highways england

A57 Link Roads
TR010034
7.7 Drainage Design Strategy Report

APFP Regulation 5(2)(q)

Planning Act 2008 Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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A57 Link Roads Scheme

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7.7 Drainage Design Strategy Report

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1. Introduction

1.1.1 This note provides the drainage strategy for the selected route option for the A57 Link Roads Scheme (The Scheme).

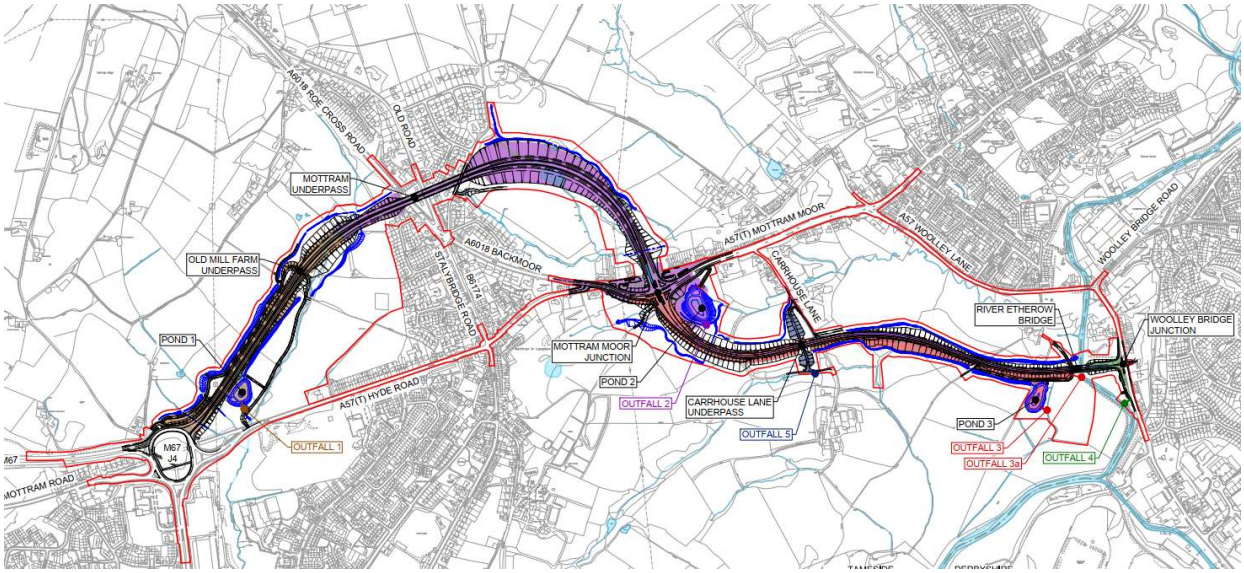
1.1.2 The purpose of the Scheme is to address longstanding issues of connectivity, congestion, reliability and safety of strategic Trans-Pennine routes between the M67 at Mottram and the M1 J36 and J35A north of Sheffield.

1.1.3 The Scheme lies mainly within the administrative boundaries of Tameside Metropolitan Borough Council (TMBC), up until to the proposed River Etherow Bridge. To the east of this, the Scheme crosses over the boundary with High Peak Borough Council (HPBC) and Derbyshire County Council (DCC).

1.1.4 The Scheme includes the following components:

- A new offline bypass of 1.12 miles (1.8km) of dual carriageway road connecting the M67 Junction 4 to A57(T) Mottram Moor
- A new offline bypass of 0.81 miles (1.3km) of single carriageway connecting the A57(T) Mottram Moor to the A57 Woolley Bridge
- Creation of two new junctions, Mottram Moor Junction and Woolley Bridge Junction and improvement works to the existing M67 Junction 4
- Creation of five new structures (Old Hall Farm Underpass, Roe Cross Road Overbridge , Mottram Underpass, Carrhouse Lane Underpass and River Etherow Bridge)
- One main temporary construction compound area, located on agricultural land to the east of the M67 Junction 4
- Detrunking of A57 Hyde Road, including safety measures from the M67 Junction 4 to the Back Moor Junction, to be agreed with TMBC.
- Safety measures and improvements to the A57 from Mottram Moor Junction to the Gun Inn Junction and from Gun Inn Junction to Woolley Bridge Junction, to be agreed with TMBC. An overview of the Scheme is shown in Figure 1.1.

Figure 1.1: Scheme Overview



2. Data Sources

2.1.1 The Scheme covers areas of existing highway owned and maintained by Highways England (HE), TMBC and DCC. Existing records have been requested from TMBC and DCC but none were available.

2.1.2 For the sections of highway that are currently maintained by HE the Highways England database HAGDMS has been reviewed but there is very little asset information for most of the Scheme. The only asset data available is shown in Figure 2.1 which is as-built information at the end of the M67. Contact has also been made with the Drainage Asset Champion for HE to check if any additional drainage information was available outside HAGDMS; after reviewing records no additional information was found.

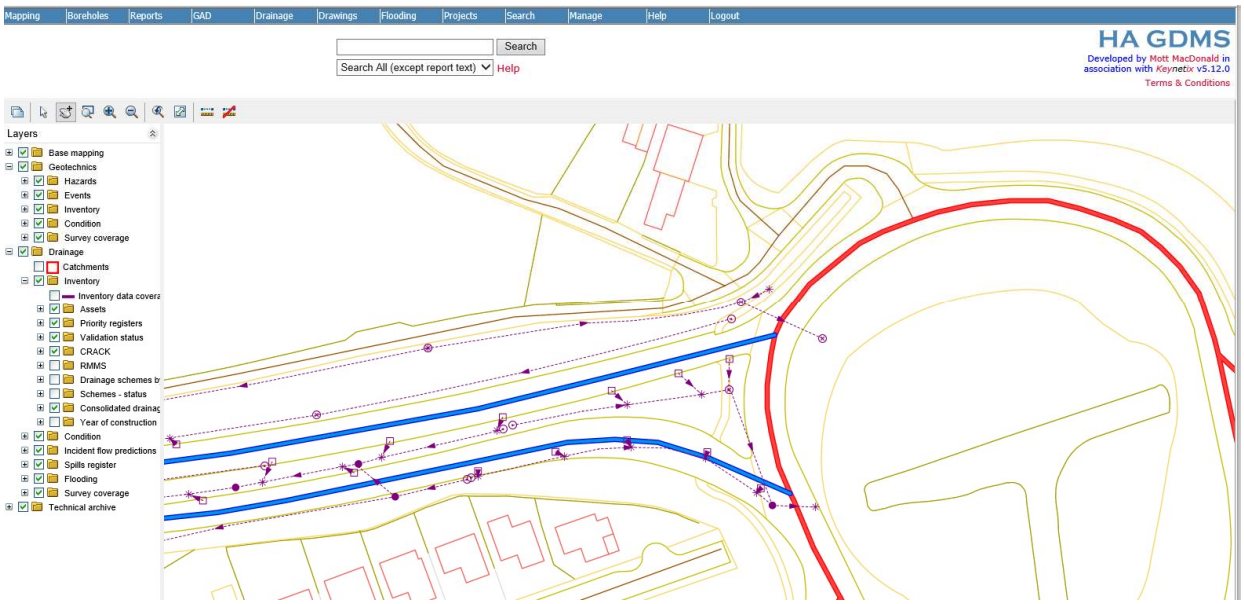


Figure 2.1: HAGDMS Extract

2.1.3 The HAGDMS database shows that there are no records of historic spills. There are several records of flooding in the vicinity of the Scheme, but all are either 'closed' or classified as 'historic'. Several of these relate to flooding that was reported on the existing A57 between the proposed Mottram Moor Junction and the Gun Inn Junction (junction between A57 Mottram Moor, Market Street and A57 Woolley Lane). These incidents have been resolved by a scheme carried out in late 2020 by HE to replace a collapsed pipe that was causing this flooding.

2.1.4 Six existing outfalls have been identified in the vicinity of the Scheme, none of which have had a field study completed. This fieldwork will be completed as described in Section 3 of this report. Out of the six outfalls three have been classified as low risk and three as moderate risk in accordance with CD 535 – Drainage Asset Data and Risk Management. It is only intended to reuse one of the low risk outfalls for this scheme.

2.1.5 A topographic survey was undertaken in 2016 using a combination of aerial and ground survey methods, which covers the full extents of the Scheme. This survey has been used to identify existing surface water collection and analyse the existing topography, including mapping of existing watercourses and ditches.

2.1.6 The highway alignment was fixed in November 2020 for the completion of the scheme preliminary design. The alignment and earthworks information from this design has been used to develop the drainage proposals. Following this design fix, alterations to the highway alignment design have been made in preparation for the DCO submission. These changes have been incorporated into the drainage proposals.

3. Field Studies

3.1.1 Several site inspections have been completed with the most recent visit in March 2021. These visits were visual inspections to validate the information in the topographical survey and to inspect existing watercourses.

3.1.2 As most of the site is greenfield and the majority of the scheme area discharges to new outfalls, a full drainage survey was not carried out for preliminary design. Prior to the commencement of the detailed design, a full drainage survey will be completed which will mainly focus on assets present at the tie-ins between the Scheme and the existing highway network.

3.1.3 A Geotechnical Investigation (GI) being carried out in Spring 2021 includes infiltration testing at the proposed pond locations along the Scheme to validate the preliminary design assumptions described in Section 5 of this report. The results of this GI will be available before the start of detailed design of the Scheme.

4. Site Description

4.1.1 Mottram in Longdendale is in the western foothills of the South Pennines, approximately 20km east of Manchester. The area is drained by several small tributaries of the River Etherow that are supported by groundwater discharges emerging as springs and seeps.

4.1.2 The terrain at the site to the west and north is steep and hilly with the River Etherow at the eastern extent of the Scheme. The topographic elevation within the scheme area ranges between 160m and 200m above ordnance datum (AOD) and the catchment area around the Scheme has an extensive surface water drainage network of minor tributaries draining towards the River Etherow. Some of the tributaries are affected by the Scheme (including Hurstclough Brook, Lumb Brook and Tara Brook). A substantial number of mapped springs suggest that the groundwater level is high in many areas and that artesian conditions are widespread. Initial indications from the GI at the time of writing appear to confirm this assumption as artesian conditions have been found at various locations around the site.

4.1.3 The area either side of the River Etherow varies between Flood Zone 2 and Flood Zone 3 where the Scheme proposals cross the river. For further details see the Flood Risk Assessment. There are no Source Protection Zones or other sensitive receptors in the vicinity of the Scheme that will be affected by hydrology.

4.1.4 A review of the existing drainage assets condition data on HAGDMS has confirmed that there is limited condition data available. The outstanding CCTV asset and condition survey will be undertaken prior to the commencement of the detailed design of the Scheme. Where the existing drainage is not affected by the proposed highway works, it is proposed to retain it as part of the permanent works. The southern part of the M67 Junction 4 roundabout and the eastern side of Woolley Bridge Junction are sections where there will be little change to existing drained areas therefore existing drainage infrastructure is likely to be retained.

5. Design Options

5.1.1 Modifications have been made to the Scheme following the announcement of the preferred route in October 2017. The previous design proposed two roundabouts, one at the previous Cricket Ground (to the west of the proposed underpass and Roe Cross Road Bridge) and a second at the junction between the Scheme and the A57 Mottram Moor. The modified design removes the Cricket Ground roundabout junction, together with the single carriageway link road from the roundabout to the previously proposed junction with the A6018 Roe Cross Road. The design also replaces the previously proposed roundabout at Mottram Moor with a more compact 4 arm traffic signal-controlled junction.

5.1.2 The proposed drainage for the Scheme either discharges directly to existing watercourses or, at junction tie-ins, to existing highway drainage leading to existing outfalls. No discharge to groundwater has been included as previous GI's have shown that there are very low infiltration rates throughout the site. These low rates are due to the high groundwater levels and the cohesive soils throughout. As noted in Section 3 of this report additional infiltration testing is being undertaken to validate this assumption. If any areas of the Site are found to achieve suitable infiltration rates, then discharge to groundwater will be maximised and outfall to watercourses will be reduced.

5.1.3 The use of Sustainable Drainage Systems (SuDS) has been maximised in the scheme design with open grassed channels and attenuation ponds used throughout. Highways England Water Risk Assessment Tool (HEWRAT) assessments have been carried out for each of the outfalls and any mitigation measures needed to achieve a low impact have been incorporated in the design. Spillage assessments have also been carried out for all catchments and any remediation required will be incorporated in the drainage network design. For further details of the assessments refer to Water Environment Data and Assessments (Chapter 13.1) of the Environmental Statement (TR010034/APP/6.3).

5.1.4 The drainage design options for the Scheme have been selected on the basis of efficiency of conveyance, ease of maintenance and the provision of water treatment and attenuation.

5.1.5 The conveyance system for the Scheme will be mainly sealed carrier drains for highway drainage with some combined filter carrier drains when remote from pavement foundations. Pre-earthworks and cut off drainage will mainly be grass channels except where space is limited when filter drains will be used.

5.1.6 Surface water collection will vary depending on the proposed highway cross section and the usage of the adjacent carriageway. The adopting authorities have been consulted regarding their preferred method of surface water collection and this will be used as much as possible in the design. For TMBC and DCC the preferred surface water collection method is kerbs and gullies. On the sections of carriageway that will be handed over to TMBC and DCC open channel collection or over the edge drainage is not practical due to the proposed highway cross section, proximity of junctions and adjacent non-motorised user provision. For HE maintained roads the selection of surface water collection has been derived in accordance with Table 3.5.1 of CG 501 as detailed in Section 6.

6. Proposed Design

6.1 Basis of Design

6.1.1 The drainage design has been carried out to comply with the design and climate change criteria set out in CG 501 – Design of Highway Drainage Systems, with an increased climate change percentage of 40% for the attenuation design to align with Environment Agency (EA) guidance[1].

6.1.2 The exact design criteria are contained in CG 501 but are summarised below:

- 1 in 1 year storm with 20% allowance for climate change – no surcharging.
- 1 in 5 year storm with 20% allowance for climate change – No flooding.
- 1 in 100 year storm with 40 % allowance for climate change – No flooding of attenuation or surface water flooding beyond the highway boundary.

6.1.3 In addition to the climate change allowances outlined above, additional sensitivity tests will be carried out as outlined in CG 501.

6.1.4 The existing greenfield flow rates for the drainage networks have been calculated and these have been used to fix the outfall rates for the networks. The existing outfall rates will be matched for all storms with a return period up to 100 years with the climate change allowance detailed above. This approach has been discussed with the two Lead Local Flood Authorities (TMBC and DCC) and has been agreed in principle.

6.1.5 The flows will be restricted by the use of flow controls close to the outfall locations. These have initially been designed as vortex flow controls with two controls prior to each outfall to match the greenfield flow for all storms from a 1 year return period up to 100 years inclusive of climate change allowance.

6.2 Surface Water Collection Strategy

6.2.1 The strategy has been developed using the criteria discussed in Section 5 of this report and is broken down as follows:

- M67 Junction 4 Roundabout – The whole of the roundabout is kerbed and will be either drained using gullies or if spacing of gullies is too close (less than 10m) it will be drained by means of Combined Kerb Drainage Units (CKD).
- Mottram Moor Link Road – The proposed dual carriageway will be drained using surface water channels.
- Mottram Underpass – Although this is an enclosed structure there will be a drainage blanket below the structure to convey groundwater to its downstream end nearest Mottram Moor Junction.
- Mottram Moor Junction / A57 Link Road / Woolley Bridge Junction – All three sections have kerbs proposed due to the proximity of footways and other non-motorised user facilities. They will be drained using gullies as the preferred method of surface water collection, or by CKD if the gully spacing is too close.

[1] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

6.3 Catchment Description

6.3.1 The Scheme is divided into five main drainage catchments which are shown on the Culvert and Drainage Plans TR010034/APP/2.12. Several smaller catchments exist at tie-ins with the existing highway network which will outfall to existing highway drainage with attenuation in the form of oversized pipes or ditches to match existing flow rates.

Catchment 1

6.3.2 This catchment extends from the M67 Junction 4 to a high point on the link road alignment approximately 200m to the west of the A6018 Roe Cross Road. It also includes part of the M67 Junction 4 roundabout which is being modified for the Scheme.

6.3.3 This catchment outfalls to Hurstclough Brook via an attenuation pond close to M67 Junction 4. The network includes several grass ditches as well as a sediment forebay and permanent water in the pond to ensure the highways discharge is treated and attenuated before entering Hurstclough Brook.

Catchment 2

6.3.4 The catchment starts 200m west of the A6018 Roe Cross Road and extends through the underpass along the large cutting towards Mottram Moor. The catchment also includes most of the proposed Mottram Moor Junction.

6.3.5 The catchment outfalls to Tara Brook via an attenuation pond to the east of the proposed Mottram Moor Junction. This attenuation pond also has a sediment forebay and permanent water to assist with water treatment and attenuation along with a section of open ditch to achieve treatment in advance of the outfall to Tara Brook.

6.3.6 The large cutting is likely to have significant groundwater flows due to the high water table and existing artesian conditions. These flow levels are being determined during the GI together with tests to determine the extent of recharge directly to ground to endeavour to maintain the existing flow path and avoid having to convey the groundwater at the surface or in a piped network. If necessary, a separate system of conveyance will be designed to channel these flows to the existing watercourse that crosses the link road alignment at the southern end of the cutting.

Catchment 3

6.3.7 This catchment is the single carriageway section of link road from the proposed Mottram Moor junction to the proposed bridge over the River Etherow.

6.3.8 The catchment outfalls to an unnamed watercourse which is a tributary to the River Etherow. The discharge is via a pond with permanent water to provide treatment and attenuation. This is supplemented by extensive sections of grass channel throughout the catchment.

Catchment 4

6.3.9 This catchment includes the highway across the proposed River Etherow bridge up to and including the Woolley Bridge Junction.

6.3.10 This catchment outfalls to the River Etherow and is attenuated via large online pipes. Treatment is provided by sediment capture (catchpits and trapped gullies) on the drainage network as well as a section of grass ditch prior to outfall.

Catchment 5

6.3.11 Catchment 5 is a short network that drains the proposed catchment at the re-aligned section of Carrhouse Lane.

6.3.12 This catchment outfalls to an unnamed watercourse which is a tributary to the River Etherow. Attenuation is provided by large online pipes and treatment by online sediment capture using catchpits and filter drains.

6.4 Effects on existing hydrology and hydrogeology

Hydrology

6.4.1 There are several existing water courses that cross the Scheme. Watercourse diversions have been designed along with culverts so they can cross the proposed highway. These watercourses along with the proposed diversions and culverts are shown on the Culvert and Drainage Plans TR010034/APP/2.12.

6.4.2 The detailed design of these culverts including any requirements for natural beds and ecological provision will be carried out during the detailed design and will be agreed with the LLFA as all these diversions are ordinary watercourses.

6.4.3 Two ordinary watercourses are culverted under the Mottram Moor Link Road immediately to the east of the M67 Junction 4 roundabout.

6.4.4 Hurstclough Brook crosses the Scheme at an oblique angle. This watercourse is culverted below the proposed highway to the west of Roe Cross Road. A new river channel is then provided along the southern edge of the link road to connect to existing Hurstclough Brook. This diversion will include provision of a low flow channel. To the north of the link road and along most of Catchment 1, a new watercourse is to be constructed which will drain the existing catchment into Hurstclough Brook.

6.4.5 Immediately north of Mottram Moor Junction a culvert is detailed along the line of an existing watercourse which is severed by the Scheme.

6.4.6 Tara Brook crosses the proposed single carriageway link immediately to the south of the proposed Mottram Moor Junction at an oblique angle. A new river channel is detailed along the southern edge of the road with a culvert under the proposed highway followed by another section of new river channel from the northern edge of the road to connect to the existing river channel. This diversion will include provision of a low flow channel.

6.4.7 For further details of the hydrology impacts refer to the Road Drainage and Water Environment chapter (Chapter 13) of the Environmental Statement (TR010034/APP/6.3).

Hydrogeology

6.4.8 Ground investigations are being undertaken and the drainage system will be designed to include appropriate measures to deal with the collection of groundwater. The flow rates will be confirmed following the conclusion of this

investigation and an allowance will be made in the design. Where practical to do so, this system will be kept separate from the carriageway drainage collection system. In general, these systems will comprise filter drains and/or ditches.

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