 'nominated undertaker'. There may well be more than one nominated undertaker – for example, HS2 Ltd could become the nominated undertaker for the main railway works, while Network Rail could become the nominated undertaker for works to an existing station such as Euston. But whoever they are, all nominated undertakers will be bound by the obligations contained in the Bill and the policies established in the EMRs.
- 1.6. These information papers have been produced to explain the commitments made in the Bill and the EMRs and how they will be applied to the design and construction of the Proposed Scheme. They also provide information about the Proposed Scheme itself, the powers contained in the Bill and how particular decisions about the project have been reached.
- 1.7. This paper outlines the approach and background to balancing ponds and replacement flood storage areas, which are used to mitigate the impact on water resources and flood risk of Phase One of High Speed 2. Further information

¹The High Speed Rail (London – West Midlands) Bill, hereafter 'the Bill'.

on flood risk is contained in the Information Paper E4: Water resources and flood risk, as well as in the Environmental Statement and Environmental Memorandum.

2. Background

- 2.1. The design of HS2 Phase One includes various drainage measures to control the rate, volume and quality of water run-off from the HS2 rail corridor and other associated infrastructure, taking into account projected climate change impacts. These systems will help to avoid an increase in flood risk and will help to maintain natural water flow by encouraging storm water to soak into the ground or, where that is not reasonably practicable, will discharge it into watercourses or surface water/combined sewers at a controlled rate.
- 2.2. This will be undertaken by implementation of Sustainable Drainage Systems (SuDS) which include balancing ponds and various other drainage techniques (such as use of swales² and linear soakaways³).
- 2.3. The design of the Proposed Scheme also includes measures to mitigate losses of flood water storage capacity that occur where development is required within the floodplain of watercourses.
- 2.4. Floodplains play a key role in naturally reducing volumes and rate of downstream flood flows. When ground levels are artificially raised within a floodplain area, it can reduce the amount of storage available and increase flood flows downstream. Where possible, the design of the scheme has sought to avoid floodplains, but where this has been unavoidable, loss of storage has been compensated for by creating replacement flood storage areas.

3. Balancing Ponds

- 3.1. Balancing ponds are often required for development projects in order to regulate water flows to avoid an increase in flooding from new surface water drainage systems. This includes the drainage required for all aspects of the Proposed Scheme covering railway drainage, new or altered highway drainage networks and new land drainage arrangements following construction of the railway. These ponds are of three types:
 - Attenuation ponds, which can temporarily store rapid runoff and then discharge it at an agreed lower rate to a nearby watercourse, thereby reducing the risk of localised flooding;
 - Infiltration ponds, which allow water run-off to be absorbed into the ground where conditions are suitable; and

² Swales are shallow vegetated channels designed to convey water and which may also allow infiltration to the ground

³ Soakaways are sub-surface structures (usually filled with stones or rubble) into which surface water is conveyed for infiltration into the ground without a connection to a piped system. Linear soakaways usually take the form of a stone filled trench

- Hybrid ponds, which combine attenuation and infiltration features.
- 3.2. Balancing ponds will typically be unlined and have banks with a varying profile (see Figure 1). Their size will depend on local drainage requirements taking climate change allowances into account. The majority will not be designed to hold water permanently, but will be dry most of the time, except following intense rainfall events. Although infiltration to ground is the preferred option for sustainable drainage systems, in certain locations ponds may be designed to be permanently wet where there are site specific environmental requirements to retain water. Those required for land drainage purposes will often resemble depressions in the ground rather than actual ponds, and are often called detention basins.



Figure 1: Example of a hybrid balancing pond during dry weather, with land potentially suitable for grazing⁴

- 3.3. In many cases, it is not possible to combine balancing ponds for different types of drainage systems (e.g. railway, highway and land), as they need to be kept separate due to varying ownership, management and maintenance requirements.
- 3.4. Systems have been designed to drain by gravity where possible; pumping will only be adopted where it is unavoidable (due to risk of failure and to save on energy and maintenance). Underground attenuation tanks may also be considered in some constrained locations, but these are generally avoided for sustainability reasons⁵ and because they are always more difficult to maintain than open ponds.

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⁵ Sustainability reasons for avoiding the use of underground tanks includes:

- they do not provide habitat for wildlife;
- they do not provide any improvement in the quality of water discharged;
- they do not allow any water to infiltrate into the ground; and
- they often require pumping, and hence have on-going energy requirements and CO₂ emissions implications.

- 3.5. Permanent access routes to balancing ponds for railway drainage will be retained by the railway and suitable means of access to new road drainage ponds will be constructed, which will be handed over to highway authorities on completion. Access and maintenance rights are not expected to be retained for most balancing ponds for land drainage since these will generally be returned to landowners.
- 3.6. Fencing requirements of railway and road drainage ponds will be assessed on a case-by-case basis, depending on a risk assessment. The degree of security required will be proportionate to the level of risk and take into account the nature of the locality.
- 3.7. Balancing ponds for land drainage will often be suitable for livestock grazing once returned to landowners. Fencing of such ponds may not be required, but a simple agricultural fence for land or livestock management purposes has been assumed in the ES.

4. Replacement Flood Storage Areas

- 4.1. Replacement flood storage areas are provided to mitigate the impact of the proposed scheme on existing floodplains and to ensure that the Proposed Scheme does not cause an increased flooding risk to vulnerable receptors (e.g. residential property) as a result of its construction or operation.
- 4.2. Replacement flood storage areas, as with land drainage balancing ponds, will be suitable for grazing once the scheme is operational. Arable farming may also be possible on replacement flood storage areas in some locations. There is no requirement to fence these areas, unless needed for land or livestock management purposes.

5. Legislation and Policy

- 5.1. The balancing ponds and replacement flood storage areas for the Proposed Scheme have been designed to ensure compliance with European legislation such as the Management of Floods Directive and the Water Framework Directive (as implemented through UK national regulations) and national legislation such as the Flood and Water Management Act 2010. Large balancing ponds may also be governed by the Reservoirs Act 1975, as amended by the Flood and Water Management Act 2010.
- 5.2. Their design is also based on the requirements of the National Planning Policy Framework (NPPF) and the associated web-based Planning Practice Guidance on flood risk, produced by the Department for Communities and Local Government (DCLG).
- 5.3. Detailed arrangements – for example, maximum water discharge rates and water storage capacity – will be finalised in conjunction with statutory bodies such as the Environment Agency (EA), Lead Local Flood Authorities (e.g. county councils, London Boroughs and metropolitan borough councils in the West Midlands) and sewerage undertakings.

6. More information

- 6.1. More detail on the Bill and related documents can be found at: www.gov.uk/HS2
- 6.2. More details on the location of balancing ponds and replacement flood storage areas are shown on the maps contained in the respective Community Forum Area reports in volume 2 of the ES:
www.gov.uk/government/publications/hs2-phase-one-environmental-statement-volume-2-community-forum-area-reports-and-map-books/hs2-phase-one-environmental-statement-volume-2-community-forum-area-reports-and-map-books
- 6.3. More detail on the proposed route for HS2 can be found at:
www.dft.gov.uk/topics/high-speed-rail/line-of-route