

High Speed Rail (Crewe – Manchester)

Supplementary Environmental Statement 2 and Additional Provision 2 Environmental Statement

Volume 5: Appendix WR-003-0MA07

Water resources and flood risk

Water resources assessment

MA07: Davenport Green to Ardwick

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Department for Transport

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1 Introduction

1.1 Structure of this appendix

- 1.1.1 This report is an appendix to the water resources and flood risk assessment which forms part of Volume 5 of the Supplementary Environmental Statement 2 (SES2) and Additional Provision 2 Environmental Statement (AP2 ES) for the Davenport Green to Ardwick (MA07) community area.
- 1.1.2 This appendix provides details of changes to the water resources assessment since the production of the High Speed Two (HS2) High Speed Rail (Crewe – Manchester) Environmental Statement (ES)¹ (the main ES) and the HS2 High Speed Rail (Crewe – Manchester) Background Information and Data (BID)² (the main BID report) which accompanied the main ES published in 2022.
- 1.1.3 An assessment of the impact of the original scheme on water resources was undertaken as part of the water resources and flood risk assessment reported in the main ES (Volume 2, Community Area report: Davenport Green to Ardwick (MA07) and Volume 5, Appendix: WR-003-0MA07) referred to hereafter as ‘the original water resources assessment’.
- 1.1.4 This appendix should be read in conjunction with the Volume 5, Appendix: WR-003-0MA07 which accompanied the main ES.
- 1.1.5 The watercourses and other surface water features are shown in the SES2 and AP2 ES Volume 5, Water resources and flood risk Map Book: Map Series WR-01 – Surface Water Baseline.
- 1.1.6 In order to differentiate between the original scheme and the subsequent changes, the following terms are used:
- ‘the original scheme’ – the hybrid Bill (the Bill) scheme submitted to Parliament in 2022, which was assessed in the main ES;
 - ‘the SES1 scheme’ – the original scheme with any changes described in SES1 that are within the existing powers of the Bill;
 - ‘the AP1 revised scheme’ – the original scheme as amended by SES1 changes and AP1 amendments;

¹ High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement*. Available online at: <https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement>.

² High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Background Information and Data*. Available online at: <https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement>.

- ‘the SES2 scheme’ – the original scheme with any changes described in SES1 (submitted in July 2022) and the SES2; and
- ‘the AP2 revised scheme’ – the original scheme as amended by SES1 and SES2 changes (as relevant) and AP2 amendments.

1.1.7 The purpose of this document is to report any changes or updates to environmental information and scheme design or assumptions that have occurred since the main ES, which will result in a change in effects and/or the introduction of new effects on water resources receptors.

1.1.8 The route-wide Water Framework Directive (WFD) compliance assessment (see Volume 5, Appendix: WR-001-00000 of the main ES) has also been updated to take into account the SES2 changes and AP2 amendments. This is presented in the SES2 and AP2 ES Volume 5, Appendix: WR-001-00000.

1.2 Assessment and methodology

1.2.1 The scope, assumptions and limitations for the water resources assessment are as set out in the main ES Environmental Impact Assessment Scope and Methodology Report (SMR)³. In the main ES, the study area was extended to include the potential zone of influence of dewatering from the construction of the vent shafts on groundwater (up to 1.5km from the vent shaft sites). This extended study area has also been applied to the assessment of the AP2 revised scheme.

³ High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement, Environmental Impact Assessment Scope and Methodology Report*, Volume 5, Appendix: CT-001-00001. Available online at: <https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement>.

Part 1: Supplementary Environmental Statement 2

2 New environmental baseline information relevant to water resources

- 2.1.1 Since the main ES, the Environment Agency has issued updated datasets for groundwater source protection zones (SPZ), discharge consents and licensed water abstractions. However, these updated datasets do not introduce any new receptors or change existing receptors for water resources and flood risk topic in this area. For the SES2 scheme, the additional data does not result in any new or different significant effects compared to the main ES.

3 Changes to design or construction assumptions which do not require changes to the Bill relevant to water resources

- 3.1.1 There are no SES2 design changes or construction assumptions that are relevant to the assessment of impacts and effects on the water environment.

4 Assessment of impacts and effects during construction

- 4.1.1 There are no SES2 design changes or construction assumptions that are relevant to the assessment of the water environment. Therefore, there are no changes to construction impacts and effects reported for the water environment.

5 Assessment of impacts and effects during operation

- 5.1.1 There are no SES2 design changes or operational assumptions that are relevant to the assessment of the water environment. Therefore, there are no changes to operational impacts and effects reported for the water environment.

Part 2: Additional Provision 2 Environmental Statement

6 Summary of amendments to scheme design and construction assumptions relevant to water resources

- 6.1.1 There are four AP2 amendments that will involve construction activities of a nature and scale that have potential implications for the water environment. These are as follows:
- change to Bill powers required for relocation of vent shaft and headhouse from Palatine Road to The Hollies (AP2-007-003);
 - change to Bill powers required for modifications to the Birchfields Road vent shaft headhouse (AP2-007-005);
 - additional land permanently required for the diversion of Blackbrook Culvert (AP2-007-006); and
 - additional land permanently required for changes to design elements managed by the Manchester tunnel north portal main compound (AP2-007-008).
- 6.1.2 The construction activities could result in impacts and effects on the surface water and groundwater environment and are discussed in the subsequent sections of Part 2.
- 6.1.3 This part of the assessment presents consideration of the potential new or changed impacts and effects associated with the proposed AP2 amendments. New or changed impacts and effects associated with the design changes, as well as those that are unchanged and were assessed in the main ES, are presented in Annex A.

7 Water resources baseline

- 7.1.1 No additional baseline information related to water resources supplemental to the SES2 information is required for assessment of AP2 amendments.

8 Assessment of impacts and effects during construction

8.1 Avoidance and mitigation

- 8.1.1 The avoidance and mitigation measures specific to water resources and flood risk are set out in the Volume 2, Community Area report: Davenport Green to Ardwick (MA07) of the main ES. No additional avoidance and mitigation measures are relevant to these amendments.

8.2 Change to Bill powers required for relocation of vent shaft and headhouse from Palatine Road to The Hollies (AP2-007-003)

- 8.2.1 The proposed vent shaft relocation (AP2-007-003) places the vent shaft to the west of Palatine Road behind the Britannia Hotel, on the disused playing fields of the former Hollies School. Therefore, for the AP2 revised scheme the relocated vent shaft will be known as The Hollies vent shaft.

Temporary effects

Aquifers

- 8.2.2 The proposed vent shaft relocation (AP2-007-003) places The Hollies vent shaft within the same geological setting as that set out in the main ES.
- 8.2.3 The main ES reported a temporary minor adverse effect on groundwater flow in the alluvium (Secondary A aquifer) and negligible effect in the river terrace deposits due to dewatering during construction. Dewatering requirements were reduced in the design due to the proposed use of diaphragm walls to construct the shaft. These effects were assessed as not significant.
- 8.2.4 A temporary moderate adverse effect, which is significant, was reported in the main ES, on groundwater flows in the Wilmslow Sandstone Formation, Sherwood Sandstone Group (Principal aquifer), as a result of dewatering for construction. A major adverse temporary effect, which is significant, on groundwater quality was also reported due to the risk of drawing saline water up from the deep aquifer during dewatering (known as saline upwelling). These potential effects were reduced to negligible and not significant through the proposed use of full depth diaphragm walls to reduce the requirement for dewatering and reduce the risk of saline upwelling. Monitoring was also proposed to identify changes in groundwater quality that may require revisions to the construction method.

- 8.2.5 The proposed vent shaft relocation (AP2-007-003) amendment will change the location to The Hollies vent shaft; however, it will have the same geological setting, construction methodology and design as the Palatine Road vent shaft set out in the main ES. Therefore, no new or different significant effects on groundwater are anticipated as a result of this amendment.

Abstractions

- 8.2.6 In the main ES, a precautionary temporary moderate adverse effect, which is significant, was reported on the Borehole at Didsbury Golf Club, Northenden, Wythenshawe. This was due to the potential for the Palatine Road vent shaft construction and dewatering to affect groundwater flow and quality. Mitigation measures were presented in the main ES, which lead to a negligible residual effect which is not significant. A survey of the abstraction site to further assess its usage and consider the risks of changes in water level or quality at this abstraction was recommended as design progresses.
- 8.2.7 The proposed vent shaft relocation (AP2-007-003) amendment will relocate the vent shaft approximately 300m further to the north-west, away from the abstraction than the original scheme. However, on a precautionary basis, pending additional ground investigation information, this potential effect remains for the AP2 revised scheme.
- 8.2.8 There will be no new or different significant effects on abstractions as a result of this amendment.

Groundwater-surface water interactions

- 8.2.9 In the main ES, a temporary, moderate adverse effect, which is significant, was reported on baseflow to the Tributary of River Mersey 2. This was due to potential reductions in groundwater level during dewatering of the Palatine Road vent shaft, leading to a reduction in surface water flows. In the main ES, the residual effect was reduced to negligible and not significant through the proposed use of full depth diaphragm walls to reduce the requirement for dewatering.
- 8.2.10 In this amendment (AP2-007-003), The Hollies vent shaft will be located further away from the Tributary of River Mersey 2 than the original scheme, to a location 250m north of the watercourse. However, on a precautionary basis, pending additional ground investigation information, this potential effect remains for the AP2 revised scheme.
- 8.2.11 There will be no new or different significant effects on groundwater-surface water interactions as a result of this amendment.

Water dependent habitats

- 8.2.12 Wrengate Wood Site of Biological Interest (SBI) and Heyscroft ancient woodland (AW) were identified in the main ES as potentially being supported by groundwater, on a precautionary basis. The main ES reports that during the construction phase, there will be a potential

temporary impact on groundwater quality and on groundwater levels and flows due to dewatering. These potential temporary effects would be mitigated to negligible with the application of the full depth diaphragm walls and through the good construction practice embedded in the draft Code of Construction Practice (CoCP)⁴ (as set out in the main ES).

- 8.2.13 The Hollies vent shaft (AP2-007-003) is located at a similar distance from this receptor to that set out in the main ES. Therefore, the impact with embedded mitigation, would remain as negligible, which is classified as not significant.

Permanent effects

- 8.2.14 The main ES reported a permanent major adverse effect, which is significant, on water quality in the Wilmslow Sandstone Formation (Principal aquifer). This was due to the potential for construction dewatering at the Palatine Road vent shaft to draw in saline water from the deep parts of the aquifer (known as saline upwelling). The effect was reduced to negligible, not significant, through the proposed use of full depth diaphragm walls to reduce the requirement for dewatering and reduce the risk of saline upwelling. Monitoring of groundwater quality before, during and after dewatering activities was proposed.
- 8.2.15 The Hollies vent shaft (AP2-007-003) will remain within the same aquifer as the original scheme, and this amendment will not change the significance of the permanent effect that was reported in the main ES.

8.3 Change to Bill powers required for modifications to the Birchfields Road vent shaft headhouse (AP2-007-005)

Temporary effects

- 8.3.1 The main ES reported potential temporary, moderate impact on groundwater flow in the glacial till, a Secondary (Undifferentiated) aquifer from dewatering during construction of the Birchfields Road vent shaft. This led to a moderate adverse effect, which is significant. Proposed mitigation presented in the main ES included the use of secant walls through the superficial deposits to reduce the requirement for dewatering. The main ES therefore reported a negligible residual effect, which is not significant.
- 8.3.2 The vent shaft modifications (AP2-007-005) include a new L-shaped basement structure with the dimensions 64.0m by 27.9m by 8.5m deep. This is to accommodate the change from vertical to horizontally mounted fans. This basement will fully penetrate the glacial till

⁴ High Speed Two Ltd (2022), High Speed Rail (Crewe–Manchester), *Environmental Statement, Draft Code of Construction Practice*, Volume 5, Appendix: CT-002-00000. Available online at: <https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement>.

(Secondary (Undifferentiated) aquifer) and extend into the underlying Collyhurst Sandstone Formation, which is part of the Appleby Group (classed as a Principal aquifer).

- 8.3.3 It has been conservatively assumed that groundwater levels within the glacial till and the Collyhurst Sandstone Formation are at ground level and that groundwater flow within the glacial till and the Collyhurst Sandstone Formation may be affected by the dewatering for the construction of the basement structure. As with the shaft construction, the proposed basement will be constructed with secant pile walls to reduce the requirement for dewatering. Therefore, the temporary impact of basement construction on groundwater levels and flow in the glacial till and Collyhurst Sandstone Formation will be negligible, resulting in a negligible effect, which is not significant (see Annex A).
- 8.3.4 There are no new or different temporary effects on abstractions, discharges to ground or groundwater – surface water interactions as a result of this amendment.

Permanent effects

- 8.3.5 No permanent significant effects on groundwater within the glacial till (Secondary (Undifferentiated) aquifer) from construction of the Birchfields Road vent shaft and associated headhouse structure were reported in the main ES.
- 8.3.6 The new basement structure to accommodate horizontally mounted fans will fully penetrate the glacial till and could form a permanent barrier to groundwater flow in the glacial till. Groundwater levels could rise on the upgradient side of the structure, which could potentially give rise to groundwater flooding at the surface at times of high groundwater levels, or groundwater flooding of any existing basements. Given the location of the two nearby committed developments⁵: MA07/524S (25m south of basement structure); and MA07/549S (195m south-west of basement structure), relative to the areas where any increase in groundwater levels may occur, it is unlikely that there would be a significant impact on those developments.
- 8.3.7 To mitigate the effects on the aquifer and existing properties, a drainage solution has been included within the design to allow groundwater to flow around the basement structure and to facilitate re-infiltration of water on the downgradient side. With this embedded mitigation included in the design, the impact is assessed to be negligible, leading to a negligible effect, which is not significant (see Annex A). Ground investigations should be conducted at this location during design progression to better determine the groundwater conditions and aid the design of the drainage solution, if required.
- 8.3.8 As the basement structure partially penetrates the bedrock Collyhurst Sandstone Formation, it could also form a permanent barrier to groundwater flow in the shallowest portion of this aquifer. The drainage solution included in the design will mitigate any potential effect this

⁵ Further information on committed developments can be found in SES2 and AP2 ES Volume 5, Appendix: CT-004-00000, Planning data.

may have by facilitating groundwater flow around the structure, and therefore the impact on the aquifer will be negligible, leading to a negligible effect, which is not significant (see Annex A).

- 8.3.9 There are no new or different effects on abstractions, discharges to ground or groundwater – surface water interactions as a result of this amendment.

8.4 Additional land permanently required for the diversion of Blackbrook Culvert (AP2-007-006)

- 8.4.1 The original scheme alignment passes beneath Blackbrook culvert, an existing culverted watercourse running southeast-northwest beneath the Siemens Ardwick Train Care Facility and adjacent railway lines to the south. In order to avoid impact from Manchester tunnelling activities, the AP2 revised scheme will include a diversion of the existing Blackbrook culvert. The new culvert will be designed to ensure there will be no impacts on the hydrology of the watercourse. Therefore, no new or different significant effects are anticipated on Blackbrook watercourse.

8.5 Additional land permanently required for changes to design elements managed by the Manchester tunnel north portal main compound (AP2-007-008)

Temporary effects

- 8.5.1 The Ardwick modifications (AP2-007-008) amendment includes a proposed new Ardwick access road cantilever retaining wall which will be up to 3m high and will have a total length of 144m. The construction of this wall has the potential to result in a new temporary minor adverse impact on groundwater quality in the glacial till (Secondary (Undifferentiated) aquifer), a moderate value receptor. This would lead to a minor adverse effect, which is not significant. The draft CoCP will be implemented throughout construction to reduce the impact of this design element on groundwater quality, so the residual effect will be reduced to a negligible effect, which is not significant.
- 8.5.2 In the absence of groundwater level data, it is assumed that the water table is at ground level. Therefore, temporary dewatering may be required during excavations for placement of the retaining wall foundations. Dewatering impacts will be localised and temporary, having a minor impact on groundwater levels leading to a minor adverse effect, which is not significant.
- 8.5.3 The superficial glacial till Secondary (Undifferentiated) aquifer is estimated to be approximately 10m thick in this area. It is not anticipated that the retaining wall foundations will penetrate into the top of the underlying bedrock, therefore no temporary impacts are expected.

Permanent effects

- 8.5.4 The new proposed Ardwick access road retaining wall included in the Ardwick modifications (AP2-007-008) amendment will extend approximately 0.75m below ground level and has the potential to form a partial barrier to groundwater flow in the glacial till (Secondary (Undifferentiated) aquifer). This may result in localised elevated groundwater levels upgradient of the structure, potentially leading to an increased risk of groundwater flooding to the eastern side of the wall, around the existing Siemens Ardwick Train Care Facility. Drainage has been provided along the back of this retaining wall, to help facilitate the movement of groundwater to reduce the risk of groundwater flooding. Following this embedded mitigation, the impact is assessed to be minor on groundwater flows, leading to a minor permanent adverse effect, which is not significant.
- 8.5.5 As part of the detailed design, ground investigations are required in this area to determine groundwater conditions, which will inform groundwater drainage design.

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- 8.5.6 The thickness of the superficial glacial till Secondary (Undifferentiated) aquifer is estimated to be approximately 10m thick in this area. Therefore, it is not anticipated that the retaining wall foundations will penetrate the top of the underlying bedrock, and no temporary impacts are expected.

9 Assessment of impacts and effects during operation

- 9.1.1 No new or different operational effects to the water environment will result from the AP2 amendments described in Part 2.

Part 3: Combined effects of changes and amendments in the MA07 area due to changes in construction traffic flows

10 Introduction

- 10.1.1 This section sets out the combined assessment of new or different significant construction traffic effects, as a result of changes in construction traffic flows. These relate to situations where the change in traffic flows cannot be directly attributed to an SES2 change or an AP2 amendment. The assessment has considered any impacts in the Davenport Green to Ardwick (MA07) community area associated with SES2 changes and AP2 amendments in the adjoining community areas.
- 10.1.2 Roads are designed to drain freely to prevent the build-up of standing water on the carriageway whilst avoiding exposure to or causing flooding. Contaminants deposited on the road surface are quickly washed off during rainfall. Where traffic levels are high, the level of contamination increases and therefore the potential for unacceptable harm being caused to the receiving water also increases. There are many circumstances in which runoff from roads is likely to have no discernible effect; however, a precautionary and best practice approach indicates the need for the assessment of the possible impact of pollutant discharges on the water environment from roads affected by the AP2 revised scheme. These effects can either be through spillage and routine runoff pollution from new roads that are used during the operational phase or changes in traffic movements on the existing road network.
- 10.1.3 The AP2 revised scheme makes provision for two methods for draining new sections of highway: direct runoff to soakaway and drainage via an attenuation pond to an existing watercourse. Where changes in traffic volumes have been identified along the existing road network, steps have been taken to identify the type of drainage in place and an assessment has been made of whether the highway works proposed have implications for pollution risk within the Davenport Green to Ardwick (MA07) community area.

11 Methodology and assessment criteria

11.1 Routine runoff pollution risk

- 11.1.1 Where highway drainage is discharged to local watercourses, the assessment for determining whether routine runoff is likely to have a detrimental impact on water quality uses the Highways England Water Risk Assessment Tool (HEWRAT), part of the Design Manual for Roads and Bridges (DMRB)⁶. Where highway realignments are to discharge to kerb side ditches which do not have a baseflow, the Groundwater Assessment (Appendix C of the DMRB – LA 113 Road Drainage and the Water Environment Revision 1⁶) is used.
- 11.1.2 The significance of the impact of the predicted effects on surface water and groundwater receptors has been assessed in accordance with the methodology described in the SMR in the main ES.

11.2 Spillage pollution risk

- 11.2.1 In addition to assessing the potential for adverse effects of routine surface water runoff from highways, an assessment of the potential spillage risk to water quality has been undertaken for highway realignments. The methodology for assessing spillage risk follows the Spillage Risk Assessment (Appendix D of the DMRB – LA 113 Road Drainage and the Water Environment Revision 1⁶).

⁶ Standards for Highways (2020), *Design Manual for Roads and Bridges (DMRB) – LA113 Road Drainage and the Water Environment Revision 1*. Available online at: <https://standardsforhighways.co.uk/search/d6388f5f-2694-4986-ac46-b17b62c21727>.

12 Detailed assessment

12.1 Screening results

- 12.1.1 A screening exercise has not identified the need for routine runoff and pollution risk or spillage assessments in the Davenport Green to Ardwick (MA07) community area during the construction or operational phase of the AP2 revised scheme.

Annex A: Revised detailed impact assessment table

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Table A1: Revised detailed impact assessment table for AP2 revised scheme

Water feature/ receptor	Receptor value	Design element	Discussion of potential impact to water receptor	Magnitude of potential impact and effect	Avoidance and mitigation measures included in design	Magnitude of remaining impact and effect	Other mitigation measures	Residual effects	Duration of effect
Glacial till – Secondary (Undifferentiated) aquifer	Moderate	Deeper excavations (>1mbgl) including: <ul style="list-style-type: none"> Birchfields Road vent shaft basement fan room (AP2-007-005) 	Construction of basement to house horizontal fans for the Birchfields Road vent shaft will fully penetrate the glacial till and act as a barrier to groundwater flow and potentially increase the upgradient risk of groundwater flooding. No change to the overall impact or effect reported in the main ES.	Magnitude of impact – Moderate Significance of effect – Moderate adverse, significant	Drainage provided around the basement structure to facilitate the flow of groundwater around the structure.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Ground investigations should be conducted to determine groundwater conditions and facilitate detailed design.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary and permanent)
		Shallow excavations (<1mbgl) including: <ul style="list-style-type: none"> Ardwick access road retaining wall (AP2-007-008) 	Temporary dewatering may be required to allow for shallow excavations for foundation slab placement. This will be temporary and localised.	Magnitude of impact – Minor Significance of effect – Minor adverse, not significant	The draft CoCP will be implemented throughout construction	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Ground investigations should be conducted to determine groundwater conditions and facilitate detailed design.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)
			The L-shaped retaining wall will reach a	Magnitude of impact –	Drainage is provided	Magnitude of impact –	None required	Magnitude of impact –	Construction (permanent)

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Water feature/ receptor	Receptor value	Design element	Discussion of potential impact to water receptor	Magnitude of potential impact and effect	Avoidance and mitigation measures included in design	Magnitude of remaining impact and effect	Other mitigation measures	Residual effects	Duration of effect
			<p>maximum of 0.75mbgl and is 144m in length. It has the potential to act as a barrier to shallow groundwater flow, causing elevated groundwater levels upgradient of the structure. This is a new impact for the AP2 revised scheme.</p>	<p>Minor Significance of effect – Minor adverse, not significant</p>	<p>behind the retaining wall to facilitate the movement of groundwater around the wall</p>	<p>Negligible Significance of effect – Negligible, not significant</p>		<p>Negligible Significance of effect – Negligible, not significant</p>	
			<p>The temporary works have the potential to affect shallow groundwater quality, although this is likely to be localised and temporary. This is a new impact for the AP2 revised scheme.</p>	<p>Magnitude of impact – Minor Significance of effect – Minor adverse, not significant</p>	<p>Implementation of draft CoCP throughout construction.</p>	<p>Magnitude of impact – Negligible Significance of effect – Negligible, not significant</p>	<p>None</p>	<p>Magnitude of impact – Negligible Significance of effect – Negligible, not significant</p>	<p>Construction (temporary)</p>
Alluvium – Secondary A aquifer	Moderate	<p>Deeper excavation (>1mbgl) including:</p> <ul style="list-style-type: none"> The Hollies vent shaft (AP2-007-003) 	<p>The temporary works have the potential to affect groundwater flow, levels and quality, although this is likely to be localised and temporary. No change to the overall</p>	<p>Magnitude of impact – Minor Significance of effect – Minor</p>	<p>None required though the draft CoCP will be implemented throughout construction.</p>	<p>Magnitude of impact – Negligible Significance of effect – Negligible,</p>	<p>None required</p>	<p>Magnitude of impact – Negligible Significance of effect – Negligible,</p>	<p>Construction (temporary)</p>

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Water feature/ receptor	Receptor value	Design element	Discussion of potential impact to water receptor	Magnitude of potential impact and effect	Avoidance and mitigation measures included in design	Magnitude of remaining impact and effect	Other mitigation measures	Residual effects	Duration of effect
			impact or effect reported in the main ES.	adverse, not significant		not significant		not significant	
River terrace deposits – Secondary A aquifer	Moderate	Deeper excavation (>1mbgl) including: <ul style="list-style-type: none"> The Hollies vent shaft (AP2-007-003) 	The temporary works have the potential to affect groundwater flow, levels and quality, although this is likely to be localised and temporary. No change to the overall impact or effect reported in the main ES.	Magnitude of impact – Minor Significance of effect – Minor adverse, not significant	None required though the draft CoCP will be implemented throughout construction.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)
			The vent shaft is not located in the river terrace deposits and the proposed use of diaphragm walls will reduce any impacts on local groundwater levels.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required though the draft CoCP will be implemented throughout construction.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary and permanent)
Sherwood Sandstone Group – Wilmslow Sandstone Formation – Principal aquifer	High	Deeper excavations (>1mbgl) including:	Dewatering during construction of the vent shaft may temporarily act to alter local groundwater flow and levels.	Magnitude of impact – Minor Significance of effect – Moderate	The proposed use of full depth diaphragm walls will reduce requirement	Magnitude of impact – Negligible Significance of effect – Negligible,	None required	Magnitude of impact – Negligible Significance of effect – Negligible,	Construction (temporary)

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Water feature/ receptor	Receptor value	Design element	Discussion of potential impact to water receptor	Magnitude of potential impact and effect	Avoidance and mitigation measures included in design	Magnitude of remaining impact and effect	Other mitigation measures	Residual effects	Duration of effect
		<ul style="list-style-type: none"> The Hollies vent shaft (AP2-007-003) 	No change to the overall impact or effect reported in the main ES.	adverse, significant	for dewatering (internal dewatering only). Dewatering will be in small quantities and temporary in nature.	not significant		not significant	
			There is a risk that dewatering during construction of the vent shaft may draw in poor quality groundwater. No change to the overall impact or effect reported in the main ES.	<p>Magnitude of impact – Major</p> <p>Significance of effect – Major adverse, significant</p>	The proposed use of full depth diaphragm walls will reduce requirement for dewatering (internal dewatering only) thus removes the risk of saline upwelling. Due to the proximity of the vent shaft to the River Mersey, diaphragm walls are	<p>Magnitude of impact – Negligible</p> <p>Significance of effect – Negligible, not significant</p>	Monitoring of groundwater quality before, during and after dewatering. If a significant change in water quality occurs during dewatering, a revised construction plan will be agreed and implemented.	<p>Magnitude of impact – Negligible</p> <p>Significance of effect – Negligible, not significant</p>	Construction (temporary and permanent)

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					included in design to mitigate the additional risk of uncontrolled inflows.				
Appleby Group – Collyhurst Sandstone Formation – Principal aquifer	High	Deeper excavations (>1mbgl) including: <ul style="list-style-type: none"> Birchfields Road vent shaft basement fan room (AP2-007-005) 	Dewatering during construction of the vent shaft and basement fan room may temporarily act to alter groundwater flow and levels. No change to the overall impact or effect reported in the main ES.	Magnitude of impact – Moderate Significance of effect – Moderate adverse, significant	Proposed methodology only allows internal dewatering at Birchfields Road vent shaft and avoidance measures (i.e. injection grouting) will be implemented during construction to reduce impact on groundwater flow.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)
			The basement fan room will form a permanent barrier to groundwater	Magnitude of impact – Minor	Drainage provided around the	Magnitude of impact – Negligible	None required	Magnitude of impact – Negligible	Construction (permanent)

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Water feature/ receptor	Receptor value	Design element	Discussion of potential impact to water receptor	Magnitude of potential impact and effect	Avoidance and mitigation measures included in design	Magnitude of remaining impact and effect	Other mitigation measures	Residual effects	Duration of effect
			flow on the shallowest portion of the aquifer. As the structure is small in comparison to the vertical and lateral extent of the aquifer, the impact it will have is minor.	Significance of effect – Moderate adverse, significant	basement structure to facilitate the flow of groundwater around the structure.	Significance of effect – Negligible, not significant		Significance of effect – Negligible, not significant	
Borehole at Didsbury Golf Club, Northenden, Wythenshawe 2569015006	Moderate	Deeper excavations (>1mbgl) including: <ul style="list-style-type: none"> The Hollies vent shaft (AP2-007-003) 	The temporary works will affect groundwater flow and quality during dewatering for the construction of the vent shaft, although this is likely to be localised and temporary. No change to the overall impact or effect reported in the main ES.	Magnitude of impact – Major Significance of effect – Moderate adverse, significant	The proposed use of full depth diaphragm walls will reduce requirement for dewatering (internal dewatering only). Dewatering will be in small quantities and temporary in nature.	Magnitude of impact – Major Significance of effect – Moderate adverse, significant	Further investigation and monitoring. If detailed investigations by the nominated undertaker confirm a risk of temporary impact on the abstraction, mitigation measures will be agreed with the licence holder.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)

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Tributary of River Mersey 2	Moderate	Deeper excavations (>1mbgl) including: <ul style="list-style-type: none"> The Hollies vent shaft (AP2-007-003) 	The detailed assessment shows that this feature is within the potential dewatering zone of influence and groundwater may be intercepted that would otherwise flow to this watercourse. No change to the overall impact or effect reported in the main ES.	Magnitude of impact – Moderate Significance of effect – Moderate adverse, significant	The proposed use of full depth diaphragm walls will reduce requirement for dewatering (internal dewatering only). Dewatering will be in small quantities and temporary in nature.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)
			There is a low risk that dewatering during construction of the vent shaft may draw in poor quality groundwater that might then be discharged to Tributary of River Mersey 2. No change to the overall impact or effect reported in the main ES.	Magnitude of impact – Moderate Significance of effect – Moderate adverse, significant	The proposed use of full depth diaphragm walls will reduce requirement for dewatering (internal dewatering only). Dewatering will	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (permanent)

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Water feature/ receptor	Receptor value	Design element	Discussion of potential impact to water receptor	Magnitude of potential impact and effect	Avoidance and mitigation measures included in design	Magnitude of remaining impact and effect	Other mitigation measures	Residual effects	Duration of effect
					be in small quantities and temporary in nature.				
Committed Development MA07/524S Committed Development MA07/549S	High	Deeper excavations (>1mbgl) including: <ul style="list-style-type: none"> Birchfields Road vent shaft basement fan room (AP2-007-005) 	There is a risk that backing up of groundwater due to the presence of the new basement fan room could result in groundwater flooding. This is however unlikely as the assumed hydraulic gradient places these committed developments downgradient of the basement, where groundwater levels are expected to be depressed.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Drainage provided around the basement structure to facilitate the flow of groundwater around the structure.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Ground investigations should be conducted to determine groundwater conditions and facilitate detailed design.	Committed Development MA07/524S Committed Development MA07/549S	Construction (permanent)

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