

HIGH SPEED TWO PHASE 2a INFORMATION PAPER

E21: 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 the Proposed Scheme.

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 High Speed Rail (West Midlands-Crewe) Bill which is now enacted. It was finalised at Royal Assent and no further changes will be made.

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 phases: Phase One will connect London with Birmingham and the West Midlands. Phase 2a will extend the route to Crewe. Phase 2b will extend the route to Manchester, Leeds and beyond. The construction and operation of Phase One of HS2 is authorised by the High Speed Rail (London – West Midlands) Act 2017.
- 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 July 2017, the Government introduced a hybrid Bill¹ to Parliament to seek powers for the construction and operation of Phase 2a of HS2 (the Proposed Scheme). The Proposed Scheme is a railway starting at Fradley at its southern end. At the northern end it connects with the West Coast Main Line (WCML) south of Crewe to allow HS2 services to join the WCML and call at Crewe Station. North of this junction with the WCML, the Proposed Scheme continues to a tunnel portal south of Crewe.
- 1.4. The work to produce the Bill includes an Environmental Impact Assessment (EIA), the results of which are reported in an Environmental Statement (ES) submitted alongside the Bill. The Secretary of State has also published draft Environmental Minimum Requirements (EMRs)², which set out the environmental and sustainability commitments that will be observed in the construction of the Proposed Scheme.
- 1.5. The Secretary of State for Transport is the Promoter of the Bill through Parliament. The Promoter will also appoint a body responsible for delivering the Proposed Scheme under the powers granted by the Bill. This body is known as the 'nominated undertaker'. The nominated undertaker will be bound by the obligations contained in the Bill and the policies established in the EMRs. There may be more than one nominated undertaker.
- 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 Proposed Scheme have been reached.

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

² For more information on the EMRs, please see Information Paper E1: Control of Environmental Impacts.

2. Overview

- 2.1. 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 the Proposed Scheme. Further information on flood risk is contained in the Information Paper E15: Water resources, flood risk and authorisation of related works, as well as in the ES and the EMRs.
- 2.2. The design of the Proposed Scheme includes various drainage measures to control the rate, volume and quality of water run-off from the rail corridor of the Proposed Scheme 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.
- 2.3. This will be undertaken by implementation of sustainable drainage systems (SuDS) which include balancing ponds and various other drainage techniques (such as use of swales³ and linear soakaways⁴).
- 2.4. 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.
- 2.5. 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 water storage available and increase flood flows downstream. Where possible, the design of the Proposed 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 required in order to regulate water flows to avoid an increase in flooding from new surface water drainage systems. These systems include 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.
- 3.2. Balancing ponds are of three types:

³ Swales are shallow vegetated channels designed to convey water and which may also allow infiltration to the ground

⁴ 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

- Attenuation ponds, which can temporarily store rapid water run-off 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
 - Hybrid ponds, which combine attenuation and infiltration features.
- 3.3. Balancing ponds will typically be unlined and have banks with a varying profile (see Figure 1 below). 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. Balancing ponds required for land drainage purposes only will often resemble depressions in the ground rather than actual ponds. These can be any of the three types listed above.
- 3.4. Although infiltration to ground is the preferred option for sustainable drainage systems, in certain locations balancing ponds may be designed to be permanently wet where there are site specific environmental requirements to retain water. These would take the form of attenuation ponds.



Figure 1: Example of a hybrid balancing pond during dry weather, with land potentially suitable for grazing⁵

- 3.5. 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

⁵ Copyright Mike Quinn and licensed for reuse under a Creative Commons Licence. Photograph taken of a balancing pond in Bromley, London.

separate due to varying ownership, management and maintenance requirements.

- 3.6. Systems have been designed to drain by gravity where possible. Pumping will only be adopted where it is unavoidable, and to save on energy and maintenance, and as they introduce a risk of failure. Underground attenuation tanks may also be considered in some constrained locations, but these are generally avoided for sustainability reasons⁶ and because they are always more difficult to maintain than open ponds.
- 3.7. Permanent access routes to balancing ponds for railway drainage will be retained by the Proposed Scheme 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.
- 3.8. Fencing requirements for 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 will take into account the nature of the locality.
- 3.9. Balancing ponds for land drainage will often be located in land 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 Proposed 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

⁶ 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.

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 Ministry of Housing, Communities & Local Government (MCHLG).
- 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 and metropolitan borough councils) 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 Area reports in volume 2 of the ES, which are available here: <https://www.gov.uk/government/collections/hs2-phase-2a-environmental-statement>.