a result of accidental spillage, and temporary disruptions to the hydrological environment within localised areas. These effects will be mitigated against whereever possible by application of best practice by the construction contractor and through implementation of environmental management plans.

1.8. **Effects during Operation:** The Preferred Scheme may result in a beneficial effect on the water environment as a result of decreased traffic flows which may therefore decrease the level of pollution in surface water run-off and groundwater. The Preferred Scheme will incorporate attenuation storage which may provide protection to areas vulnerable from surface water flooding.

Impact of Next Best Alternative

1.9. The impact of the Next Best Alternative on the water environment has been assessed as **neutral** due to minimal effects during construction or operation as mitigation measures will be put in place.

1.10. **Effects during Construction:** Construction of the Next Best Alternative may have an adverse effect on groundwater quality due to excavations and on flow or level of the water environment due to ground works. The construction works may result in temporary adverse effects on the water environment as a result of accidental spillage of fuels or pollutants, and temporary disruptions to the hydrological environment within localised areas. These effects will be mitigated against where ever possible by the construction contractor applying best practice environmental management plans.

1.11. **Effects during Operation:** The Next Best Alternative may result in a beneficial effect on the water environment as a result of decreased traffic flows which may therefore decrease the level of pollution in surface water run-off and groundwater. The Next Best Alternative will incorporate attenuation storage which may provide protection to areas vulnerable from surface water flooding.

Impact of Lower Cost Alternative

1.12. The impact of the Lower Cost Alternative on the water environment has been assessed as **neutral** as there will be a minimal effect on the water environment.

1.13. **Effects during Construction**: For the Lower Cost Alternative, construction may have an adverse effect on groundwater quality due to excavations and on flow or level of the water environment due to ground works. The construction works may result in temporary adverse effects on the water environment as a result of accidental spillage, and temporary disruptions to the hydrological environment within localised areas. These effects will be mitigated against where ever possible by the construction contractor applying best practice environmental management plans.

1.14. **Effects during Operation:** The Lower Cost Alternative may result in a beneficial effect on the water environment as a result of decreased traffic flows which may therefore decrease the level of pollution in surface water run-off and groundwater. The Lower Cost Alternative will incorporate attenuation storage which may provide protection to areas vulnerable from surface water flooding.

TAG Unit 3.3.11 - Water Environment: Worksheet

Scheme: Preferred Route

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Surface water quality									
Potential detrimental effects on water quality as a result of the works to strengthen Leeds Bridge. (details of the works involved is unknown at the time of the production of this assessment) Construction of Bodington and Stourton Park and Rides may potentially effect the water quality of Meanwood and Stourton Beck as a result of construction works (accidental spillage, sedimentation) and leaks from vehicles during operation.	River Aire/ Meanwood Beck/Stourton Beck route wide	Chemical Water Quality, Biodiversity: Salmon and cyprinid fisheries (at Meanwood Beck)	EA Website indicates for River Aire classifications at Low Beck downstream of crown point road:: Chemistry: B Biology: F Nitrates: 4 Phosphates: 5 EA Website indicates for the River Aire classifications at Old Mill Beck upstream of Leeds Bridge Chemistry: C Biology: - Nitrates: 4 Phosphates: 5	Local-Regional	Common to area	Not possible	Medium	Construction activities could adversely affect the watercourse temporarily, If the road drains to the watercourse appropriate design to ensure that discharges to the water comply with the EA requirements through the use of appropriate SUDS design such as swales and oil interceptors: Moderate to Major	Low significance in the long term and significant Temporarily during the construction works

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Volumes of traffic may decrease due to a modal shift from provision of the new public transport system. This may have a slightly beneficial on water quality within the River Aire.	River Aire Route wide	Chemical Water Quality	EA Website indicates for River Aire classifications at Low Beck downstream of crown point road:: Chemistry: B Biology: F Nitrates: 4 Phosphates: 5 EA Website indicates for the River Aire classifications at Old Mill Beck upstream of Leeds Bridge Chemistry: C Biology: - Nitrates: 4 Phosphates: 5	Local-Regional	Common to area	Not possible	Medium	It is assumed that traffic volumes will decrease. If this is confirmed by the EIA this will have a positive impact on the water quality. Negligible to minor (depending on traffic volumes)	Insignificant
	River Aire South route	Value to economy, abstractions	4 ground water abstractions beneath the south route with a further 7 within	Abstractions important at local scale. Aquifer important at	Common to area	Substitution may not be possible for the abstractions for Carlsburg Tetley Brewery Ltd. This may also	Very high	Major	Very significant

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
			250m of the south route. 3 surface water abstractions within 250m of the south route	local/regional scale.		apply to other abstractions in the area. Further investigations will be required as to the substitutability of the abstractions.			
Flood Plain									
The North, East and City Hub Routes are all in an area where there is a 0.1% chance of flooding in one year. The South Route crosses areas of 0.1%, greater than 1% and 5% of flooding in a year. The route development will not increase the flood risk due to the small scale of the development. The south route follows the existing highway or currently paved areas in zones having 5% chance of flooding in one year.	River Aire South route	Conveyance of flow and material	South section of the route crosses the area of extreme flooding during major floods of 5%chance of flooding each year (without defences). Existing flood risk.	Local-Regional	Main river in locality	Not possible	Medium	There is an increase of flood risk at both of the park and rides which have a development area greater than 1 hectare, and where new embankments are required. Mitigation measures such as attenuation storage are designed to provide protection for the increase in surface runoff: Minor	Insignificant

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
	River Aire South route	Conveyance of flow and material	Flood flow routes affected at Balm Road rail crossing due to a new pier construction. This crosses the area of extreme flooding during major floods of >1% chance of flooding each year (without defences). Existing flood risk. The construction of an embankment along the railway will also affect flow routing.	Local-Regional	Scarce	Not possible	Medium	Minor	Insignificant
Ground water quality									
Potential effects on ground water quality as a result of construction work, particularly excavation works in off-line sections	Water supply	Groundwater vulnerability	4 ground water abstractions beneath the south route with a further	Abstractions important at local scale. Aquifer	Common to area	Substitution may not be possible for the abstractions for Carlsberg Tetley Brewery Ltd.	Very high	Major	Very significant

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
			7 within 250m of the south route. 3 surface water abstractions within 250m of the south route. The route is not within a SPZ and is located on a minor aquifer. The route lies within an area of high groundwater vulnerability (until proven otherwise as stated on the Groundwater Vulnerability maps) Risk to groundwater is negligible using DMRB assessment method	important at local/regional scale.		This may also apply to other abstractions in the area. Further investigations will be required as to the substitutability of the abstractions.			
		Conveyance of flood flows	South Route: groundwater is approx	Local importance	Common to area	No substitution possible	Medium	Negligible	Insignificant

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
			3mbgl. East and City Hub routes - groundwater level is 5mbgl. Groundwater flow may be intercepted by the Scheme option development. Sufficient measures will be taken to ensure that the effect is negligible						
		Transport and dilution of waste products	Generally poor ground water quality. Pollution controls will protect ground water from contaminants	Regional	Common	No substitution possible	Low	Negligible drainage system designed to maximise options for pollution removal	Insignificant

Reference Source(s):

1. Environment Agency website, Whats in your back yard? Available at Environment Agency - What's in your backyard?
2. Highways Agency Design Manual for Roads and Bridges DMBR volume 11 part 10. Available at http://www.standardsforhighways.co.uk/dmrb/vol11/section3/11s3p10.pdf
3. Department of Transport WebTAG Unit 3.3.11. Available at Department for Transport - Transport Analysis Guidance - WebTAG
4. Freshwater Fish Directive, Available at Defra, UK - Water quality - EC Freshwater Fish Directive
   Mott MacDonald reports (2009) including:
5. City Hub Phase 1 Geo-Environmental Desk Study. Report No 236834/RPT11 A,
6. East Line Phase 1 Geo-Environmental Desk Study. Report No 236834/RPT12 A
7. North Line Phase 1 Geo-Environmental Desk Study. Report No 236834/RPT13 A
8. South Line Phase 1 Geo-Environmental Desk Study. Report No 236834/RPT14 A
9. Flood Risk Assessment. Report No 236834/RTP19A.

Summary assessment score:

Insignificant in the long term.

Qualitative comments:

The proposed route overlies a minor aquifer in an area of high groundwater vulnerability. The City Hub, North, South and East routes will have no impact on the flood risk as the route development through the areas of high flood risk (5% in one year) are small in scale. The Park and Rides which are larger developments are in the zones of 0.1% chance of flooding in one year, these will have attenuation storage to mitigate the increase in surface run off. The South route will be aligned to the existing highway within the area where there is 5% chance of flooding in one year, with no impact on flood routing or flood storage volumes. A pier will be constructed at Balm Road rail crossing which is within the area having a >1% chance of flooding in one year. This will not take up any flood storage area or change the flood routing, as this will be replacing the existing structure. If a new bridge structure is constructed there will be an adverse impact on the flood storage volume, but the impacts would be easily mitigated against. An embankment will be constructed along the railway sidings; this will take up flood storage volume and will also affect the flood routing.

Where the route has a potential to have an adverse impact either during construction or operation of the route on the groundwater quality, flow or level, measures will be taken to mitigate the effects.

Road drainage will have oil interceptors to ensure that discharges into the water courses meet the EA requirements, particularly at the Park and Rides where the drainage is expected to be discharged into their respective becks, and will attenuate the road surface runoff to reduce flood risk. Further studies will be required to assess if soakaways will be an alternative to attenuation storage.

Construction activities including the strengthening of Leeds Bridge may have the potential to adversely affect water and groundwater quality through accidental spillages during construction and from vehicle leakages during operation. The magnitude of this effect would be dependant on the substance spilt and the volume that enters the resource. However, given that this would be a temporary effect and should be appropriately mitigated through use of best practice construction techniques, no long-term

adverse effects attributable to construction are anticipated. Providing that EA Pollution Prevention Guidelines are adhered to during the construction process the risk to the water environment should be minimised.

It is assumed that the Preferred Route Scheme option will lead to a decreased traffic flows and therefore decreased pollution of the surface water runoff and groundwater.

The DMRB presents a quantitative assessment for assessing these impacts on water quality. This assessment method should be employed at a later, more detailed, design stage to determine and quantify the effects on the local water environment. Traffic data will be required for this assessment.

Scheme: Next Best Alternative

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Surface Water Quality									
Construction of Bodington and Stourton Park and Rides (80% the size of the Preferred Option) may potentially effect the water quality of Meanwood and Stourton Beck as a result of construction works (accidental spillage, sedimentation) and leaks from vehicles during operation.	River Aire/ Meanwood Beck/Stourton Beck route wide	Chemical Water Quality Biodiversity: Salmon and cyprinid fisheries (at Meanwood Beck)	EA Website indicates for River Aire classifications at Low Beck downstream of crown point road: Chemistry: B Biology: F Nitrates: 4 Phosphates: 5 EA Website indicates for the River Aire classifications at Old Mill Beck upstream of Leeds Bridge: Chemistry: C Biology: - Nitrates: 4 Phosphates: 5	Local-Regional	Common to area	Not possible	Medium	Construction activities could adversely affect the watercourse temporarily, If the road drains to the watercourse appropriate design to ensure that discharges to the water comply with the EA requirements through the use of appropriate SUDS design such as swales and oil interceptors:	Low significance in the long term and significant temporarily during the construction works

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
								Moderate to Major	

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
It is assumed that volumes of traffic will decrease due to a modal shift as a result of the new public transport system. This may have a slightly beneficial on water quality within the River Aire.	River Aire Route wide	Chemical Water Quality	EA Website indicates for River Aire classifications at Low Beck downstream of crown point road:: Chemistry: B Biology: F Nitrates: 4 Phosphates: 5 EA Website indicates for the River Aire classifications at Old Mill Beck upstream of Leeds Bridge Chemistry: C Biology: - Nitrates: 4 Phosphates: 5	Local-Regional	Common to area	Not possible	Medium	It is assumed that the traffic volumes will decrease. If this is confirmed by the EIA this will have a positive impact on the water quality. Negligible to minor (depending on traffic volumes)	Insignificant

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
	River Aire South Route	Value to economy, Abstractions	4 ground water abstractions beneath the south route with a further 7 within 250m of the south route. 3 surface water abstractions within 250m of the south route	Abstractions important at local-scale. Aquifer important at Local/regional scale.	Common to area	Substitution may not be possible for the abstractions for Carlsberg Tetley Brewery Ltd. This may also apply to other abstractions in the area. Further investigations will be required as to the substitutability of the abstractions.	Very high	Major	Very significant
Flood Plain									
The North, East and City Hub Routes are all in an area where there is a 0.1% chance of flooding in one year. The South Route crosses areas of 0.1%, greater than 1% and 5% of flooding in a year. The route development will not increase the flood risk due to the small scale of the development. The south route follows the existing highway or currently paved areas in zones having 5% chance of flooding in one year.	River Aire South route	Conveyance of flow and material	South section of the route crosses the area of extreme flooding during major floods of 5% chance of flooding each year (without defences). Existing flood risk.	Local-Regional	Main river in locality	Not possible	Medium	There is an increase of flood risk at both of the park and rides which have a development area greater than 1 hectare. Mitigation measures such as attenuation storage are designed to provide	Insignificant

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
								protection: minor	
Ground water quality									
Potential effects on ground water quality as a result of construction work, particularly excavation works in off-line sections.	Water supply	Groundwater Vulnerability	4 ground water abstractions beneath the south route with a further 7 within 250m of the south route. 3 surface water abstractions within 250m of the south route. The route is not along a SPZ and is located along a minor aquifer. The route lies within high groundwater vulnerability (until proven otherwise as stated on the groundwater vulnerability	Abstractions important at local scale. Aquifer important at local/regional scale.	Common to area	Substitution may not be possible for the abstractions for Carlsburg Tetley Brewery Ltd. This may also apply to other abstractions in the area. Further investigations will be required as to the substitutability of the abstractions.	Very high	Major	Very significant

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
			map) Risk to groundwater is negligible using DMBR assessments.						
		Conveyance of flood flows	South Route; groundwater is approx 3mbgl. East and City Hub routes groundwater level is 5mbgl. Groundwater flow may be intercepted by the route improvements. Sufficient measures will be taken to ensure that the effect is negligible	Local importance	Common to area	No substitution possible	Medium	Negligible	Insignificant
		Transport and dilution of waste products	Generally poor ground water quality. Pollution controls will protect	Regional	Common	No substitution possible	Low	Negligible drainage system designed to maximise options for pollution	Insignificant

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
			ground water from contaminants					removal	

Reference Source(s):

1. Environment Agency website, Whats in your back yard? Available at Environment Agency - What's in your backyard?
2. Highways Agency Design Manual for Roads and Bridges DMBR volume 11 part 10. Available at http://www.standardsforhighways.co.uk/dmrb/vol11/section3/11s3p10.pdf
3. Department of Transport WebTAG Unit 3.3.11. Available at Department for Transport - Transport Analysis Guidance - WebTAG
4. Freshwater Fish Directive, Available at Defra, UK - Water quality - EC Freshwater Fish Directive
   Mott MacDonald reports (2009) including:
5. City Hub Phase 1 Geo-Environmental Desk Study. Report No 236834/RPT11 A,
6. East Line Phase 1 Geo-Environmental Desk Study. Report No 236834/RPT12 A
7. North Line Phase 1 Geo-Environmental Desk Study. Report No 236834/RPT13 A
8. South Line Phase 1 Geo-Environmental Desk Study. Report No 236834/RPT14 A
9. Flood Risk Assessment. Report No 236834/RTP19A.

Summary assessment score:

Insignificant in the long term.

Qualitative comments:

The proposed route overlies a minor aquifer in an area of high groundwater vulnerability. The City Hub, North, South and East routes will have no impact on the flood risk as the route development through the areas of high flood risk (5% in one year) are small in scale. The Park and Rides which are larger developments are in the zones of 0.1% chance of flooding in one year, these will have attenuation storage to mitigate the increase in surface run off . The South route will be aligned to the existing highway with in the area where there is 5% chance of flooding in one year, with no impact on flood routing or flood storage volumes.

The where the route has a potential to have an adverse impact on the groundwater quality, flow or level, measures will be taken to mitigate the effects.
Road drainage will have oil interceptors to ensure that discharges into the water courses meet the EA requirements, particularly at the Park and Rides (80% smaller than the Preferred Route) where the drainage is expected to be discharged into their respective Becks, and will attenuate the road surface runoff to reduce flood risk. Further studies will be required to assess if soakaways will be an alternative to attenuation storage.

Construction activities have the potential to adversely affect water and groundwater quality through accidental spillages during construction and from vehicle leakages during operation. The magnitude of this effect would be dependant on the substance spilt and the volume that enters the resource. Given that this would be a temporary effect, no long-term adverse effects attributable to construction are anticipated. Providing that EA Pollution Prevention Guidelines are adhered to during the construction process the risk to the water environment should be minimised.

It is assumed that the operation of the Next Best Alternative Scheme option will lead to a decreased traffic flows and therefore decreased pollution of the surface water runoff and groundwater.

The DMRB presents a quantitative assessment for assessing these impacts on water quality. This assessment method should be employed at a later, more detailed, design stage to determine and quantify the effects on the local water environment. Traffic data will be required for this assessment.

Scheme: Lower Cost Alternative

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Surface water quality									
Construction of Bodington and Stourton Park and Rides (50% smaller than that of the Preferred Option) may potentially effect the water quality of Meanwood and Stourton Beck as a result of construction works (accidental spillage, sedimentation) and leaks from vehicles during operation.	River Aire/ Meanwood Beck/Stourton Beck route wide	Chemical Water Quality Biodiversity: Salmon and cyprinid fisheries (at Meanwood Beck)	EA Website indicates for River Aire classifications at Low Beck downstream of crown point road: Chemistry: B Biology: F Nitrates: 4 Phosphates: 5 EA Website indicates for the River Aire classifications at Old Mill Beck upstream of Leeds Bridge: Chemistry: C Biology: - Nitrates: 4 Phosphates: 5	Local-Regional	Common to area	Not possible	Medium	Construction activities could adversely affect the watercourse temporarily, If the road drains to the watercourse appropriate design to ensure that discharges to the water comply with the EA requirements through the use of appropriate SUDS design such as swales and oil interceptors:	Low significance in the long term and significant Temporarily during the construction works

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
								Moderate to Major	
Volumes of traffic may decrease due to a modal shift from provision of the new public transport system. This may have a slightly beneficial on water quality within the River Aire.	River Aire Route wide	Chemical Water Quality	EA Website indicates for River Aire classifications at Low Beck downstream of crown point road:: Chemistry: B Biology: F Nitrates: 4 Phosphates: 5 EA Website indicates for the River Aire classifications at Old Mill Beck upstream of Leeds Bridge Chemistry: C Biology: - Nitrates: 4 Phosphates: 5	Local-Regional	Common to area	Not possible	Medium	It is unknown if the traffic volumes will decrease. If they do this will have a positive impact on the water quality. Negligible to minor (depending on traffic volumes)	Insignificant
	River Aire South route	Value to economy, Abstractions	4 ground water abstractions beneath the south route	Abstractions important at local scale. Aquifer	Common to area	Substitution may not be possible for the abstractions for Carlsburg Tetley	Very high	Major	Very significant

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
			with a further 7 within 250m of the south route. 3 surface water abstractions within 250m of the south route	important at local/regional scale.		Brewery Ltd. This may also apply to other abstractions in the area. Further investigations will be required as to the substitutability of the abstractions.			
Flood Plain									
The North, East and City Hub Routes are all in an area where there is a 0.1% chance of flooding in one year. The South Route crosses areas of 0.1%, greater than 1% and 5% of flooding in a year. The route development will not increase the flood risk due to the small scale of the development. The south route follows the existing highway or currently paved areas in zones having 5% chance of flooding in one year.	River Aire South route	Conveyance of flow and material	South section of the route crosses the area of extreme flooding during major floods of 5% chance of flooding each year (without defences). Existing flood risk.	Local-Regional	Main river in locality	Not possible	Medium	There is an increase of flood risk at both of the park and rides which have a development area greater than 1 hectare. Mitigation measures such as attenuation storage are designed to provide protection: minor	Insignificant

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Ground water quality									
Potential effects on ground water quality as a result of construction work, particularly excavation works in off-line sections	Water supply	Groundwater vulnerability	4 ground water abstractions beneath the south route with a further 7 within 250m of the south route. 3 surface water abstractions within 250m of the south route. The route is not along a SPZ and is located along a minor aquifer. The route lies within high groundwater vulnerability (until proven otherwise as stated on the groundwater vulnerability maps) Risk assessments	Abstractions important at local-scale. Aquifer important at Local/regional scale.	Common to area	Substitution may not be possible for the abstractions for Carlsberg Tetley Brewery Ltd. This may also apply to other abstractions in the area. Further investigations will be required as to the substitutability of the abstractions.	Very high	Major	Very significant

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
			using DMBR to groundwater is negligible						
		Conveyance of flood flows	South Route the groundwater is approx 3mbgl. East and City Hub routes groundwater level is 5mbgl. Groundwater flow may be intercepted by the route improvements. Sufficient measures will be taken to ensure that the effect is negligible	Local importance	Common to area	No substitution possible	Medium	Negligible	Insignificant
		Transport and dilution of waste products	Generally poor ground water quality. Pollution controls will protect ground water from	Regional	Common	No substitution possible	Low	Negligible drainage system designed to maximise options for pollution removal	Insignificant

Description of study area / Summary of potential impacts	Feature	Attributes / Services	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
			contaminants						

Reference Source(s):

1. Environment Agency website, Whats in your back yard? Available at Environment Agency - What's in your backyard?
2. Highways Agency Design Manual for Roads and Bridges DMBR volume 11 part 10. Available at http://www.standardsforhighways.co.uk/dmrb/vol11/section3/11s3p10.pdf
3. Department of Transport WebTAG Unit 3.3.11. Available at Department for Transport - Transport Analysis Guidance - WebTAG
4. Freshwater Fish Directive, Available at Defra, UK - Water quality - EC Freshwater Fish Directive
   Mott MacDonald reports (2009) including:
5. City Hub Phase 1 Geo-Environmental Desk Study. Report No 236834/RPT11 A,
6. East Line Phase 1 Geo-Environmental Desk Study. Report No 236834/RPT12 A
7. North Line Phase 1 Geo-Environmental Desk Study. Report No 236834/RPT13 A
8. South Line Phase 1 Geo-Environmental Desk Study. Report No 236834/RPT14 A
9. Flood Risk Assessment. Report No 236834/RTP19A.

Summary assessment score:

Insignificant in the long term.

Qualitative comments:

The lower cost alternative overlies a minor aquifer in an area of high groundwater vulnerability. The City Hub, North, South and East routes will have no impact on the flood risk as the route development through the areas of high flood risk (5% in one year) are small in scale. The Park and Rides which are larger developments are in the zones of 0.1% chance of flooding in one year, these will have attenuation storage to mitigate the increase in surface run off. The South route will be aligned to the existing highway with in the area where there is 5% chance of flooding in one year, with no impact on flood routing or flood storage volumes. Assuming that the lower cost alternative does not require changes to the existing highway network or bridge structures, the impact on the water environment is likely to be insignificant. The decrease in vehicle use on the road as a result of the new bus service has the potential to reduce contaminants in the road runoff and therefore improving the water quality entering the water environment. Road drainage will have oil interceptors to ensure that discharges into the water courses meet the EA requirements, particularly at the Park and Rides (50 % smaller than the Preferred Route) where the drainage is expected to be discharged into their respective becks, and will attenuate the road surface runoff to reduce flood risk. Further studies will be required to assess if soakaways will be an alternative to attenuation storage.

Construction activities have the potential to adversely affect water and groundwater quality through accidental spillages during construction and from vehicle leaks during operation. The magnitude of this effect would be dependant on the substance spilt and the volume that enters the resource. Given that this would be a temporary effect, no long-term adverse effects attributable to construction are anticipated. Providing that EA Pollution Prevention Guidelines are adhered to during the construction process the risk to the water environment should be minimised.

The operation of the Lower Cost Alternative may lead to a decreased traffic flows and therefore decreased pollution of the surface water runoff and groundwater.

The DMRB presents a quantitative assessment for assessing these impacts on water quality. This assessment method should be employed at a later, more detailed, design stage to determine and quantify the effects on the local water environment. Traffic data will be required for this assessment.