HIGH SPEED RAIL (LONDON - WEST MIDLANDS)

Supplementary Environmental Statement and Additional Provision 2 Environmental Statement

Volume 5 | Technical appendices

Water resources (WR-001-000)

July 2015

SES and AP2 ES 3.5.6.1

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Department for Transport

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A report prepared for High Speed Two (HS2) Limited:

AECOM ARUP ATKINS CAPITA

ERM ineco Mott MacDonald PARSONS BRINCKERHOFF TEMPLE

High Speed Two (HS2) Limited,
One Canada Square,
London
E14 5AB

Details of how to obtain further copies are available from HS2 Ltd.

Telephone: 020 7944 4908

General email enquiries: HS2enquiries@hs2.org.uk

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Contents

List of tables

List of Annexes

1 Introduction

1.1 Structure of the water resources and flood risk assessment appendices

1.1.1 This appendix provides an update to Appendix WR-001-000 Route-wide Appendix from the Environmental Statement (ES) published in November 2013 (the 'main ES') (Volume 5 of the main ES) as a result of surveys completed as part of the Supplementary Environmental Statement (SES) and the Additional Provision 2 Environmental Statement (AP2 ES). This update should therefore be read in conjunction with Appendix WR-001-000 from the main ES.

1.1.2 Where the available baseline data was limited and a potential risk was identified in the main ES, Water Framework Directive (WFD) surveys were undertaken during 2014 and are the basis of Part 1 of this appendix.

1.1.3 The water resources and flood risk assessment appendices comprise three main parts. The first of these is a route-wide appendix (i.e. this appendix).

1.1.4 Specific appendices for each community forum area (CFA) are also provided, as follows, where there has been a new or different significant effect or an AP2 amendment requiring supporting explanatory material:

- a water resources assessment; and
- a flood risk assessment (FRA).

1.1.5 For some CFA, additional appendices give details of site specific hydraulic models that were created to assist the FRA.

1.1.6 Maps referred to throughout the water resources and flood risk assessment appendices are contained in the Volume 5, Water Resources and Flood Risk Assessment Map Book.

1.1.7 This appendix is structured as follows:

- Part 1: Supplementary Environmental Statement;
- Part 2: Additional Provision 2 Environmental Statement; and
- Annexes containing the details of the WFD surveys and WFD assessment.

1.2 Purpose of this appendix

1.2.1 This appendix reports on the assessments that have been carried out on a route-wide basis since September 2013. It includes an assessment of compliance of the original scheme (i.e. the scheme assessed within the main ES) and the AP2 amendments with the requirements of the WFD 2000/60/EC[1].

[1] Water Framework Directive - Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, Strasbourg, European Parliament and European Council.

1.3 Stakeholder engagement

1.3.1 Discussions were held with the Environment Agency during the preparation of the original scheme, SES and AP2 WFD assessments. These discussions ensured that issues raised by the Environment Agency were addressed during the preparation of this report and, where considered appropriate, their suggestions were incorporated.

2 Part 1 – Water Framework Directive Supplementary Environmental Statement

2.1 Introduction

Overview of the Water Framework Directive

2.1.1 The WFD aims to protect and enhance the quality of the water environment across all European Union (EU) member states. It takes a holistic approach to the sustainable management of water by considering the interactions between surface water, groundwater and water-dependent ecosystems.

2.1.2 Under the WFD, 'water bodies' are the basic management units and are defined as all or part of a river system or aquifer. These water bodies form part of a larger 'river basin district' (RBD), for which 'river basin management plans' (RBMP) are developed by EU member states and environmental objectives are set. These RBMP are produced every six years, in accordance with the river basin management planning cycle. The most recent RBMPs were produced in 2009. The next plans are due in 2015.

2.1.3 The WFD requires all EU member states to classify the current condition or 'status or potential' of surface water and groundwater bodies and to set a series of objectives for maintaining or improving conditions so that water bodies maintain or reach 'good status or potential'.

Water Framework Directive requirements for new developments

2.1.4 To ensure compliance with the WFD, decision makers, must consider whether proposals for new developments have the potential to:

- cause a deterioration of a water body from its current status or potential; and/or
- prevent future attainment of good status or potential where not already achieved.

2.1.5 This appendix presents the assessment of potential for deterioration.

2.1.6 The assessment of prevention of future attainment of good status or potential was presented in the main ES taking into account the Environment Agency reasons for failure and the programme of measures in the RBMP. The assessment concluded that the original scheme will not prevent future attainment of good status or potential where not already achieved.

2.1.7 The Environment Agency is generally responsible for implementation of the WFD in England.

Water Framework Directive assessment in the main ES

2.1.8 The original scheme will cross a large number of surface water bodies and groundwater bodies. An assessment of the original scheme's compliance against the

WFD objectives of the potentially affected water bodies was provided in the Volume 5 Appendix WR-001-000 of the main ES.

2.1.9 The route-wide WFD assessment considered effects on 60 surface water bodies and 15 groundwater bodies which lie within the original scheme boundary, and those which lie up and downstream for which there is a potential risk of impacts. The scope and the assessment methodology were agreed with the Environment Agency.

2.1.10 The majority of the original scheme is predicted to result in local or temporary effects that are considered unlikely to affect WFD status at the water body scale even though potential risks to individual WFD elements were identified for a number of the water bodies. A detailed description of the WFD elements is provided in Appendix WR-001-000 of the main ES.

2.1.11 The assessment concluded that the original scheme will not prevent future attainment of good status or potential where not already achieved.

2.1.12 The assessment also concluded that 45 surface water bodies and six groundwater bodies will not experience any deterioration in current status or potential.

2.1.13 For 15 surface water bodies and nine groundwater bodies there is considered to be a risk of deterioration. For 11 of the surface water bodies and eight of the groundwater bodies, the risk of deterioration in status is considered to be low.

2.1.14 For the remaining four surface water bodies and one groundwater body there is a higher risk of deterioration in current status or potential despite mitigation measures identified in all the CFA reports.

2.1.15 The assessment was undertaken on a precautionary basis given that the baseline data was not available for all the affected water bodies and tributaries, and that the design of mitigation measures is at an outline stage.

2.2 Water Framework Directive surveys 2014

2.2.1 WFD surveys (which include hydromorphological walkovers, fish, macro-invertebrate and macrophyte surveys, groundwater spring and groundwater dependent terrestrial ecosystem (GWDTE) walkovers and National Vegetation Classification (NVC) surveys) have been undertaken since submission of the main ES. A summary of surface water body surveys is provided in Table 1 and groundwater surveys in Table 2.

2.2.2 Details of WFD survey work undertaken since September 2013 are provided in Annex A Surface water and Annex B Groundwater of this report. The WFD annexes are presented as spreadsheets for each water body. The survey results are contained in the associated audit trail.

Table 1: Summary of surface water WFD surveys

Water body Identification (ID)	Water body name	CFA (number and name)	Catchment/RBD	Survey sites (Y denotes survey completed)	Hydromorph walkover	Ecological walkover	Fish survey	Macroinvertebrate	Macrophyte
GB106039023090	Colne and Grand Union Canal (GUC) (from confluence with Chess to Ash)	7 - Colne Valley	Colne	Colne at South Harefield	Y	Y	Y	Y	Y
				New Years Green Bourne at South Harefield	Y	Y	-	-	-
GB106039030320	Stoke Brook, Aylesbury	10 - Dunsmore, Wendover and Halton 11 - Stoke Mandeville and Aylesbury	Thame and South Chilterns	Hartwell Ditches at Lower Hartwell	Y	Y	-	-	-
				Sedrup Ditches at Aylesbury	Y	Y	-	-	-
				Unnamed tributary of Stoke Brook, east of North Lee	Y	Y	-	-	-
				Unnamed tributary of Stoke Brook (parallel to main water body), east of North Lee	Y	Y	-	Y	Y
				Stoke Brook at North Lee	Y	Y	-	Y	Y
				Unnamed tributary of Stoke Brook near Nash Lee	Y	Y	-	Y	Y
GB106039030420	Fleet Marston Brook, Denham Brook, Pitchcott Brook west	11 - Stoke Mandeville and Aylesbury 12 - Waddesdon and Quainton	Thame and South Chilterns	Fleet Marston Brook upper reaches north of Waddesdon	Y	Y	-	-	-
				Unnamed tributary of Fleet Marston Brook, near Fleet Marston Farm	Y	Y	-	-	-
				Unnamed tributary of Fleet Marston Brook, near Aylesbury Vale Parkway	Y	Y	-	-	-
GB106039030070	Tetchwick Brook, Source to Ray and tributaries	12 - Waddesdon and Quainton	Cherwell	Doddershall Brook west of Quainton	Y	Y	-	-	-
				Unnamed tributary of Tetchwick Brook, near Upper South Farm	Y	Y	-	-	-
GB105033030560	Twin	13 - Calvert, Steeple Claydon, Twyford and Chetwode	Upper and Bedford Ouse	Unnamed tributary of the Twin, near Shepherds Furze Farm	Y	Y	-	-	-
				Unnamed tributary of the Twin, south of Steeple Claydon	Y	Y	-	-	-
GB105033038210	Padbury Brook (The	13 - Calvert, Steeple	Upper and Bedford Ouse	Padbury Brook, south of Chetwode	Y	Y	Y	Y	Y

Water body Identification (ID)	Water body name	CFA (number and name)	Catchment/RBD	Survey sites (Y denotes survey completed)	Hydromorph walkover	Ecological walkover	Fish survey	Macroinvertebrate	Macrophyte
	Twins)	Claydon, Twyford and Chetwode 14 - Newton Purcell to Brackley		Unnamed tributary of Padbuiry Brook, near Barton Hartshorn	Y	Y	-	Y	-
				Unnamed tributary of Padbury Brook, east of Portway Farm	Y	Y	-	-	-
				Unnamed tributary of Padbury Brook, west of Portway Farm	Y	Y	-	-	-
				Unnamed tributary of Padbury Brook, near Cowley Lodge	Y	Y	-	-	-
				Unnamed tributary of Padbury Brook, parallel to main water body	Y	Y	-	-	-
				Unnamed tributary of Padbury Brook, near Rosehill Farm	Y	Y	-	-	-
GB105033037880	Ouse	14 - Newton Purcell to Brackley	Upper and Bedford Ouse	River Ouse, north of Turweston	Y	Y	-	-	-
				Unnamed tributary of River Ouse near Brackley	Y	Y	-	-	-
GB105033037940	Radstone Brook	14 - Newton Purcell to Brackley 15 - Greatworth to Lower Boddington	Upper and Bedford Ouse	Radstone Brook at Radstone	Y	Y	-	-	-
				Unnamed tributary of Radstone Brook, north of Radstone	Y	Y	-	-	-
				Radstone Brook upper reaches, near Radstone	Y	Y	-	-	-
GB106039037350	Cherwell (Ashby Brook to Cropredy)	15 - Greatworth to Lower Boddington	Cherwell	River Cherwell, east of Edgcote	Y	Y	Y	Y	Y
				Unnamed tributary of River Cherwell, near Danes Moor	Y	Y	-	-	-
				River Cherwell upper reaches and tributaries, east of Thorpe Mandeville	Y	Y	-	Y	-
				Osierbed Spinney, tributary of River Cherwell, east of Edgcote	Y	Y	-	-	-
GB109054044070	River Itchen - source to confluence with River Stowe	16 - Ladbroke and Southam	Warwickshire Avon	Unnamed tributary of River Itchen, east of Ladbroke	Y	Y	-	-	-
GB109054044480	Finham Brook - confluence with Canley Brook to	18 - Stoneleigh, Kenilworth and Burton	Warwickshire Avon	Finham Brook, west of Stoneleigh	Y	Y	Y	Y	-

Water body Identification (ID)	Water body name	CFA (number and name)	Catchment/RBD	Survey sites (Y denotes survey completed)	Hydromorph walkover	Ecological walkover	Fish survey	Macroinvertebrate	Macrophyte
	confluence with River Sowe	Green							
GB109054044520	Canley Brook - source to confluence with Finham Brook	18 - Stoneleigh, Kenilworth and Burton Green	Warwickshire Avon	Canley Brook, east of Crackley Lane	Y	Y	Y	Y	Y
				Unnamed tributary of Canley Brook, near Hurst Farm	Y	Y	-	-	-
GB104028042571	River Blythe from Temple Balsall Brook to Patrick Bridge	23 - Balsall Common and Hampton in Arden	Tame Anker and Mease	Horn Brook, tributary of River Blythe, west of Kenilworth Road	Y	Y	-	-	-
				Bayleys Brook, north of Truggist Lane	Y	Y	-	-	-
				Bayleys Brook, near Marsh Farm	Y	Y	Y	Y	-
				Bayleys Brook, east of Kenilworth Road -ground-truthed: site does not exist at crossing (already in culvert) - picked it up, upstream of crossing however.	Y	Y	-	-	-
GB104028042572	River Blythe from Patrick Bridge to River Tame	23 - Balsall Common and Hampton in Arden 24 - Birmingham Interchange and Chelmsley Wood	Tame Anker and Mease	River Blythe, north of Meriden Road	Y	Y	Y	Y	Y
				Shadow Brook, west of Didington Lane	Y	Y	-	-	-
				Hollywell Brook, east of Middle Bickenhill Lane	Y	Y	-	-	-
GB104028047020	East Litchfield catchment - tributary of Tame	22 - Whittington to Handsacre	Tame Anker and Mease	Fisherwick Brook, west of Cappers Lane	Y	Y	-	-	-

2.2.3 The results of the WFD surveys provide additional baseline information to inform the WFD assessment. In some cases this results in increased sensitivity of the surveyed water body and in some cases reduced sensitivity.

2.2.4 Examples of changes in sensitivity as a result of each survey type in relation to WFD surface water classification (biological, physico-chemical and hydromorphological) include:

- biological - macrophytes: walkover surveys indicated that tributaries were

heavily shaded and unsuitable for macrophytes, therefore the impact on this sub-element has been reassessed from a minor, localised effect (yellow) to having no impact (green);

- biological – macroinvertebrates: walkover surveys confirmed that a watercourse was of poor potential for macroinvertebrates, therefore the impact on this sub-element has been reassessed from a minor, localised effect (yellow) to having no impact (green);
- biological – fish: walkover surveys confirmed that a tributary of a main watercourse consisted of poor fish habitat, therefore the impact on this sub-element has been reassessed from an adverse effect (amber) to a minor, localised effect (yellow); and
- physico-chemical: walkover surveys confirmed that a watercourse was dry/ephemeral, therefore the physico-chemical impacts have been reassessed from a minor, localised effect (yellow) to having no impact (green).
- hydromorphological: walkover surveys confirmed that a watercourse is effectively field drains with no morphological value, therefore the hydromorphological impacts have been reassessed from an adverse effect (amber) to having no impact (green).

Table 2: Summary of groundwater WFD surveys

Water body ID	Water body name	CFA (number and name)	Catchment/RBD	Survey sites (Y denotes survey completed)	Groundwaterwalkover	GWD NVC
GB40601G604100	Chiltern Chalk Scarp	10 - Dunsmore, Wendover and Halton	Thames	Wendover/Worlds End	Y	Y
GB40501G402300	Upper Bedford Ouse Oolite Principal	14 - Newton Purcell to Brackley	Anglian	Turweston	Y	Y
		14 - Newton Purcell to Brackley		Brackley South	Y	Y
		15 - Greatworth to Lower Boddington		Greatworth South	Y	-
GB40602G604200	Byfield Jurassic	15 - Greatworth to Lower Boddington	Thames	Thorpe Mandeville	Y	Y
GB40602G600200	Banbury Jurassic	15 - Greatworth to Lower Boddington	Thames	Edgcote/Chipping Warden	Y	-

Water body ID	Water body name	CFA (number and name)	Catchment/RBD	Survey sites (Y denotes survey completed)	Groundwaterwal kover	GWD NVC
GB40401G302700	Tame Anker and Mease - PT Sandstone Nuneaton and Meriden	23 - Balsall Common and Hampton in Arden	Humber	Berkswell Marsh Site of Special Scientific Interest (SSSI)	Y	Y
GB40402G990800	Tame Anker Mease - Secondary Combined	24 - Birmingham Interchange and Chelmsley Wood	Humber	Coleshill and Bannerly Pools SSSI	Y	Y
GB40401G301000	Tame Anker Mease - PT Sandstone Birmingham Lichfield	21 - Drayton Bassett, Hints and Weeford	Humber	Swinfen Cutting	Y	-

2.2.5 The Volume 2 SES assessments use the updated baseline to determine whether there is a new or different significant effect from those reported in the main ES and the AP1 ES.

Assumptions and limitations

2.2.6 Where baseline data is limited, professional judgement has been used in the assessment and a precautionary approach taken.

2.3 Water Framework Directive assessment of new or different significant effects

Surface water body assessment

Presentation of findings

2.3.1 The assessment for each surface water body is presented in Annex A using the same matrix approach as the main ES. WFD elements are listed in the left hand column, with HS2 scheme elements presented across the top of the matrix. A summary of the available engineering design information relating to each HS2 scheme element is presented beneath the name of the scheme element to allow the reader to understand the basis for the assessment. Individual impacts arising from each HS2 scheme element are grouped into a set of columns under the HS2 scheme element.

2.3.2 HS2 scheme elements affecting the main water body are dealt with first on the left hand side of the matrix, with scheme elements affecting tributaries towards the right hand side. Any cumulative effects with other water bodies are also included. The overall assessment for each quality element is presented towards the right hand side of the matrix.

2.3.3 A further column, containing new hydromorphological baseline information is presented on the extreme right hand side of the matrix.

2.3.4 An assessment of the effects of the HS2 scheme element is presented for each of the quality elements. At the end of the row, an assessment is made of the cumulative effects of the original scheme on the status/potential of that WFD element.

Results of no deterioration assessment

2.3.5 The surface water assessment results are contained in Annex A.

2.3.6 A summary of findings is presented in Table 3.

Table 3: Summary of SES surface water WFD assessment

Surface water body name	Water body ID	Catchment	CFA (number and name)	Original assessment	Post-WFD baseline survey
Canley Brook - source to confluence with Finham Brook	GB109054044520	Warwickshire Avon	18 - Stoneleigh, Kenilworth and Burton Green	amber	amber
Finham Brook - confluence Canley Brook to confluence River Sowe	GB109054044480	Warwickshire Avon	18 - Stoneleigh, Kenilworth and Burton Green	amber	amber
River Itchen - source to confluence with River Stowe	GB109054044070	Warwickshire Avon	16 - Ladbroke and Southam	amber	yellow reduced risk
Cherwell (Ashby Brook to Cropredy)	GB106039037350	Cherwell	15 - Greatworth to Lower Boddington	amber	yellow reduced risk
Fleet Marston Brook, Denham Brook, Pitchcott Brook west	GB106039030420	Thame and South Chilterns	11 - Stoke Mandeville and Aylesbury 12 - Waddesdon and Quainton	amber	yellow reduced risk
Stoke Brook Aylesbury	GB106039030320	Thame and South Chilterns	10 - Dunsmore, Wendover and Halton 11 - Stoke Mandeville and Aylesbury	amber	amber
Tetchwick Brook, Source to Ray and tributaries	GB106039030070	Cherwell	12 - Waddesdon and Quainton	amber	yellow reduced risk

Colne and GUC (from confluence with Chess to Ash)	GB106039023090	Colne	7 - Colne Valley	amber	yellow reduced risk
Padbury Brook (The Twins)	GB105033038210	Upper and Bedford Ouse	13 - Calvert, Steeple Claydon, Twyford and Chetwode 14 - Newton Purcell to Brackley	amber	amber
Radstone Brook	GB105033037940	Upper and Bedford Ouse	14 - Newton Purcell to Brackley 15 - Greatworth to Lower Boddington	amber	amber
Ouse	GB105033037880	Upper and Bedford Ouse	14 - Newton Purcell to Brackley	amber	amber
Twin	GB105033030560	Upper and Bedford Ouse	13 - Calvert, Steeple Claydon, Twyford and Chetwode	amber	yellow reduced risk
East Litchfield catchment - tributary of Tame	GB104028047020	Tame Anker and Mease	22 - Whittington to Handsacre	amber	amber
River Blythe from Patrick Bridge to River Tame	GB104028042572	Tame Anker and Mease	23 - Balsall Common and Hampton in Arden 24 - Birmingham Interchange and Chelmsley Wood	amber	amber
River Blythe from Temple Balsall Brook to Patrick Bridge	GB104028042571	Tame Anker and Mease	23- Balsall Common and Hampton in Arden	amber	amber

2.3.7 The 15 water bodies listed in Table 3 were considered to be at amber risk of deterioration as a result of effects on one or more of the quality elements. Further details are presented in Table 4.

2.3.8 Six water bodies are now considered to have a reduced risk of deterioration as a result of additional baseline information, including the River Itchen (source to confluence with River Stowe), River Cherwell (Ashby Brook to Cropredy), Fleet Marston Brook, Tetchwick Brook, River Colne and GUC (from confluence with Chess to Ash) and the Twin.

2.3.9 For the River Itchen, River Cherwell (Ashby Brook to Cropredy) and River Colne, the potential risk of deterioration was from biological elements alone. Additional baseline information for the Itchen and Cherwell confirmed that both water bodies support only a few fish species and that the impacted reaches also consist of poor quality fish habitat, resulting in only a minor effect on the fish sub-element and removing the need for a precautionary approach. For the River Colne, the impacted reach of the New Years Green Bourne tributary was found to be of poor quality for invertebrates resulting in only a minor effect on macroinvertebrate sub-element.

2.3.10 For the Tetchwick Brook, Fleet Marston Brook, and the Twin, the potential risk of deterioration was from hydromorphology alone due to multiple culverts on tributaries. Additional baseline information has shown that the tributaries are generally field drains which are low flowing and/or ephemeral and therefore not continuously flowing. These watercourses have no morphological value, and there is no longer considered to be a significant risk of deterioration of the status or potential of these water bodies.

2.3.11 The amber risk of deterioration for the other nine water bodies remains unchanged.

2.3.12 Canley Brook has potential risk of deterioration associated with macroinvertebrate, fish, phosphate and all hydromorphological sub-elements. This remains unchanged due to significant impacts associated with river diversion and cuttings. Fish surveys also identified good brown trout populations and sensitive fish communities in the impacted water body reach. The risk of deterioration associated with the macrophyte sub-element has also been increased due to surveys identifying diverse macrophyte communities and the potential for increased phosphate concentrations to affect the macrophyte communities present.

2.3.13 Finham Brook has potential risk of deterioration associated with the hydromorphological element which remains unchanged due to significant impacts associated with cuttings and the need for a more detailed hydrology investigation to determine groundwater/surface water interactions and impacts from the upstream Canley Brook. An increased risk of deterioration has been assessed for the macrophyte and macroinvertebrate sub-elements due to additional survey information suggesting the water body supports good macrophyte habitat and macroinvertebrate diversity. Combined hydromorphological and biological effects were considered to give rise to a potential risk of deterioration in the Stoke Brook and Padbury Brook (The Twins) water bodies. In both cases, river diversions, and/or culverting would occur on significant lengths of the water body or its major tributaries. In the case of the Padbury Brook, macroinvertebrates are at good status and fish are

at high status, and are therefore considered to be sensitive receptors. For the Stoke Brook, a precautionary approach has been adopted for macrophytes, macroinvertebrates and phosphate in the downstream reaches, despite additional baseline information indicating that the spring-fed upstream reaches of Stoke Brook and its tributaries support poor macrophyte diversity and poor to good macroinvertebrate diversity. Additional baseline information also indicated that neither the Stoke Brook or its tributaries support suitable habitat for fish (salmonid species).

2.3.14 The Radstone Brook continues to have potential risk of deterioration associated with all biological elements and is unchanged since the main ES due to the limited access and length of the surveys. Walkover surveys did indicate poor fish habitat in places, however, given the length of watercourse affected and lack of detailed fish survey data, the risk of deterioration remains unchanged.

2.3.15 The Ouse has potential risk of deterioration associated with the fish biological elements remaining unchanged due to lack of fish surveys. Surveys are due to be carried out in 2015.

2.3.16 For East Litchfield the potential risk of deterioration associated with all biological and hydromorphological elements remains unchanged due to additional baseline information confirming the presence of microhabitat and substrate diversity in the upstream reaches of the catchment, including good macroinvertebrate habitat.

2.3.17 The Blythe water bodies continue to have a potential risk of deterioration associated with the fish biological elements remaining unchanged. Both Blythe water bodies support populations of brown trout. Additional fish surveys also confirmed the presence of six other fish species and good habitats for fish that spawn on plants (phytophilic fish). The River Blythe bypass walkover survey indicated that there are isolated pockets of trout spawning habitat. For Horn Brook, no additional survey information was available due to lack of access. Both are considered to have a risk of deterioration to the fish sub-element as a result of obstructing fish migration.

2.3.18 Walkover surveys on the Hollywell Brook tributary found good marginal habitat, flow and substrate diversity, indicating good potential for macrophytes, macroinvertebrates and fish. Whilst identified and assessed as separate WFD water bodies, the impacts on fish migration are cumulative and affect both the upstream and downstream Blythe water bodies.

Table 4: Key changes to risks to surface water status

Water body name and ID	CFA	Biology		Physico-chemical		Hydromorphology		Overall summary (green, yellow, amber colour coding denotes increasing level of potential risk)
		Sub-element (status)	Change in risk	Sub-element (status)	Change in risk	Sub-element (status)	Change in risk	
Canley Brook - source to confluence with Finham Brook GB109054044520	18	**Macrophyte (no status)**	**Increased**	Phosphate (Moderate)	No change	All sub-elements	No change	No overall change in risk of deterioration, therefore no change to main ES. One increased risk identified with respect to Macrophytes. Additional surveys confirm presence of diverse macrophyte communities. Also a need for a more detailed hydrology investigation to determine groundwater/surface water interactions.
		Macroinvertebrates (Moderate)	No change					
		Fish (no status)	No change					
Finham Brook - confluence Canley Brook to confluence River Sowe GB109054044480	18	**Macrophyte (no status)**	**Increased**	Phosphate (Moderate)	No change	All sub-elements	No change	No overall change in risk of deterioration, therefore no change to main ES. Two increased risks identified with respect to Macrophytes and Macroinvertebrates. Additional surveys indicate presence of good macrophyte habitat and macroinvertebrate diversity. Also a need for a more detailed hydrology investigation to determine groundwater/surface water interactions.
		Macroinvertebrates (Moderate)	**Increased**					
		Fish (no status)	No change					
River Itchen - source to confluence with River Stowe GB109054044070	16	**Fish (no status)**	**Reduced**	All sub-elements	No change	All sub-elements	No change	**Overall risk of deterioration reduced.** Additional surveys confirmed low fish diversity and poor quality fish habitat.
Cherwell (Ashby Brook to Cropredy) GB106039037350	15	Macroinvertebrates (High)	**Reduced**	All sub-elements	No change	All sub-elements	No change	**Overall risk of deterioration reduced.** Additional surveys confirmed low fish diversity and poor quality fish habitat.
		Fish (Good)	**Reduced**					
Fleet Marston Brook, Denham Brook, Pitchcott Brook west GB106039030420	11, 12	All sub-elements	No change	All sub-elements	No change	All sub-elements	**Reduced risk**	**Overall risk of deterioration reduced.** Additional surveys confirm the tributaries are generally field drains which are low flowing and/or ephemeral and have no morphological value.
Stoke Brook Aylesbury	10, 11	Macrophyte (no status)	No change	Phosphate	No change	All sub-elements	No change	No overall change in risk of deterioration, therefore no change to main ES. One reduced risk identified with

Water body name and ID	CFA	Biology		Physico-chemical		Hydromorphology		Overall summary (green, yellow, amber colour coding denotes increasing level of potential risk)
		Sub-element (status)	Change in risk	Sub-element (status)	Change in risk	Sub-element (status)	Change in risk	
GB106039030320		Macroinvertebrates (Moderate)	No change					respect to fish. Additional surveys confirm that neither the Stoke Brook or its tributaries support suitable habitat for fish (salmonid species).
		Fish (no status)	**Reduced**					
Tetchwick Brook, Source to Ray and tributaries GB106039030070	12	All sub-elements	No change	All sub-elements	No change	**All sub-elements**	**Reduced**	**Overall risk of deterioration reduced.** Additional surveys confirm the tributaries are generally field drains which are low flowing and/or ephemeral and have no morphological value.
Colne and GUC (from confluence with Chess to Ash) GB106039023090	7	**Macroinvertebrates (Good)**	**Reduced**	Phosphate	No change	All sub-elements	No change	**Overall risk of deterioration reduced.** Additional surveys confirmed poor quality habitat for macroinvertebrates.
Padbury Brook (The Twins) GB105033038210	13, 14	Macroinvertebrates (Good)	No change	All sub-elements	No change	All sub-elements	No change	No overall change in risk of deterioration, therefore no change to main ES. A precautionary approach has been adopted for macroinvertebrates and fish in the downstream reaches. Additional surveys on the upstream reaches of Stoke Brook and its tributaries confirmed poor to good macroinvertebrate diversity.
		Fish (High)	No change					
Radstone Brook GB105033037940	14, 15	Macrophyte (no status)	No change	All sub-elements	No change	All sub-elements	No change	No overall change in risk of deterioration, therefore no change to main ES. A precautionary approach has been adopted for all biological elements. Although additional walkover surveys did indicate limited habitat for macrophytes, macroinvertebrates and fish, survey access was limited and subsequently no detailed survey data was available to confirm presence.
		Macroinvertebrates (no status)	No change					
		Fish (no status)	No change					
Ouse GB105033037880	14	Fish (High)	No change	All sub-elements	No change	All sub-elements	No change	No overall change in risk of deterioration, therefore no change to main ES. Additional surveys not yet carried out, planned for 2015.
Twin	13	All sub-elements	No change	All sub-	No change	**All sub-**	**Reduced**	**Overall risk of deterioration reduced.** Additional

Water body name and ID	CFA	Biology		Physico-chemical		Hydromorphology		Overall summary (green, yellow, amber colour coding denotes increasing level of potential risk)
		Sub-element (status)	Change in risk	Sub-element (status)	Change in risk	Sub-element (status)	Change in risk	
GB105033030560				elements		**elements**		surveys confirm the tributaries are generally field drains which are low flowing and/or ephemeral and have no morphological value.
East Litchfield catchment - tributary of Tame GB104028047020	22	All sub-elements	No change	All sub-elements	No change	All sub-elements	No change	No overall change in risk of deterioration, therefore no change to main ES. A precautionary approach has been adopted. Additional surveys confirmed presence of microhabitat and substrate diversity in the upstream reaches, including good macroinvertebrate habitat. Also a need for a more detailed hydrology investigation to determine groundwater/surface water interactions.
River Blythe from Patrick Bridge to River Tame GB104028042572	19, 23, 24	Fish (High)	No change	All sub-elements	No change	All sub-elements	No change	No overall change in risk of deterioration, therefore no change to main ES. Additional fish surveys confirmed presence of high fish diversity and good fish habitats. Walkover surveys found good potential for macrophytes, macroinvertebrates and fish.
River Blythe from Temple Balsall Brook to Patrick Bridge GB104028042571	23	Fish (High)	No change	All sub-elements	No change	All sub-elements	No change	No overall change in risk of deterioration, therefore no change to main ES. Additional fish surveys confirmed presence of high fish diversity and good fish habitats including presence of isolated pockets of trout spawning habitat. Survey access was restricted in some locations, so the lack of survey data requires a precautionary approach.

Groundwater body assessments

Presentation of findings

2.3.19 The assessment for each groundwater body is presented in Annex B of this appendix. WFD elements are listed in the left hand column, with scheme elements presented across the top of the matrix. Individual impacts arising from each HS2 scheme element are grouped into a set of columns under the HS2 scheme element.

2.3.20 An assessment of the effects of the HS2 scheme element is presented for each of the WFD elements. At the end of the row, an assessment is made of the cumulative effects of the original scheme on the status/potential of that WFD element.

No deterioration assessment

2.3.21 The WFD surveys have not resulted in any changes in relation to the WFD groundwater classification (quantitative and qualitative).

2.4 Supplementary Environmental Statement Water Framework Directive assessment conclusions

Change in potential risks to water body status

Surface water

2.4.1 In the main ES 15 water bodies were considered to be at amber risk of deterioration as a result of effects on one or more of the WFD elements. Re-assessment using the new WFD survey results resulted in six water bodies having a reduced risk of deterioration.

2.4.2 Surface water bodies with reduced risk include the River Itchen (source to confluence with River Stowe), River Cherwell (Ashby Brook to Cropredy), Fleet Marston Brook, Tetchwick Brook, River Colne and the GUC (from confluence with Chess to Ash) and the Twin.

2.4.3 The amber risk of deterioration for the other nine water bodies remains unchanged.

2.4.4 WFD status and compliance will be informed by further surveys and monitoring as the scheme design develops.

Groundwater

2.4.5 On the basis of the new WFD survey information, the WFD assessment concluded that there would be no new or different significant effects on groundwater bodies.

Compliance

2.4.6 As for the main ES, the WFD assessment has been undertaken on a precautionary basis given that the baseline data was not available for all the affected water bodies and tributaries, and that the design of mitigation measures associated with the scheme is at an outline stage.

2.4.7 The WFD assessment provides an indication of the likely compliance of the scheme at the time the assessment was prepared. It is based on the original scheme design, surveys completed as part of the SES, AP2 amendments, incorporated mitigation measures and on the current status of 60 surface water bodies and 15 groundwater bodies.

2.4.8 The assessment concluded that, as for the original scheme, where the failure to prevent deterioration in the status of a body of surface water or groundwater is the result of new modifications to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater, there will be no breach of the WFD where:

- all practicable steps are taken to mitigate the adverse impact on the status of the body of water;
- the reasons for those modifications or alterations are specifically set out and explained in the RBMP;
- the reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in Article 4.1 of the WFD are outweighed by the benefits of the new modifications or alterations to (among other things) sustainable development; and
- the beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option.

2.4.9 It is concluded that:

- in light of the work carried out by HS2 Ltd in liaison with the Environment Agency, all practicable measures to mitigate any adverse impacts on surface water bodies and groundwater have been identified, and those measures will continue to be reviewed;
- the RBMP process is subject to review and any effects of the original scheme will be taken into account in future RBMP;
- there is an overriding public interest in the construction of the original scheme and amendments, and in any event the benefits of the scheme as a form of sustainable development outweigh the benefits of achieving the objectives in Article 4(1) (to the limited extent that the original scheme would hinder the attainment of those objectives); and
- there are no better environmental options to the works described which are technically feasible and proportionate in cost.

2.4.10 For those reasons, even if the original scheme does result in the deterioration in status of a body of surface water or groundwater, there would be no breach of the WFD.

3 Part 2 – Water Framework Directive Additional Provision 2

3.1 Additional Provision 2 changes relevant to the Water Framework Directive

3.1.1 Twenty-five AP2 changes (i.e. amendments) were scoped in as having the potential to have a significant effect on WFD compliance. The relevant AP2 amendments are summarised in Table 5.

Table 5: Scoped in AP2 amendments

CFA number and name)	AP2 amendment number	AP2 amendment Location
Off-Route	AP2-000-001	HEx Depot, Berkshire
4 - Kilburn (Brent) to Old Oak Common	AP2-004-004	WCML Crossrail link - connection with GWML only (active provision)
	AP2-004-005	Tunnel adit- Atlas Road to Old Oak Common Box
7 - Colne Valley	AP2-007-003	Bucks Golf Club
12 - Waddesdon and Quainton	AP2-012-001	Waddesdon and Quainton
	*	Crossroads Farm culvert
	AP2-012-005	Adam's Underbridge
14 - Newton Purcell to Brackley	*	Newton Purcell to Brackley
15 - Greatworth to Lower Boddington	AP2-015-002	Greatworth Hall
	AP2-015-005	Lower Thorpe
	AP2-015-006	Northamptonshire
	AP2-015-009	Chipping Warden
17 - Offchurch and Cubbington	AP2-017-001	Offchurch and Cubbington
18 - Stoneleigh, Kenilworth and Burton Green	AP2-018-004	Stoneleigh, Kenilworth and Burton Green
19 - Coleshill Junction	AP2-019-002	Coleshill Junction (traffic segregation)
20 - Curdworth to Middleton	AP2-020-005	Curdworth to Middleton (Cuttle Mill access)
	AP2-020-005	Curdworth to Middleton (Cuttle Mill landscape)
	AP2-020-007	Middleton
21 - Drayton Bassett, Hints and Weeford	AP2-021-004	Drayton Bassett, Hints and Weeford
	AP2-021-001	Parish of Drayton Bassett
22 - Whittington to Handsacre	AP2-022-001	Whittington to Handsacre (Handsacre Connection)
	AP2-022-001	Whittington to Handsacre (Tuppenhurst Farm)

CFA number and name)	AP2 amendment number	AP2 amendment Location
	AP2-022-001	Parish of Fradley and Streethay, and Parish of Lichfield (vertical alignment)
23 - Whittington to Handsacre	AP2-023-005	Solihull Metropolitan Borough, Parish of Hampton-in-Arden
	AP2-023-006	Diddington Lane

*Note: The WFD assessment refers to two AP2 amendments which were not reported in the Volume 2 CFA chapters because they did not cause any likely new or different significant effects. However, as these were considered to have the potential to affect the WFD assessment, they have been taken into account here.

3.2 WFD assessment of new or different likely significant environmental effects

Surface water body assessment

Presentation of findings

3.2.1 The assessment for each surface water body is presented in Annex A using the same matrix approach as the main ES. New or different HS2 scheme elements associated with AP2 amendments are highlighted in columns.

3.2.2 The 25 relevant AP2 changes have the potential to affect 16 surface water bodies.

3.2.3 One surface water body is added to the assessment, the Horton Brook in the Colne catchment which is potentially affected by the new HEx Depot at Langley (AP2-000-001).

No deterioration assessment

3.2.4 The surface water assessment results are contained in Annex A. A summary of the findings is presented in Table 6. The baseline condition for the AP2 amendments assessment includes the SES WFD survey results set out in Part 1 of this appendix.

3.2.5 Changes arising from AP2 amendments are summarised in the final column of Table 6. Of the 16 surface water bodies potentially affected, 14 remain at the same level of risk as in the main ES. Two of the 14 (Padbury Brook and the River Blythe) remain at amber risk but with a slight increase in the risk of deterioration compared with the original scheme assessment. The two surface water bodies with an increase in risk are Bourne-Bilson Brook and the River Tame from River Anker to River Trent. These have an increase from yellow to amber risk due to possible adverse effects on fish.

Table 6: Summary of surface water AP2 WFD assessment changes

Surface water body name	Water body ID	Catchment	CFA (number and name)	Additional baseline survey (Y denotes yes; N denotes no)	No. of scoped in AP2 amendments within the CFA	Risk of deterioration to overall status		
						Original assessment	Post-additional baseline survey	Original scheme and -AP2 amendments
Cherwell (Ashby Brook to Cropredy)	GB106039037350	Cherwell	15 - Greatworth to Lower Boddington	Y	2	amber	yellow reduced risk	yellow no change
Tetchwick Brook, source to Ray and tributaries	GB106039030070	Cherwell	12 - Waddesdon and Quainton	Y	1	amber	yellow reduced risk	yellow no change
Colne and GUC (from confluence with Chess to Ash)	GB106039023090	Colne	7 - Colne Valley	Y	1	amber	yellow reduced risk	yellow no change
Padbury Brook (The Twins)	GB105033038210	Upper and Bedford Ouse	13 - Calvert, Steeple Claydon, Twyford and Chetwode 14 - Newton Purcell to Brackley	Y	1	amber	amber no change	amber no change
River Blythe from Patrick Bridge to River Tame	GB104028042572	Tame Anker and Mease	23 Balsall Common and Hampton in	Y	2	amber	amber no change	amber no change

Surface water body name	Water body ID	Catchment	CFA (number and name)	Additional baseline survey (Y denotes yes; N denotes no)	No. of scoped in AP2 amendments within the CFA	Risk of deterioration to overall status		
						Original assessment	Post-additional baseline survey	Original scheme and -AP2 amendments
			Arden 24 - Birmingham Interchange and Chelmsley Wood					
Coventry and Ashby Canals	GB70910212	N/A	22 - Whittington to Handsacre	N	1	yellow	N/A	yellow no change
GUC, Uxbridge to Hanwell Locks, Slough Arm, Paddington A	GB70610078	N/A	1 - Euston Station and approach 2 - Camden Town and HS1 link 3 - Primrose Hill to Kilburn (Camden) 4 - Kilburn (Brent) to Old Oak Common 5 - Northolt Corridor	N	1	yellow	N/A	yellow no change

Surface water body name	Water body ID	Catchment	CFA (number and name)	Additional baseline survey (Y denotes yes; N denotes no)	No. of scoped in AP2 amendments within the CFA	Risk of deterioration to overall status		
						Original assessment	Post-additional baseline survey	Original scheme and -AP2 amendments
Trent and Mersey Canal, summit to Alrewas	GB70410142	N/A	22 - Whittington to Handsacre	N	2	yellow	N/A	yellow no change
River Leam - confluence River Itchen to confluence River Avon	GB109054044140	Warwickshire Avon	17 - Offchurch and Cubbington	N	1	yellow	N/A	yellow no change
Ray and tributaries north-east of Grendon Underwood	GB106039030100	Cherwell	12 - Waddesdon and Quainton	N	1	yellow	N/A	yellow no change
Bourne-Bilson Brook Catchment (tributary of Trent)	GB104028047270	Staffordshire Trent Valley	22 - Whittington to Handsacre	N	1	yellow	N/A	amber increased risk
Pyford Brook Catchment (tributary of Trent)	GB104028047250	Staffordshire Trent Valley	22 - Whittington to Handsacre	N	2	yellow	N/A	yellow no change
River Tame from River Anker to River Trent	GB104028047050	Tame Anker and Mease	22 - Whittington to Handsacre	N	7	yellow	N/A	amber increased risk
Black-Bourne Brook from source (confluence) to River Tame	GB104028047000	Tame Anker and Mease	21 - Drayton Bassett, Hints and Weeford	N	2	yellow	N/A	yellow no change
Langley Brook from Middleton Hall Catch to River Tame	GB104028046900	Tame Anker and Mease	20 - Curdworth to Middleton 21 - Drayton	N	2	yellow	N/A	yellow no change

Surface water body name	Water body ID	Catchment	CFA (number and name)	Additional baseline survey (Y denotes yes; N denotes no)	No. of scoped in AP2 amendments within the CFA	Risk of deterioration to overall status		
						Original assessment	Post-additional baseline survey	Original scheme and -AP2 amendments
			Bassett, Hints and Weeford					
Langley Brook from Source to Middleton Hall Catch	GB104028046890	Tame Anker and Mease	20 - Curdworth to Middleton	N	2	yellow	N/A	yellow no change
Horton Brook	GB106039023040	Colne	N/A	N	3	Not previously assessed	N/A	New HS2 scheme element (AP2 amendment). Precautionary assessment

3.2.6 For the water bodies including the River Cherwell, Tetchwick Brook, River Colne, Coventry and Ashby Canals, GUC, Trent and Mersey Canal, River Leam, River Ray, Pyford Brook, Black-Bourne Brook and both Langley Brook water bodies, the AP2 scheme elements have been assessed as having a minor impact individually, and only making a small contribution to the cumulative impact in combination with other scheme elements (original scheme and AP2 amendments). Consequently, for these water bodies there is no change in the risk of deterioration from their previous assessments.

3.2.7 The Padbury Brook and River Blythe water bodies have previously been assessed as being adversely affected (amber). The AP2 scheme elements have been assessed as having a minor impact individually, but contribute to the cumulative impact in combination with other scheme elements (original scheme and AP2 amendments). Subsequently, the AP2 scheme elements slightly increase the risk of deterioration from the previous assessment, but the risk remains amber.

3.2.8 The addition of a culvert on Bourne-Bilson Brook, which supports migratory fish, has been assessed as having the potential for an adverse effect on the fish sub-element at a water body scale. The overall risk of deterioration for this water body has therefore been increased from yellow to amber.

3.2.9 The AP2 amendments (three AP2 river diversions, three culverts and Streethay cutting) have been assessed as having significant adverse effects on all biological sub-elements. In addition, at this stage it is unclear how the Streethay cutting will impact on surface water/groundwater interactions in the Fulfen Wood tributary and the associated effect on fish. The overall risk of deterioration for this water body has therefore been increased from yellow to amber.

3.2.10 The development of a new HEx Depot at Langley (AP2-000 -001) (off- route) has the potential to affect the Horton Brook surface water body (GB106039023040). This water body was not included in the WFD assessment in the main ES but has been added to the current WFD compliance assessment. The assessment followed the assessment approach outlined in the Appendix WR-001-000 Route-wide appendix from the main ES (Volume 5).

3.2.11 The Horton Brook was identified as being at amber (adverse widespread or prolonged effect) risk of deterioration as a result of the effects on fish due to the land required and changes to morphology associated with the proposed culvert, as part of the AP2 amendment. A locally beneficial effect for fish was associated with the Horton Brook diversion. Given that the downstream Endon Brook (Endon Brook - GB104028052710) water body is a Freshwater Fish Directive water body, a precautionary approach is applied in the absence of baseline data.

3.2.12 A summary of the key risks to quantitative and chemical status for the Horton Brook surface water body are presented in Table 7.

Table 7: Horton Brook catchment summary - key risks to surface water status

Water body name and ID	WFD element (Sub-element - status)	Comment
Horton Brook GB106039023040	Biology (fish - no data available)	Land required as part of the AP2 amendment (for bridge footings) are likely to lead to the permanent loss of approximately 50m of habitat. In addition, the proposed culvert would potentially constitute an obstacle to fish movements. There is the potential for flow pattern and channel morphology homogenisation, increased velocities and reduced habitat continuity. Although Horton brook is not a designated fishery, the downstream water body (Endon Brook - GB104028052710) is a Freshwater Fish Directive Water body. Therefore, in the absence of baseline data, the effect is considered to be potentially adverse on the WFD status of this quality element.

Groundwater body assessments

Presentation of findings

3.2.13 The assessment for each water body is presented in Annex B of this appendix.

3.2.14 The 10 relevant AP2 amendments have the potential to affect six groundwater bodies.

3.2.15 One groundwater body is added to the assessment, the Lower Thames Gravels aquifer which is potentially affected by the new HEx Depot at Langley (AP2-000 -001).

No deterioration assessment

3.2.16 The groundwater assessment results are contained in Annex B of this appendix.

3.2.17 A summary of the findings is presented in Table 8. There were no changes to the risks assessed in the main ES for the 15 groundwater bodies affected by the AP2 revised scheme.

Table 8: Summary of groundwater AP2 WFD assessments

Water Body ID	Groundwater Body Name	CFA (number)	Scoped in AP2 amendments within the CFA	Quantitative WFD elements			Qualitative WFD elements		
				Current	Prediction with AP2 amendment	Comments	Current	Prediction	Comments
GB40601G601200	Mid-Chilterns Chalk	7, 8, 9, 10	AP2-007-003	Poor	No significant deterioration	No changes to main ES - Local, minor or temporary effects	Poor	Remains at Good status subject to Environment Agency approval of mitigation measures	No changes to main ES -risks identified with respect to: Drinking Water Protected Areas
GB40502G401300	Upper Bedford Ouse Oolite Secondary	13, 14, 15	AP2-015-002	Good	Remains at Good status	No changes to main ES - Local, minor or temporary effects	Good	Remains at Good status	No changes to main ES - local, minor or temporary effects
GB40602G604200	Byfield Jurassic	15	AP2-015-006	Good	Remains at Good status	No changes to main ES - risks identified with respect to: surface waters; GWDTE and water balance	Good	Remains at Good status	No changes to main ES - local, minor or temporary effects
GB40902G302200	Warwickshire Avon - Coal Measures Coventry	17, 18, 23	AP2-018-004	Poor	No significant deterioration	No changes to main ES - risks identified with respect to: surface waters and water balance	Poor	No significant deterioration	No changes to main ES - local, minor or temporary effects
GB40402G990800	Tame Anker Mease - Secondary Combined	19, 20, 21, 22, 23, 24, 25, 26	AP2-022-001,AP2-021-001	Good	Remains at Good status	No changes to main ES - risks identified with respect to: surface waters; GWDTE	Poor	No significant deterioration	No changes to main ES - risks identified with respect to: surface waters; GWDTE

Water Body ID	Groundwater Body Name	CFA (number)	Scoped in AP2 amendments within the CFA	Quantitative WFD elements			Qualitative WFD elements		
				Current	Prediction with AP2 amendment	Comments	Current	Prediction	Comments
GB40402G300300	Staffordshire Trent Valley - Mercia Mudstone East & Coal Measures	22	AP2-022-001, AP2-022-001, AP2-022-001	Good	Remains at Good status	No changes to main ES - local, minor or temporary effects	Good	Remains at Good status	No changes to main ES - local, minor or temporary effects
GB40603G000300	Lower Thames Gravels	Off-route	AP2-000-001	Good	Remains at Good status	New assessment. - local, minor or temporary effects	Poor	No significant deterioration	New Assessment. - local, minor or temporary effects

3.2.18 The development of a new HEx Depot at Langley (AP2-000 -001) (off- route) has the potential to affect the Lower Thames Gravels groundwater body. This water body was not included in the WFD assessment in the main ES but has been added to the current WFD compliance assessment. The assessment followed the assessment approach outlined in the Appendix WR-001-000 Route-wide Appendix from the main ES (Volume 5).

3.2.19 A summary of the key risks to quantitative and chemical status for the Lower Thames Gravels groundwater body is presented in Table 9.

3.2.20 The potential risks are associated with the surface water and water balance WFD elements and constitute a localised/temporary adverse (yellow) risk of deterioration.

Table 9: Key risks to Lower Thames Gravels groundwater body status

Groundwater body	**Quantitative status**		**Chemical status**	
	WFDelement	**Comments**	**WFD element**	**Comments**
Lower Thames Gravels	Surface waters	Local or temporary impacts predicted. The Langley cutting may have an impact on Horton Brook due to potential reduction in flows. Water returned upstream of the water course, and as such there will be unlikely to be an overall loss of groundwater from the surface water catchment. Taking into account scale effects, this is not considered likely to cause a deterioration in groundwater body status. The diversion of Horton Brook may have an impact on the surface water catchment during construction depending on the level of groundwater dependence. Taking into account scale effects, this is not considered likely to cause a deterioration in groundwater body status.	Surface waters	Local or temporary impacts predicted. No individual AP2 design element is considered to pose a significant risk to groundwater body status. However, combined impacts of all AP2 design elements have the potential to affect the Lower Thames Gravels. There are existing water quality issues in groundwater body. Sub-water table activities may occur for the Langley cutting and Horton Brook diversion adjacent to the Horton Brook surface water body. Potential impacts will be mitigated through draft Code of Construction Practice (CoCP) and best practice for design, construction and operations. Taking into account the scale of effects compared to the size of the groundwater body, this is not considered likely to cause a deterioration in groundwater body status. No potential risk to WFD status post-mitigation is predicted but monitoring is required to confirm.

Groundwater body	Quantitative status		Chemical status	
	WFDelement	Comments	WFD element	Comments
	Water balance	Local or temporary impacts predicted. Mitigated through discharge of water back to ground where possible. However, assuming that passive drainage is not considered as licensable abstraction, it is considered unlikely that failure of the WFD element would occur under the current Environment Agency classification methodology.	-	-

3.3 Additional Provision 2 Water Framework Directive assessment conclusions

Change in potential risks to water body status

Surface water

3.3.1 Of the 16 surface water bodies potentially affected by AP2 amendments, 14 remain at the same level of risk as for the original scheme; two (Padbury Brook and the River Blythe) remain at amber risk but with a slight increase in the risk of deterioration compared with the original scheme assessment; and two (Bourne-Bilson Brook and the River Tame from River Anker to River Trent) have an increase from yellow to amber risk due to possible adverse effects on fish.

3.3.2 The proposed development of a new HEx Depot at Langley (AP2-000 -001) (off -route) has introduced the Horton Brook surface water body into the WFD assessment. The Horton Brook was identified as being at amber (adverse widespread or prolonged effect) risk of deterioration as a result of the effects on fish of the land required for the amendment and changes to morphology associated with the proposed culvert.

Groundwater

3.3.3 There were no changes to the risks assessed in the main ES for the 15 groundwater bodies affected by the AP2 revised scheme or for the six groundwater bodies potentially affected by AP2.

3.3.4 The proposed development of a new Heathrow Express Depot at Langley (AP2-000 -001) has introduced the Lower Thames Gravels into the WFD assessment. The potential risks are associated with the surface water and water balance WFD elements and constitute a localised/temporary adverse (yellow) risk of deterioration.

Compliance

3.3.5 As for the main ES and SES, the WFD assessment has been undertaken on a precautionary basis given that the baseline data was not available for all the affected

water bodies and tributaries, and that the design of mitigation measures is at an outline stage.

3.3.6 The WFD assessment provides an indication of the likely compliance of the HS2 scheme at the time the assessment was prepared. It is based on the original scheme design, incorporated mitigation measures and on the current status of 60 surface water bodies and 15 groundwater bodies.

3.3.7 The assessment concluded that, as for the original scheme, where the failure to prevent deterioration in the status of a body of surface water or groundwater is the result of new modifications to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater, there will be no breach of the WFD where:

- all practicable steps are taken to mitigate the adverse impact on the status of the body of water;
- the reasons for those modifications or alterations are specifically set out and explained in the RBMP;
- the reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in Article 4.1 of the WFD are outweighed by the benefits of the new modifications or alterations to (among other things) sustainable development; and
- the beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option.

3.3.8 It is concluded that:

- in light of the work carried out by HS2 Ltd in liaison with the Environment Agency, all practicable measures to mitigate any adverse impacts on surface water bodies and groundwater have been identified, and those measures will continue to be reviewed;
- the RBMP process is subject to review and any effects of the original scheme will be taken into account in future RBMP;
- there is an overriding public interest in the construction of the original scheme, and in any event the benefits of the scheme as a form of sustainable development outweigh the benefits of achieving the objectives in Article 4(1) (to the limited extent that the original scheme would hinder the attainment of those objectives); and
- there are no better environmental options to the works described which are

technically feasible and proportionate in cost.

3.3.9 For those reasons, even if the original scheme does result in the deterioration in status of a body of surface water or groundwater, there would be no breach of the WFD.

High Speed Two (HS2) Limited
One Canada Square
London E14 5AB

T 020 7944 4908
E hs2enquiries@hs2.org.uk

X74A