

## Appendix A11.7: Impact Assessment

### 1 Introduction

1.1.1 This appendix describes the potential adverse impacts of the proposed scheme prior to mitigation on the attributes 'Hydrology and Flood Risk', 'Fluvial Geomorphology', 'Water Quality', 'Water Supply', 'Dilution and Removal of Waste Products' and 'Biodiversity' for each of the identified water features together with proposed mitigations, with a summary of residual impacts remaining.

### 2 Water Features Scoped Out

2.1.1 During the assessment a number of water features have been scoped out as they have been assessed as unlikely to be impacted by the construction or operation of the Scheme. Out of the total of 89 water features identified within the study area, 16 have no impact at construction or operational stages across all attributes, due to a lack of hydraulic connectivity with the proposed scheme. These include:

- WF82, WF83, WF85, WF86, WF90, WF91, WF135, WF168, WF169, WF170, WF171 (Banvie Burn), WF172, WF173, WF174, WF176 and WF177

2.1.2 In addition,

- WF125 and WF126 have been merged and treated as a single receptor for the impact assessment;
- WF94 has been scoped out for fluvial geomorphology and flood risk; and
- WF93, WF124, WF138 and WF146 have been removed from the assessment as they are existing road drainage features.

### 3 Construction and Operational Activities

3.1.1 The construction and operational activities associated with each water feature are detailed in Table 1 below.

**Table 1: Proposed construction/operational activities**

Water Feature	Dualled Mainline	Side Road / Access Track	New Bridge/ Bridge Extension	Replacement Culvert/ New Culvert /Culvert Extension	SuDS Feature/ Outfall	Pre-earthwork Drain (PED)	Channel Re-grading/Re-alignment	Additional Comments
WF100 (lower)	✓	✓	✓ (2)		✓ (5)	✓		Two new bridges: Essangal (with piers on banks between ch4300 - ch4350) and Pitaldonich (with abutments on banks between ch11250 – ch11350). SuDS outfalls F, I, J(1), J(2), K.
WF100 (upper)	✓	✓			✓ (3)			SuDS outfalls M, N, O.
WF84	✓					✓		-
WF87	✓	✓	✓	✓(2)		✓		-
WF89	✓		✓		✓ (2)	✓		SuDS outfall A, B
WF92	✓			✓		✓		Cascade to culvert inlet.
WF95	✓	✓		✓			✓	-
WF96	✓	✓				✓		-
WF97	✓			✓		✓	✓	-
WF98	✓	✓	✓		✓	✓		SuDS outfall C, D(1)

Water Feature	Dualled Mainline	Side Road / Access Track	New Bridge/ Bridge Extension	Replacement Culvert/ New Culvert /Culvert Extension	SuDS Feature/ Outfall	Pre-earthwork Drain (PED)	Channel Re-grading/Re-alignment	Additional Comments
WF99	✓				✓	✓		SuDS outfall E(1)+E(2)
WF178	✓			✓	✓	✓		SuDS outfall D(2)
WF176		✓						-
WF101	✓	✓		✓		✓		-
WF102	✓			✓		✓	✓	-
WF103	✓	✓		✓(3)		✓	✓	-
WF104	✓	✓		✓(3)		✓		-
WF105	✓	✓		✓		✓		Cascade to culvert inlet.
WF106	✓	✓		✓		✓		Cascade to culvert inlet.
WF107	✓	✓		✓		✓		-
WF108	✓			✓		✓		Cascade to culvert inlet.
WF109	✓			✓		✓		Cascade to culvert inlet.
WF110	✓	✓		✓(2)		✓	✓	Two cascades to culvert inlets.
WF111	✓	✓		✓(2)		✓		Cascade to culvert inlet.
WF112	✓	✓		✓(2)		✓		Cascade to culvert inlet.
WF113	✓	✓		✓(2)		✓		Cascade to culvert inlet.
WF114	✓			✓		✓		Cascade to culvert inlet.
WF115	✓	✓	✓		✓			Demolition of the existing A9 bridge and construction of a new wider bridge (extended by approximately 50m). SuDS outfalls G, H.
WF116	✓			✓			✓	-
WF117	✓	✓		✓(2)		✓		-
WF118	✓			✓		✓		-
WF119	✓			✓		✓	✓	Cascade to culvert inlet.
WF120	✓			✓(2)			✓	Cascade to culvert inlet.
WF121	✓			✓(2)		✓		Cascade to culvert inlet.
WF123		✓						-
WF125	✓			✓		✓	✓	-
WF126	✓							-
WF127	✓					✓		-
WF128	✓	✓		✓		✓	✓	-
WF129	✓			✓				-
WF131	✓	✓		✓		✓		-
WF132	✓	✓		✓		✓	✓	-
WF133		✓						-

Water Feature	Dualled Mainline	Side Road / Access Track	New Bridge/ Bridge Extension	Replacement Culvert/ New Culvert /Culvert Extension	SuDS Feature/ Outfall	Pre-earthwork Drain (PED)	Channel Re-grading/Re-alignment	Additional Comments
WF134	✓	✓		✓(2)		✓	✓	-
WF136	✓			✓	✓		✓	SuDS outfall L. Cascade to culvert inlet.
WF137	✓			✓				Cascade to culvert inlet.
WF139	✓			✓(2)		✓		Cascade to culvert inlet
WF140	✓			✓		✓		Cascade to culvert inlet.
WF141	✓			✓		✓		Cascade to culvert inlet.
WF142	✓		✓			✓		Demolition of the existing A9 bridge and construction of a new wider bridge (extended by approximately 15m).
WF143	✓			✓		✓	✓	-
WF144	✓			✓			✓	-
WF145	✓	✓		✓(2)		✓	✓	-
WF147	✓	✓		✓		✓	✓	-
WF148	✓			✓		✓		Cascade to culvert inlet.
WF149	✓		✓			✓		Extension of the existing bridge and construction of cascade to accommodate the additional carriageway (extended by approximately 45m).
WF150	✓			✓		✓		-
WF151	✓			✓			✓	-
WF152	✓			✓				-
WF153	✓			✓		✓		-
WF167	✓		✓					Demolition of the existing A9 bridge and construction of a new wider bridge (extended by approximately 40m).
WF154	✓			✓		✓		Cascade to culvert inlet.
WF155	✓	✓		✓		✓		-
WF156	✓	✓		✓(2)		✓	✓	Cascade to culvert inlet.
WF157	✓	✓		✓(2)		✓	✓	Cascade to culvert inlet
WF158	✓		✓		✓	✓		Demolition of the existing A9 bridge and construction of a new wider bridge (extended by approximately 30m). SuDS outfall Q.
WF159	✓	✓		✓		✓	✓	-

Water Feature	Dualled Mainline	Side Road / Access Track	New Bridge/ Bridge Extension	Replacement Culvert/ New Culvert /Culvert Extension	SuDS Feature/ Outfall	Pre-earthwork Drain (PED)	Channel Re-grading/Re-alignment	Additional Comments
WF160	✓			✓		✓	✓	-
WF161	✓			✓		✓	✓	-
WF162	✓			✓		✓	✓	-
WF163	✓			✓		✓	✓	Cascade to culvert inlet.
WF164	✓		✓		✓	✓		Demolition of the existing bridge and construction of a new wider bridge (extended by approximately 10m). SuDS outfall S.
WF165	✓							-

## 4 Impact Assessment

- 4.1.1 This section reports on the assessment of the specific impacts affecting water features during both the construction and operational phase of the proposed scheme. Where no impacts are anticipated across all attributes, these water features have been listed above in paragraph 2.1.2 and are not included within this section. All of the impacts reported are adverse unless otherwise stated.
- 4.1.2 Standard mitigation will be applied to all water features affected by the proposed scheme. Specific mitigation measures have also been provided at certain water features in Table 2 and 3 below, and a full description of the standard and specific mitigation measures to be adopted is provided in Chapter 11 (Road Drainage and the Water Environment); Tables 11.19 to 11.22.
- 4.1.3 Table 11.7 of Chapter 11 (Road Drainage and the Water Environment) allows for the use of professional judgement to assign a significance rating in certain circumstances. An asterisk (\*) is shown in the assessment columns in Table 2 and 3 below where this has been undertaken. The selection of a higher significance is chosen where a greater number of high risk activities are proposed, or where the impact on one attribute is intrinsically linked to another attribute (e.g. water quality and biodiversity) that has a higher sensitivity.
- 4.1.4 It is noted that within Chapter 11 (Road Drainage and the Water Environment) and Appendix A11.1 (Baseline), a distinction has been made between the receptor 'Water Quality' and 'Water Supply', due to the potential for the magnitude of impact on these attributes to differ depending on the source location of the water supply. Where an impact on a water supply is of a greater significance than the impact on water quality, the assessment and significance of the impact is provided within brackets in the water quality (water supply) column of Tables 2 and 3.

Construction Impacts

Table 2: Specific construction impacts and impact significance (colour coding indicates impact significance).

Water Feature	Potential Construction Impacts	Impact Significance: Pre-Mitigation					Specific Mitigation	Impact Significance: Post-Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF100 (lower)	<p><b>Flood Risk:</b> Temporary increase of impermeable areas within the catchment and the construction of six new road drainage outfalls (E, F, I, J(1), J(2), K) within/in close proximity to the River Garry have the potential to increase peak flow rates into the river and increase the risk of flooding. Temporary construction structures for the new Essangal Underbridge and Pitaldonich Underbridge within close proximity to the watercourse/in-channel works may cause constrictions of flows/loss of floodplain storage due to works encroaching into the floodplain and therefore result in increased flood risk.</p> <p><b>Fluvial Geomorphology:</b> Works within the vicinity and along the banks of the River Garry altering channel banks and reducing floodplain area. Potential fine sediment input to river from construction activities proposed within the channel and within tributaries, with associated changes to morphological features. Works over the channel, within the proximity of the channel, in the channel and in the adjacent floodplain at Essangal, (ch4100-ch4400) for construction of new piers and bridge. Potential disturbance of riparian corridor, banks and marginal deposits from works for the new piers. New bridge construction at Pitaldonich (ch11200) requiring works over the channel and within the floodplain.</p> <p><b>Water Quality:</b> A temporary measurable deterioration in water quality (including Environmental Quality Standards (EQS)) for greater than one month and long term change to designated site from the generation of turbid runoff and/or accidental spillage of fuels, oils, cementitious material or other polluting substances. Significant in-channel works. Disruption or severance of pipeline for Shierglas quarry abstraction KP-PWS15.</p>	very high x major = Very Large*	high x moderate = Large*	high x major = Very Large* (high x major = Large)	low x minor = Neutral	very high x major = Very Large	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23, P05-W24	very high x minor = Moderate*	high x minor = Slight*	high x negligible = Neutral (high x minor = Slight)	low x negligible = Neutral	very high x negligible = Neutral
WF100 (upper)	<p><b>Flood Risk:</b> The increase of impermeable areas within the catchment and the construction of three road drainage outfalls/SuDS basins (M, N and O) (which will discharge directly into the River Garry) have the potential to increase peak flows entering the watercourse and increasing the risk of flooding.</p> <p><b>Fluvial Geomorphology:</b> Works within the vicinity and along the banks of the River Garry altering channel banks and reducing floodplain area. Potential fine sediment input to river from Construction Activities proposed within the channel and within tributaries, with associated changes to morphological features.</p> <p><b>Water Quality:</b> A temporary measurable deterioration in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils, cementitious material or other polluting substances.</p>	high x moderate = Moderate*	high x moderate = Moderate*	high x major = Large*	low x minor = Neutral	medium x major = Large*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23, P05-W24	high x minor = Slight*	high x minor = Slight*	high x minor = Slight*	low x negligible = Neutral	medium x minor = Slight
WF84	<p><b>Flood Risk:</b> None anticipated.</p> <p><b>Fluvial Geomorphology:</b> None anticipated.</p> <p><b>Water Quality:</b> A temporary measurable localised decrease in water quality from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x negligible = Neutral	medium x negligible = Neutral	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x negligible = Neutral	medium x negligible = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF87	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Culvert extension/in-channel works/temporary construction structures placed within the flood risk zones or for flow diversion may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Fine sediment input from culvert extension activities, channel realignment and the general construction of the mainline widening and new side road (i.e. from bare earth surfaces). Loss of approx. 35m of modified watercourse within culvert. Disturbance of existing morphological features within the channel (particularly natural step-pool sequence) and potential changes to flow processes.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances. Disruption, severance or pollution of pipeline to downstream KP-PWS1 (domestic use).</p>	low x moderate = Slight*	medium x moderate = Moderate	medium x moderate = Moderate (high x major = Very Large*)	medium x moderate = Moderate	medium x moderate = Moderate	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral*	medium x minor = Slight	medium x minor = Slight (high x minor = Slight*)	medium x minor = Slight	medium x minor = Slight

Water Feature	Potential Construction Impacts	Impact Significance: Pre-Mitigation					Specific Mitigation	Impact Significance: Post-Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF89	<p><b>Flood Risk:</b> Bridge supports and surrounding earthworks are elevated above the bankfull width of the channel and are unlikely to cause restriction in flood flows. Increase of impermeable areas within the catchment and the construction of two SuDS outfalls (A and B) which discharge into the watercourse have the potential to increase peak flows rates into the watercourse and increasing the risk of flooding. However, the increase in impermeable area is limited in comparison to overall catchment size.</p> <p><b>Fluvial Geomorphology:</b> Potential for fine sediment input to watercourse from construction of the mainline widening and new side roads (i.e. from bare earth surfaces). Works within the vicinity and at the top of the valley slopes of the watercourse associated with the bridge extension. Disturbance to adjacent riparian vegetation (particularly established trees).</p> <p><b>Water Quality:</b> A temporary measurable localised decrease in water quality (including EQS) for less than one month and temporary impacts on designated species from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	very high x minor = Moderate	high x minor = Slight*	very high x moderate = Large*	low x negligible = Neutral	very high x moderate = Large*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	very high x negligible = Neutral	high x negligible = Neutral	very high x negligible = Neutral	low x negligible = Neutral	very high x negligible = Neutral
WF92	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/cascade/channel realignment may cause restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage. Change to runoff rates from site drainage and change in vegetation type.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (leading to bare earth surfaces). Works within and adjacent to the watercourse, leading to removal of earth banks and disturbing earth and gravel bed. Works to extend culvert by approximately 23m over watercourse will impact upon banks, bed and riparian zone. Realignment of ditch section running alongside of north side of existing A9 embankment</p> <p><b>Water Quality:</b> Temporary measurable localised decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances. No impacts on PWS (KP-PWS14 and KP-PWS3) anticipated as source and pipework is upstream.</p>	high x moderate = Moderate*	low x moderate = Slight	medium x moderate = Moderate	low x minor = Neutral	medium x moderate = Moderate	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = slight*	low x minor = Neutral	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight
WF94	<p><b>Flood Risk:</b> None anticipated.</p> <p><b>Fluvial Geomorphology:</b> None anticipated.</p> <p><b>Water Quality:</b> A temporary measurable localised decrease in water quality from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	Scoped Out.	Scoped Out.	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	Scoped Out.	Scoped Out.	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF95	<p><b>Flood Risk:</b> Construction of new culvert and channel realignment. Potential for temporary increase in hardstanding area and/or soil compaction/vegetation clearance during construction to result in temporary increases in runoff rates into the watercourse. Culvert construction, in-channel works and temporary construction structures placed within the flood risk zones may cause; restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction activities proposed within and adjacent to the watercourse associated with re-sectioning of earth bed and banks. Works to extend existing culvert, leading to removal of approximately 12m of earth bed and banks.</p> <p><b>Water Quality:</b> A temporary measurable localised decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances. No impact on PWS (KP-PWS5) is anticipated as source and pipework is upstream.</p>	low x moderate = Slight	low x minor = Neutral	medium x moderate = Moderate	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Negligible	low x negligible = Neutral	medium x minor = Slight	low x negligible = Neutral	low x minor = Neutral
WF96	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of culvert extension/temporary construction structures may cause; loss of floodplain area, restriction in flood flows, temporary increase flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks from construction activities proposed within and adjacent to the watercourse associated with the mainline widening and new side road (leading to bare earth surfaces). Works within the watercourse leading to removal of approximately 15m of existing earth banks and fine gravel and silt bed.</p> <p><b>Water Quality:</b> A temporary measurable localised decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances. No impact on PWS (KP-PWS9) is anticipated as source and pipework is upstream.</p>	high x moderate = Moderate*	low x minor = Neutral	medium x moderate = Moderate	low x minor = Neutral	medium x moderate = Moderate	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	low x negligible = Neutral	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight

Water Feature	Potential Construction Impacts	Impact Significance: Pre-Mitigation					Specific Mitigation	Impact Significance: Post-Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF97	<p><b>Flood Risk:</b> In-channel works/channel realignment may cause restriction in flood flows, temporarily increase flood risk locally and be susceptible to flood damage. Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. The construction works may also result in a temporary loss of floodplain area.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (leading to bare earth surfaces). Works within the watercourse, leading to removal of earth bed and banks. Alteration to downstream movement of sediment when constructed realigned channel connected, with water passing down the channel entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x minor = Neutral	low x moderate = Slight	low x minor = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF98	<p><b>Flood Risk:</b> Bridge supports and surrounding earthworks are well above the channel zone and are unlikely to cause restriction of flood flows, temporarily increase flood risk locally or be susceptible to flood damage. Temporary construction works for SuDS within catchment may slightly increase peak flow rates into watercourse. Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse.</p> <p><b>Fluvial Geomorphology:</b> Potential fine sediment input to river from construction activities proposed, including bridge extension and new side road (leading to bare earth surfaces), with associated changes to morphological features. Embankment construction for new side road requiring works within and adjacent to the channel disturbing valley slope, banks, step-pool sequence and substrate.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Moderate*	medium x minor = Slight	medium x major = Large*	medium x moderate = Moderate	medium x major = Large*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	medium x negligible = Neutral	medium x minor = Slight	medium x minor = Slight	medium x minor = Slight
WF99	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction may result in temporary increases in runoff rates into the watercourse. Construction of one new road drainage outfall (combined outfall from SuDS ponds E(1) and E(2)) into the watercourse has the potential to increase peak flows into the river, increasing the risk of flooding.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction activities proposed within and adjacent to the watercourse associated with the mainline widening (leading to bare earth surfaces).</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x minor = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF178	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Temporary construction works for SuDS (SUDS basin D(2) will discharge to this watercourse) may slightly increase peak flow rates into watercourse. Culvert replacement/channel realignment may cause; restrictions in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction activities proposed within and adjacent to the watercourse associated with the new side road. Works within and adjacent to the watercourse, leading to removal of earth banks and fine gravel substrate. Removal of vegetated riparian zone, including established trees, destabilising banks and leaving bare earth surfaces. Construction of SuDS basin outfall immediately downstream of culvert.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Moderate*	low x minor = Neutral	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x negligible = Neutral	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral

Water Feature	Potential Construction Impacts	Impact Significance: Pre-Mitigation					Specific Mitigation	Impact Significance: Post-Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF101	<p><b>Flood Risk:</b> Culvert extension/new culvert/in-channel works/temporary construction structures placed within the flood risk zones may cause; restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage. Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Potential loss of floodplain area.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and construction of a new side road (which would lead to bare earth surfaces). Culvert extension will involve removal of existing bed, earth banks and vegetated riparian zone, including established trees. Alteration to downstream movement of sediment when newly constructed realigned channel is connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x minor = Neutral	low x moderate = Slight	high x moderate = Moderate*	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x negligible = Neutral	low x negligible = Neutral	low x minor = Neutral	high x minor = Slight*	low x minor = Neutral
WF102	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of culvert extension /temporary construction structures placed within the flood risk zones may cause; loss of flood plain storage, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side roads (i.e. from bare earth surfaces). Works within and adjacent to the watercourse for culvert extension and new culvert, leading to removal of approximately 60m (in total) of gravel and pebble bed including a step-pool sequence, earth banks and vegetated riparian zone, including established trees.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances. No impact on PWS (PGG-PWS9) is anticipated as source and pipework is upstream.</p>	low x moderate = Slight	medium x moderate = Moderate	medium x major = Large*	low x negligible = Neutral	medium x major = Large*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	medium x minor = Slight	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight
WF103	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of culverts/temporary construction structures placed within the flood risk zones/ditch realignment may cause; loss of flood plain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage. However, the scale of this impact is unlikely to affect any sensitive receptors due to the limited extent of works in comparison to the overall catchment.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side roads (i.e. from bare earth surfaces). Works within and adjacent to the channel for new culverts, leading to removal of cobble bed with sand deposits, earth banks and vegetated riparian zone, including established trees. Channel realignment to the base of new access road embankment.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p> <p>Disruption or severance of pipeline underneath the existing A9 which connects Garrybank (residential property) to PWS PGG-S2 source (domestic use) upslope of existing A9.</p>	high x moderate = Moderate*	medium x moderate = Moderate	medium x major = Large* (high x major = Very Large)	low x negligible = Neutral	medium x major = Large*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	medium x minor = Slight	medium x minor = Slight (high x negligible = Neutral)	low x negligible = Neutral	medium x minor = Slight
WF104	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the water. Construction of culverts/realignment/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces). Works within and adjacent to the watercourse for new culverts, leading to removal of gravel bed, earth banks, and vegetated riparian zone, including established trees. Alteration to downstream movement of sediment when constructed realigned channel connected, with water passing down the channel entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	medium x moderate = Moderate	medium x major = Large*	low x negligible = Neutral	medium x major = Large*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	medium x minor = Slight	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight

Water Feature	Potential Construction Impacts	Impact Significance: Pre-Mitigation					Specific Mitigation	Impact Significance: Post-Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF105	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of culvert/cascade/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces). Removal of approximately 20m of earth banks and sandy bed.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x minor = Neutral	low x major = Slight*	low x negligible = Neutral	low x major = Slight*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF106	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of culvert/cascade/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces). Removal of up to 60m of earth banks and fine gravel bed. Construction of new outfalls, including one at confluence of WF106 with River Garry (WF100).</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x moderate = Slight	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x minor = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF107	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of culvert/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporarily increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the new side road (i.e. from bare earth surfaces). Works within the watercourse for culvert extension, leading to removal of approximately 10m of earth banks and fine gravel bed.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x minor = Neutral	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF108	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increase in runoff rates into the watercourse. Construction of culvert/cascade/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restrictions in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Culvert extension requiring removal of approximately 9m of earth banks and sand bed.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Moderate*	low x minor = Neutral	medium x moderate = Moderate	low x negligible = Neutral	medium x moderate = Moderate	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	low x negligible = Neutral	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight
WF109	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increase in runoff rates into the watercourse. Construction of culvert/cascade/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restrictions in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Removal of approximately 5m of earth banks and silt bed.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x minor = Neutral	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral

Water Feature	Potential Construction Impacts	Impact Significance: Pre-Mitigation					Specific Mitigation	Impact Significance: Post-Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF110	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of culverts/cascades/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces). Combined length of new culvert will require the removal of approximately 38m of earth banks and gravel bed.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x moderate = Slight	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x minor = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF111	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/new culvert/ cascade/temporary construction structures placed within the flood risk zones may cause; loss of floodplain storage, restrictions in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces). Combined length of new culverts will require the removal of approximately 18m of earth banks and cobble and pebble bed. Alteration to downstream movement of sediment when constructed realigned channel connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Moderate*	medium x moderate = Moderate	medium x moderate = Moderate	low x negligible = Neutral	medium x moderate = Moderate	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23, P05-W25	high x minor = Slight*	medium x minor = Slight	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight
WF112	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/new cascade/new culvert/temporary construction structures placed within the flood risk zones may cause; loss of floodplain storage, restrictions in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces). Combined length of new culverts will lead to removal of approximately 30m of earth banks and gravel and pebble bed.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Moderate*	low x minor = Neutral	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF113	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/new cascade/new culvert/temporary construction structures placed within the flood risk zones may cause; loss of floodplain storage, restrictions in flood flows, temporary increase flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces). Combined length of new culverts will require the removal of approximately 17m of earth banks and cobble and gravel bed.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Moderate*	low x minor = Neutral	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral

Water Feature	Potential Construction Impacts	Impact Significance: Pre-Mitigation					Specific Mitigation	Impact Significance: Post-Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF114	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/new cascade/realignment/temporary construction structures placed within the flood risk zones may cause; loss of floodplain storage, restrictions in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening: combined length of new culverts will require the removal of approximately 18m of earth banks and cobble and gravel bed. Alteration to downstream movement of sediment when constructed realigned channel connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	medium x moderate = Moderate	medium x moderate = Moderate	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	medium x minor = Slight	medium x minor = Slight	low x negligible = Neutral	low x minor = Neutral
WF115	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction and the construction of two road drainage outfalls/SuDS ponds may result in temporary increases in runoff rates into the watercourse. The proposed location of the SuDS ponds encroaches into the floodplain and therefore may also increase flood risk locally due to loss of floodplain area during construction works. Construction of bridge/temporary construction structures placed within the flood risk zones would cause; loss of floodplain area, restriction in flood flows, temporary increase flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks, demolition of existing bridge and construction within and adjacent to the watercourse associated with the mainline widening.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	very high x moderate = Large*	high x moderate = Moderate	high x major = Very Large	low x negligible = Neutral	very high x major = Very Large	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23, P05-W26	very high x minor = Moderate*	high x minor = Slight	high x minor = Slight / Moderate	low x negligible = Neutral	very high x negligible = Neutral
WF116	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/channel regrading/temporary construction structures placed within the flood risk zones may cause; loss of floodplain storage, restrictions in flood flows, temporary increase flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Removal of approximately 65m of bed and banks.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Moderate*	low x minor = Neutral	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF117	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/new culvert/temporary construction structures placed within the flood risk zones may cause; loss of flood plain storage, restrictions in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Combined culverts will lead to the removal of approximately 70m of bed and banks.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Moderate*	low x minor = Neutral	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF118	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/ditch realignment/temporary construction structures placed within the flood risk zones may cause; loss of floodplain storage, restrictions in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Combined length of new culverts will require the removal of approximately 40m of bed and banks.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x minor = Neutral	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral

Water Feature	Potential Construction Impacts	Impact Significance: Pre-Mitigation					Specific Mitigation	Impact Significance: Post-Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF119	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/cascade/drainage ditch realignment/temporary construction structures placed within the flood risk zones may cause; loss of floodplain storage, restrictions in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Length of new culvert will lead to removal of approximately 30m of bed and banks. Realignment of a small drain leading into the main channel. Alteration to downstream movement of sediment when constructed realigned channel connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x moderate = Slight	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x minor = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF120	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/new culverts/channel realignment/new cascade/temporary construction structures placed within the flood risk zones may cause; loss of floodplain storage, restrictions in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Construction of SuDS pond I will result in the removal of approximately 20m of bed and banks, also impacts upon local springs (issues). Realignment of a small drain leading into the main channel. Alteration to downstream movement of sediment when constructed realigned channel connected, with water passing down the channel entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x major = Slight*	low x major = Slight*	low x negligible = Neutral	low x major = Slight*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x minor = Neutral	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight
WF121	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/new cascade/side road/new access track culvert/SuDS pond and outfall infrastructure/temporary construction structures placed within the flood risk zones may cause; loss of floodplain storage, restrictions in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Combined culverts will require the removal of approximately 50m of channel including earth banks, step-pool sequence and natural substrate.</p> <p><b>Water Quality:</b> A temporary measureable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	medium x minor = Slight	medium x major = Large*	low x negligible = Neutral	medium x major = Large*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	medium x minor = Slight	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight
WF123	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Potential for increased flood risk during construction due to construction works potentially encroaching into the floodplain of the River Bruar (WF123).</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction in the proximity of the watercourse.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month and temporary impacts on designated species from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	very high x minor = Moderate*	high x negligible = Neutral	high x moderate = Moderate*	low x negligible = Neutral	very high x moderate = Large*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	very high x negligible = Neutral	high x negligible = Neutral	high x negligible = Neutral	low x negligible = Neutral	very high x negligible = Neutral

Water Feature	Potential Construction Impacts	Impact Significance: Pre-Mitigation					Specific Mitigation	Impact Significance: Post-Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF125/ WF126	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/realignment/temporary construction structures placed within the flood risk zones may cause; loss of floodplain storage, restrictions in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Culvert will result in the removal of approximately 170m to 300m of earth banks and natural substrate.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Moderate*	low x major = Slight*	low x major = Moderate*	high x negligible = Neutral	low x major = Moderate*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	low x minor = Neutral	low x moderate = Slight	high x negligible = Neutral	low x moderate = Slight
WF127	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of culvert extension/temporary construction structures placed within the flood risk zones may cause; restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Culvert will result in the removal of approximately 105m of channel including earth banks and cobble bed. However, the bed is not considered natural but instead a result of dredging into the floodplain material.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Moderate*	low x minor = Neutral	medium x moderate = Moderate	low x negligible = Neutral	medium x moderate = Moderate	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	low x negligible = Neutral	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight
WF128	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of new side road culverts/culvert extension/channel realignment/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the new side road (i.e. from bare earth surfaces). Culvert will result in the removal of approximately 35m of banks and bed.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Moderate*	low x minor = Neutral	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF129	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of channel diversion/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Removal of approximately 26m of earth banks and bed.</p> <p><b>Water Quality:</b> A temporary measurable localised decrease in water quality from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x moderate = Slight	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x moderate = Slight	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF131	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of new culvert/channel realignment/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Removal of approximately 30m earth banks and bed. Alteration to downstream movement of sediment when constructed realigned channel connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x minor = Neutral	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral

Water Feature	Potential Construction Impacts	Impact Significance: Pre-Mitigation					Specific Mitigation	Impact Significance: Post-Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF132	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, partial culvert replacement, earthworks and construction adjacent to the watercourse associated with the mainline widening and access road construction.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Large*	medium x minor = Slight	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23, W22	high x minor = Slight*	medium x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF133	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding areas and soil compaction during construction to result in temporary increased runoff rates in the watercourse.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces).</p> <p><b>Water Quality:</b> A temporary decrease in water quality from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances. Disruption, severance or pollution of PGG-PWS3 (domestic use).</p>	high x negligible = Neutral	medium x negligible = Neutral	medium x negligible = Neutral (high x major = Very Large*)	low x negligible = Neutral	medium x negligible = Neutral	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x negligible = Neutral	medium x negligible = Neutral	medium x negligible = Neutral (high x minor = Slight*)	low x negligible = Neutral	medium x negligible = Neutral
WF134	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/side road/bridge/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces). Removal of approximately 44m of earth banks with cobble and coarse gravel bed for new culvert. Alteration to downstream movement of sediment when constructed realigned channel connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Large*	low x minor = Neutral	low x major = Moderate*	low x negligible = Neutral	low x major = Moderate*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Moderate*	low x negligible = Neutral	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight
WF136	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/cascade/channel realignment/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage. Temporary construction works for SuDS (SuDS pond L will discharge to this watercourse) may slightly increase peak flow rates into watercourse.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Removal of approximately 20m of earth banks and fine gravel bed due to new culvert. Alteration to downstream movement of sediment when constructed realigned channel connected, flow entraining newly exposed sediment</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Large*	low x moderate = Slight	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	low x moderate = Slight	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF137	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/cascade/channel realignment/ temporary construction structures placed within the flood risk zones may cause; loss of flood plain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage. Temporary construction works for SuDS (pond L) may slightly increase peak flow rates into watercourse.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Removal of banks and bed for new outlet and for regrading of channel downstream (approximately 12m).</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x minor = Neutral	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral

Water Feature	Potential Construction Impacts	Impact Significance: Pre-Mitigation					Specific Mitigation	Impact Significance: Post-Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF139	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/channel realignment/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Culvert extension will result in the removal of approximately 50m of earth of banks and bed. Alteration to downstream movement of sediment when newly constructed realigned channel is connected, with flow entraining newly exposed sediment. Realignment of ditches along northern boundary of the extended A9 embankment will lead to the removal of approximately 80m of channel.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x major = Slight	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x minor = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF140	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/cascade/channel realignment/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Culvert extension will result in removal of approximately 17m of earth banks and bed. Realignment of ditches along northern boundary of the extended A9 embankment will lead to removal of approximately 18m of channel. Alteration to downstream movement of sediment when constructed realigned channel connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Moderate*	medium x minor = Slight	medium x moderate = Moderate	low x negligible = Neutral	medium x moderate = Moderate	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	medium x negligible = Neutral	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight
WF141	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/channel realignment/pipe down cut slope/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage. Temporary construction works for SuDS (basin M may slightly increase peak flow rates into watercourse.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Culvert extension will result in removal of approximately 4m banks and bed. Realignment of ditches along northern boundary of the extended A9 embankment. Alteration to downstream movement of sediment when constructed realigned channel connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x minor = Neutral	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF142	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Bridge supports and surrounding earthworks may cause; restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Works within the vicinity and along the banks of WF142 altering channel slopes and floodplain area. Potential fine sediment input to river from demolition and construction activities proposed (i.e. from bare earth surfaces) within and adjacent to the watercourse with associated changes to morphological features.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	very high x negligible = Neutral	high x major = Large*	low x negligible = Neutral	high x major = Large*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	very high x negligible = Neutral	high x minor = Slight*	low x negligible = Neutral	high x minor = Slight*

Water Feature	Potential Construction Impacts	Impact Significance: Pre-Mitigation					Specific Mitigation	Impact Significance: Post-Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF143	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/regrading of channel/drainage ditch realignment/temporary construction structures placed within the flood risk zones may cause; loss of flood plain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Culvert extension will result in the removal of approximately 15m of earth banks and bed. Alteration to downstream movement of sediment when constructed realigned channel connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	medium x moderate = Moderate	low x moderate = Slight	medium x moderate = Moderate	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	medium x minor = Slight	low x minor = Neutral	medium x minor = Slight	low x negligible = Neutral	low x minor = Neutral
WF144	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/ channel regrading/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Removal of banks and bed.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x moderate = Slight	medium x minor = Slight	low x negligible = Neutral	low x minor = Neutral	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x minor = Neutral	medium x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF145	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of new replacement culverts/channel regrading/access track culvert/side road and associated culvert/temporary construction structures placed within the flood risk zones may cause; loss of flood plain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces). Combined length of culverts will remove approximately 32m of cobble-pebble bed and earth banks including vegetated riparian corridor.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x minor = Neutral	medium x moderate = Moderate	low x negligible = Neutral	medium x moderate = Moderate	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x negligible = Neutral	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight
WF147	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of new culvert/bridge/side road/channel realignment/temporary construction structures placed within the flood risk zones may cause; loss of flood plain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage. Temporary construction works for SuDS basin O may slightly increase peak flow rates into watercourse.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces). Removal of approximately 20m of gravel bed and banks including vegetated riparian corridor. Extensive excavation of the floodplain to form new realigned channel changing connectivity and flow pathways. Alteration to downstream movement of sediment when constructed realigned channel connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x major = Slight	medium x major = Large*	low x negligible = Neutral	medium x major = Large*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x minor = Neutral	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight

Water Feature	Potential Construction Impacts	Impact Significance: Pre-Mitigation					Specific Mitigation	Impact Significance: Post-Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF148	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of replacement culvert/channel realignment/cascade/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Removal of approximately 55m of concrete banks and bed. Alteration to downstream movement of sediment when constructed realigned channel connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances</p>	low x moderate = Slight	low x minor = Neutral	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF149	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Bridge supports and surrounding earthworks may cause; loss of floodplain storage, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks for construction of bridge extension, partial demolition of existing structure and mainline widening. Alteration to watercourse banks and bed including disturbance/removal of existing morphological (particularly bedrock) features within the channel leading to potential changes to flow processes. Changes to lateral connectivity with the floodplain during construction.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances</p>	low x moderate = Slight	medium x minor = Slight	medium x major = Large*	low x negligible = Neutral	medium x major = Large*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	medium x negligible = Neutral	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight
WF150	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding areas and soil compaction during construction to result in temporary increased runoff rates in the watercourse. Construction of channel realignment/temporary construction structures placed within the flood risk zones may cause; loss of flood plain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Removal of approximately 30m of banks and bed. Alteration to downstream movement of sediment when constructed realigned channel connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Moderate*	low x moderate = Slight	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	low x minor = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF151	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of culvert extension/channel diversion/temporary construction structures placed within the flood risk zones may cause; loss of flood plain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Removal of approximately 15m of banks and bed.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	medium x minor = Slight	medium x minor = Slight	low x negligible = Neutral	low x minor = Neutral	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	medium x negligible = Neutral	medium x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF152	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of a new culvert/temporary construction structures placed within the flood risk zones may cause; loss of flood plain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Removal of approximately 44m of banks and bed.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x minor = Neutral	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral

Water Feature	Potential Construction Impacts	Impact Significance: Pre-Mitigation					Specific Mitigation	Impact Significance: Post-Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF153	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of culvert extension/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Removal of approximately 25m of channel with naturalised banks and bed.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x minor = Neutral	medium x moderate = Moderate	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x negligible = Neutral	medium x minor = Slight	low x negligible = Neutral	low x minor = Neutral
WF88 / WF167	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Bridge supports and surrounding earthworks may cause; loss of floodplain storage, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage. Temporary construction works for SuDS (basin P)/outfall may slightly increase peak flow rates into watercourse.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks, demolition of existing bridge and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Removal of approximately 40m of natural channel, active in high flows (low flows impacted by upstream abstraction). Alteration of channel banks for outfall structure approximately 12m downstream of culvert.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	medium x moderate = Moderate	medium x minor = Slight	low x major = Moderate*	low x negligible = Neutral	low x major = Moderate*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	medium x minor = Slight	medium x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF154	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of new culvert/cascade/temporary construction structures placed within the flood risk zones may cause; loss of flood plain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces). Removal of approximately 42m of gravel and cobble bed and banks, including the vegetated riparian corridor. Excavation of the floodplain to form new realigned channels will alter capacity and connectivity with the local floodplain. Alteration to downstream movement of sediment when constructed realigned channels (tributaries of the main channel) are connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	medium x moderate = Moderate	medium x moderate = Moderate	low x negligible = Neutral	medium x moderate = Moderate	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	medium x minor = Slight	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight
WF155	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of new culverts/channel realignment/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces). Removal of gravel bed and concrete banks including vegetated riparian corridor. Excavation of the floodplain to form new realigned channels creating new drainage pathways and altering the capacity and lateral connectivity. Alteration to downstream movement of sediment when constructed realigned channel connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x moderate = Slight	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x minor = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral

Water Feature	Potential Construction Impacts	Impact Significance: Pre-Mitigation					Specific Mitigation	Impact Significance: Post-Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF156	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of new culverts/channel realignment/regrading/cascade/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage. Change to runoff rates from site drainage and change in vegetation type.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces). Removal of banks and bed including the vegetated riparian corridor. Excavation of the floodplain to form new realigned channels leading to changes in lateral connectivity. Alteration to downstream movement of sediment when constructed realigned channels connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances. Pollution of PWS due to works upstream of source and disruption or severance of pipeline (PGG-PWS8).</p>	high x moderate = Moderate*	medium x moderate = Moderate	medium x moderate = Moderate (high x major = Very Large)	low x negligible = Neutral	medium x moderate = Moderate	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	medium x minor = Slight	medium x minor = Slight (high x minor = Slight*)	low x negligible = Neutral	medium x minor = Slight
WF157	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of new culverts/channel realignment/side road/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage. Temporary construction works for SuDS (basin Q) may slightly increase peak flow rates into watercourse.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces). Removal of approximately 25m of cobble/gravel bed and natural banks, including the vegetated riparian corridor. Excavation of the floodplain to form new realigned channel, leading to changes in lateral connectivity. Alteration to downstream movement of sediment when constructed realigned channel (tributaries of main channel) connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x Moderate = Slight	medium x Moderate = moderate	low x negligible = Neutral	medium x Moderate = moderate	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x minor = Neutral	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight
WF158	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of new bridges/side road/temporary construction structures placed within the flood risk zones may cause; loss of flood plain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage. Temporary construction works for SuDS basins/outfalls Q and R may slightly increase peak flow rates into watercourse.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks, demolition of existing bridge, construction of a new bridge and Construction Activities proposed within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces). Removal of banks including vegetated riparian corridor for bridge extension and new bridge. Excavation of the floodplain to form new realigned tributary to the main channel, leading to changes in capacity and lateral connectivity. Alteration to downstream movement of sediment when constructed realigned channel connected, with flow entraining newly exposed sediment. New SuDS attenuation basin outfalls on left and right banks downstream of A9 leading to changes in bank face structure.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	medium x moderate = Moderate	high x minor = Slight*	high x major = Large*	low x negligible = Neutral	medium x major = Large*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	medium x minor = Slight	high x negligible = Neutral	high x minor = Slight*	low x negligible = Neutral	medium x minor = Slight

Water Feature	Potential Construction Impacts	Impact Significance: Pre-Mitigation					Specific Mitigation	Impact Significance: Post-Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF159	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of new culverts/channel realignment/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces). Removal of approximately 25m of cobble/gravel bed and banks, including vegetated riparian corridor. Excavation of the floodplain to form new realigned sections of channel and tributary ditches, leading to changes in lateral connectivity. Alteration to downstream movement of sediment when constructed realigned channel connected, with water passing down the channel entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Moderate*	medium x minor = Slight	medium x major = Large*	low x negligible = Neutral	medium x major = Large*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	medium x negligible = Neutral	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight
WF160	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of new culverts/channel realignment/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening and new side road (i.e. from bare earth surfaces). Removal of approximately 40m of naturalised bed, banks and vegetated riparian corridor. Excavation of the floodplain to form new realigned channel, leading to changes in capacity and lateral connectivity. Alteration to downstream movement of sediment when constructed realigned channel connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x minor = Neutral	low x Moderate = Slight	low x negligible = Neutral	low x Moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral
WF161	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of new culvert/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Removal of approximately 15m of bed and banks.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Moderate*	low x minor = Neutral	low x minor = Neutral	low x negligible = Neutral	low x minor = Neutral	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF162	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of new culvert/regraded channel/realigned drainage ditches/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporarily increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Removal of approximately 15m of natural banks and bed. Excavation of the floodplain to form new realigned channel, leading to changes in lateral connectivity. Alteration to downstream movement of sediment when constructed realigned channel connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x minor = Neutral	medium x moderate = Moderate	low x negligible = Neutral	medium x moderate = Moderate	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x negligible = Neutral	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight

Water Feature	Potential Construction Impacts	Impact Significance: Pre-Mitigation					Specific Mitigation	Impact Significance: Post-Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF163	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of new culvert/cascade/channel realignment/temporary construction structures placed within the flood risk zones may cause; loss of floodplain area, restriction in flood flows, temporary increase in flood risk locally and may be susceptible to flood damage.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Removal of approximately 12m of naturalised bed, banks and vegetated riparian corridor. Excavation of the floodplain to form new realigned channel, leading to changes in lateral connectivity. Alteration to downstream movement of sediment when constructed realigned channel connected, with water passing down the channel entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for less than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x moderate = Slight	low x minor = Neutral	low x moderate = Slight	low x negligible = Neutral	low x moderate = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF164	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse. Construction of new bridge and demolition of existing bridge/realignment of tributary ditches/construction of SuDS pond/temporary construction structures placed within the flood risk zones may cause; loss of flood plain area, restriction in flood flows, temporarily increase in flood risk locally and may be susceptible to flood damage. Temporary construction works for SuDS pond/outfall S may slightly increase peak flow rates into watercourse.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks; demolition of existing bridge Construction Activities proposed within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces). Removal of approximately 10m of banks and vegetated riparian corridor. Changes to channel cross-section during works. Alteration to downstream movement of sediment when constructed realigned channel connected, with flow entraining newly exposed sediment.</p> <p><b>Water Quality:</b> A temporary measurable decrease in water quality (including EQS) for greater than one month from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	high x moderate = Moderate*	high x moderate = Moderate*	medium x major = Large*	low x negligible = Neutral	medium x major = Large*	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	high x minor = Slight*	high x minor = Slight*	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight
WF165	<p><b>Flood Risk:</b> Potential for temporary increase in hardstanding area and/or soil compaction during construction to result in temporary increases in runoff rates into the watercourse.</p> <p><b>Fluvial Geomorphology:</b> Temporary increase in fine sediment delivery from site clearance, earthworks and construction within and adjacent to the watercourse associated with the mainline widening (i.e. from bare earth surfaces).</p> <p><b>Water Quality:</b> A temporary measurable localised decrease in water quality from the generation of turbid runoff and/or accidental spillage of fuels, oils cementitious material or other polluting substances.</p>	low x minor = Neutral	medium x negligible = Neutral	medium x minor = Slight	low x negligible = Neutral	medium x minor = Slight	P05-W18, P05-W19, P05-W20, P05-W21, P05-W23	low x negligible = Neutral	medium x negligible = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral

Operational Impacts

Table 3: Specific operational impacts and impact significance

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF100 (lower)	<p><b>Flood Risk:</b> Structures within the flood risk zones/bridge piers and abutments/SuDS ponds/access roads may cause restriction in flood flows at Essangal Underbridge and at River Garry Underbridge crossings. The proposed scheme has been assessed as resulting in a net loss of floodplain storage of approximately 20,100m<sup>3</sup> upstream of the existing A9 embankments at the existing Pitaldonich Bridge for the 0.5% AEP plus CC event. Modelling indicates that upstream of the new River Garry Underbridge on the eastern floodplain of the River Garry peak water levels will increase by &gt;100mm for the 0.5% AEP (200-year) plus CC event. A local access road is located within the flood extent outline for the design flood event. The model also indicates the loss of upstream floodplain storage increases peak water levels in the channel downstream by approximately 10mm for the design flood event resulting in additional water spilling out of the watercourse around ch10900. There is also loss of floodplain downstream of the bridge due to a new NMU access track. The scheme results in some areas of increased flood risk but these are limited to agricultural land and the River Tay SAC which are not considered as sensitive receptors.</p> <p>The proposed scheme has been assessed as resulting in the net loss of floodplain storage of approximately 7,550m<sup>3</sup> as a result of widening the A9 road embankments and the construction of SuDS basins and access roads in the floodplain at the Essangal underbridge crossing for the 0.5% AEP (200-year) plus CC event. Modelling indicates that upstream of the proposed crossing flood water is simulated to impound against the north side of the proposed scheme with flood depths being simulated to increase by approximately 28mm over a small area. The proposed scheme is however not assessed as being at risk for the 0.5% AEP (200-year) plus CC event. There is also simulated to be a slight reduction in peak water levels of approximately 7mm in a localised area south of the A9 embankment. There is simulated to be a negligible change in flood levels at Chestnut Cottage, the Highland Main Line railway and the B8079 upstream of the bridge crossing (approximate 2mm increase in flood level estimated for these attributes). Overall the impact of the proposed scheme at the Essangal Bridge crossing has been assessed as negligible by the FRA but with localised beneficial and adverse flood impacts being noted.</p> <p>The increase of impermeable areas within the catchment and the operation of six new road drainage outfalls (E, F, I, J1, J2, K) into the River Garry / just upstream of a watercourses confluence with the River Garry have the potential to increase peak flows into the river, and increase the risk of flooding. Attenuation of flows within SuDS ponds will help control runoff rates entering the watercourse.</p> <p><b>Fluvial Geomorphology:</b> Essangal Underbridge – The pier in the floodplain is likely to lead to localised impacts around the bridge and some channel adjustment downstream. This would include: scour around the pier; erosion of the upstream face of the existing deposits on the left bank; deflection of flows towards the right bank potentially causing incision against the existing bank reinforcement; scour of the upstream pool; partial loss of the existing riffle feature as a result of the pier; and, potential deposition downstream of eroded material. Further information is provided in Appendix A11.5 (Fluvial Geomorphology).</p> <p>River Garry Underbridge – The new bridge abutments are within the floodplain of the River Garry, altering lateral connectivity. Changes to flow processes during high flows as a consequence could alter morphological processes within the channel upstream, at the crossing itself and downstream. This is of particular importance in flood conditions where the longer extent of bridge abutment is likely to direct flows downstream. Approximately 200m downstream the river channel is significantly eroding the outside of the bend which could be altered as a consequence of the new abutments. Side roads on each bank further altering lateral connectivity. The proposed outfalls along the channel length would lead to removal of natural bed, banks and vegetated riparian corridor. Outfalls could also alter flow processes and sediment movement.</p> <p>Invervack (approx. Ch9900 to Ch10500) – The proposed scheme is located in an area that may potentially be affected by future channel migration and hence erosion. Embedded design has resulted in an offline solution to minimise this risk; however, there remains the potential for erosion at this location as a result of extreme events and/or channel alterations over longer timescales.</p> <p><b>Water Quality:</b> No risk identified by HAWRAT ('Pass' for both soluble and sediment-bound pollutants) during operation. Risk of pollution from spillage &lt;0.5% during operation.</p>	very high x major = Very Large	high x moderate = Moderate*	high x negligible = Neutral	low x negligible = Neutral	very high x negligible = Neutral	P05-W29, P05-W41, P05-W42, P05-W43, P05-W51	very high x major = Very Large	high x minor = Slight*	high x negligible = Neutral	low x negligible = Neutral	very high x negligible = Neutral

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF100 (upper)	<p><b>Flood Risk:</b> The increase of impermeable areas within the catchment and the operation of three new road drainage outfalls (M, N and O) into the River Garry have the potential to increase peak flows into the river and increasing the risk of flooding. Attenuation of flows within SuDS basins will help control runoff rates entering the watercourse.</p> <p><b>Fluvial Geomorphology:</b> Three proposed outfall structures located along the channel. All outfalls located within bedrock length of River Garry and not considered to have a significant effect on the channel cross-section. Removal of vegetated riparian corridor.</p> <p><b>Water Quality:</b> No risk identified by HAWRAT ('Pass' for both soluble and sediment-bound pollutants) during operation. Risk of pollution from spillage &lt;0.5% during operation.</p>	high x negligible = Neutral	high x negligible = Neutral	high x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	P05-W29, P05-W41, P05-W42, P05-W43	high x negligible = Neutral	high x negligible = Neutral	high x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF84	<p><b>Flood Risk:</b> None anticipated.</p> <p><b>Fluvial Geomorphology:</b> None anticipated.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x negligible = Neutral	medium x negligible = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral		high x negligible = Neutral	medium x negligible = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF87	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert extension/new pre-earthwork drainage outfall. Operation of the extended culvert is predicted to have a negligible effect on flood water levels upstream and downstream of the culvert. Upstream water levels have been simulated by 1D hydraulic modelling to decrease by approximately 3mm and downstream water levels have been simulated to increase by approximately 8mm for the 0.5% AEP (200-year) plus CC event. There is considered to be no increase in flood risk to the proposed scheme or to residential properties post scheme construction.</p> <p><b>Fluvial Geomorphology:</b> New side road would alter floodplain connectivity potentially leading to changes in runoff and subsequently flow and sediment processes during high flows. The new culvert (and bed alteration) would alter the existing channel cross-section and remove existing riparian vegetation (including established trees). Changes to the gradient of the channel, with the culvert and realignment slackening the gradient, altering flow processes and channel form.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	medium x minor = Slight	medium x negligible = Neutral	medium x negligible = Neutral	medium x negligible = Neutral	P05-W45	low x negligible = Neutral	medium x negligible = Neutral	medium x negligible = Neutral	medium x negligible = Neutral	medium x negligible = Neutral
WF89	<p><b>Flood Risk:</b> Alterations to flood risk due to bridge abutments/piers potentially restricting flood flows and result in a small decrease in floodplain storage. Such impacts have been assessed by the FRA as negligible. The increase of impermeable areas within the catchment and the operation of two new road drainage outfalls (A and B) into the watercourse have the potential to increase peak flows rates into the river and increasing the risk of flooding. Attenuation of flows within SuDS ponds will help control runoff rates entering the watercourse.</p> <p>WF89 will receive surcharged flows from WF92 as a result of the proposed mitigation for WF92 (P05-W27), however the impact on WF89 is considered to be negligible (&lt;10mm) based on simple estimations using manning's equation and typical cross sections. In addition, the difference in flood hydrographs between WF92 and the significantly larger WF89 make the likelihood of peak flow events occurring simultaneously on both catchments highly unlikely.</p> <p><b>Fluvial Geomorphology:</b> The new bridge abutments would remove a short length of the river valley slope. Potential for flow pathways to be created down steep valley slope from outfalls on the top. As a result, fine sediment could be entrained as the water flows down the slope.</p> <p><b>Water Quality:</b> No risk identified by HAWRAT (Pass both soluble and sediment-bound pollutants) during operation. Risk of pollution from spillage &lt;0.5% during operation.</p>	very high x negligible = Neutral	high x minor = Slight*	very high x negligible = Neutral	low x negligible = Neutral	very high x negligible = Neutral	P05-W30, P05-W42	very high x negligible = Neutral	high x negligible = Neutral	very high x negligible = Neutral	low x negligible = Neutral	very high x negligible = Neutral
WF92	<p><b>Flood Risk:</b> As part of the embedded design, the existing culvert capacity will be maintained in order to prevent downstream flood risk impacts from increased pass forward flows. However, this will pose a direct flood risk to the proposed scheme as a result of the existing culvert capacity only conveying between the 50% AEP (2-year) and 20% AEP (5-year) flood event. In addition, it has been assessed that there is insufficient floodplain storage upslope of the crossing to prevent direct impacts to the proposed scheme during the 0.5% AEP (200-year) plus CC event.</p> <p>After the adoption of mitigation (P05-W27), surcharged flows will be diverted to WF89. This will result in the removal of a flood flow pathway towards Killiecrankie and the risk of flooding to a residential property (Druimuan), in addition to a general reduction in flood depths of &gt;10mm and &lt;50mm during the 0.5% AEP plus CC event in this area.</p> <p><b>Fluvial Geomorphology:</b> Loss of approximately 23m of existing channel, bed and banks and lateral connectivity due to culvert extension. Changes to the gradient of the channel, with the proposed culvert increasing the gradient, altering flow and channel form.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x moderate = Large	low x minor = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	P05-W27	high x negligible adverse to minor beneficial = Neutral to Moderate* (beneficial)	low x negligible = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF94	<p><b>Flood Risk:</b> None anticipated.</p> <p><b>Fluvial Geomorphology:</b> None anticipated.</p> <p><b>Water Quality:</b> None anticipated.</p>	Scoped Out	Scoped Out.	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		Scoped Out	Scoped Out.	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF95	<p><b>Flood Risk:</b> Alterations to flood risk due to: new culvert and channel realignment. Headwater level is predicted to increase by greater than 100mm for the design 0.5% AEP (200-year) plus CC event. Given there are no sensitive flood risk receptors located in close proximity upstream of the culvert and the road is raised at this location the FRA has assessed the culvert replacement as low risk in terms of flooding. There is simulated to be no increase in pass forward flow due to the proposed scheme. Potential loss of floodplain area but any impacts are anticipated to be minimal. Increased impervious surfaces due to carriageway near watercourse.</p> <p><b>Fluvial Geomorphology:</b> Loss of approximately 12m of existing natural bed and banks due to culvert extension.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x moderate = Slight	medium x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x minor = Neutral	medium x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF96	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert extension. Operation of the extended culvert is simulated to result in a small decrease in upstream water levels. Headwater level is simulated to decrease by 10mm due to culvert extension for the 0.5% AEP (200-year) plus CC event. The culvert would continue to surcharge for the design flood event. The proposed scheme has therefore been assessed as having a negligible impact on flood risk with flood mechanisms remaining unchanged from the baseline. Potential loss of flood plain area along culvert extension/realignment.</p> <p><b>Fluvial Geomorphology:</b> Loss of approximately 15m of existing bed and banks due to culvert extension beneath side access road.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral		high x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF97	<p><b>Flood Risk:</b> Removal of the existing culvert will remove a potential source of flow constriction and blockage. The watercourse will be diverted into WF98. There is the potential for a slight increase in flood risk along the realigned section of channel/in the vicinity of the carrier pipe but there are no sensitive flood risk receptors in these locations so any impacts are considered negligible.</p> <p><b>Fluvial Geomorphology:</b> Loss of existing bed and banks due to channel realignment.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF98	<p><b>Flood Risk:</b> Bridge embankments may cause restriction in flood flows and result in a small decrease in floodplain storage. The abutments are raised above the level of the watercourse and therefore impacts have only been assessed as likely to occur at higher flows. The FRA has assessed the impact of the extended bridge structure as negligible. The increase of impermeable areas within the watercourse catchment and the construction of two new road drainage outfalls (C and D(1)) which discharge into the watercourse have the potential to increase peak flows in the river and increase the flood risk. Attenuation of flows within SuDS ponds/basins will ensure that runoff rates do not increase. The carrier pipe will discharge water from WF97 into this watercourse. Runoff from WF97 is currently likely to flow into WF98 so no additional impacts are anticipated.</p> <p><b>Fluvial Geomorphology:</b> New side road potentially alters runoff and subsequently flow and sediment processes particularly during high flows. Re-profiling of existing steep valley slope. Channel currently unstable with potential for undermining or erosion of side road embankment due to proximity to river edge and current morphological processes observed.</p> <p><b>Water Quality:</b> HAWRAT 'Pass' for soluble pollutants, HAWRAT 'Fail' for sediment-bound pollutants during operation. Risk of pollution from spillage &lt;0.5% during operation.</p>	high x negligible = Neutral	medium x minor = Slight	medium x minor = Slight	medium x minor = Slight	medium x minor = Slight	P05-W42, P05-W43 P05-W46	high x negligible = Neutral	medium x minor = Slight	medium x negligible = Neutral	medium x negligible = Neutral	medium x negligible = Neutral
WF99	<p><b>Flood Risk:</b> The increase of impermeable areas within the catchment and the construction of two new road drainage outfalls (from ponds E(1) and E(2)) into the watercourse have the potential to increase peak flows into the river and increase the risk of flooding. Attenuation of flows within SuDS ponds will ensure that runoff rates do not increase.</p> <p><b>Fluvial Geomorphology:</b> Potential changes to input of fine sediment from outfall discharge. Changes to flow processes in the watercourse as a result of discharges leading to scour.</p> <p><b>Water Quality:</b> HAWRAT 'Fail' for both soluble and sediment-bound pollutants during operation at Tier 1. HAWRAT 'Fail' for soluble pollutants during operation at Tier 2. Exceedance of AA-EQS for dissolved copper at both Tier 1 and Tier 2. Risk of pollution from spillage &lt;0.5% during operation.</p>	low x negligible = Neutral	low x minor = Neutral	low x major = Moderate*	low x major = Moderate*	low x major = Moderate*	P05-W42	low x negligible = Neutral	low x negligible = Neutral	low x minor = Neutral	low x minor = Neutral	low x minor = Neutral
WF178	<p><b>Flood Risk:</b> The increase of impermeable areas within the catchment and the operation of a road drainage outfall into the watercourse would have the potential to increase peak flows into the river and therefore increase flood risk. Attenuation of flows within the SuDS basin will ensure that runoff rates are controlled. The culvert replacement/realigned sections of channel may also slightly impact flood risk but any impacts have been assessed by the FRA as negligible.</p> <p><b>Fluvial Geomorphology:</b> New side road alters floodplain connectivity with potential for changes in runoff, flow and sediment processes, particularly during high flows. Loss of approximately 10m of bed and banks due to culvert extension and outfall, also potentially altering lateral connectivity. Outfall discharges could also alter flow processes and lead to localised scour.</p> <p><b>Water Quality:</b> HAWRAT 'Fail' for dissolved zinc and sediment-bound pollutants during operation. Risk of pollution from spillage &lt;0.5% during operation.</p>	high x negligible = Neutral	low x minor = Neutral	low x moderate = Slight	low x moderate = Slight	low x moderate = Slight	P05-W41	high x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF101	<p><b>Flood Risk:</b> Operation of culvert extension would result in a small increase in upstream water levels. The headwater depth for the 0.5% AEP (200-year) plus CC event is predicted to increase by approximately 40mm. Given the proposed scheme is not assessed as being at flood risk for the design flood event, flows have been simulated to remain in bank upstream of the culvert (with sufficient freeboard to the top of the river bank) the FRA has assessed this watercourse as being at low risk.</p> <p>There is also the potential for the loss of a small area of floodplain due to the culvert extension/side road creation.</p> <p><b>Fluvial Geomorphology:</b> New side road embankment will alter floodplain connectivity, leading to changes in runoff, flow and sediment processes during high flows. Culvert extension and new culvert will lead to loss of approximately 20m of bed and banks. The modifications would also alter lateral connectivity.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	high x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	high x negligible = Neutral	low x negligible = Neutral
WF102	<p><b>Flood Risk:</b> Operation of the culvert extension is predicted to result in an increase in upstream water levels of greater than 100mm's for the 0.5% AEP (200-year) plus CC event. This watercourse has been assessed as having a lack of freeboard to the proposed scheme but this is a direct result of the culvert inlet being located above the level of the proposed scheme main road. This watercourse is in free flowing conditions during the 0.5% AEP (200-year) plus climate change event, and the risk of flood to the proposed scheme is low. There are no sensitive upstream flood risk receptors in close proximity to the culvert and no increase in downstream flood risk is anticipated. The FRA has therefore assessed this watercourse as low risk. There is the potential for loss of a small area of flood plain storage due to culvert extension but any impacts are anticipated to be minimal.</p> <p><b>Fluvial Geomorphology:</b> New side roads will alter the lateral connectivity of WF102 and main river Garry (WF100) leading to changes in runoff and potentially flow and sediment processes particularly during high flows. Culvert works will lead to the loss of approximately 60m (extension of existing culvert to facilitate A9 widening and two new side roads) of bed and banks, including an existing step-pool sequence plus riparian vegetation.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	medium x moderate = Moderate	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	P05-W31	low x negligible = Neutral	medium x minor = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF103	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement and construction of two new culverts. Operation of replacement culvert under the mainline is predicted to result in an increase in upstream water levels of &gt;100mm for the 0.5% AEP (200-year) plus CC event but no change to downstream flood risk is anticipated. Given there are no sensitive flood risk receptors upstream of the mainline culvert and that the proposed scheme has sufficient freeboard the impact of this increase in level has been assessed as low risk by the FRA. The side road culverts have also been assessed as having a negligible impact on flood risk as flow has been simulated to remain in bank for the design flood event.</p> <p>There is the potential for loss of a small area of flood plain storage due to culvert replacement/new culverts but any impacts are anticipated to be minimal.</p> <p><b>Fluvial Geomorphology:</b> New side road alters the lateral connectivity leading to changes in runoff, flow dynamics and sediment processes particularly during high flows. Three new culverts would result in the loss of approximately 30m of natural bed and banks, including existing step-pool sequence and natural cobble and pebble bed substrate with sand deposits.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x negligible = Neutral	medium x moderate = Moderate	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	P05-W32	high x negligible = Neutral	medium x minor = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF104	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement and construction of two new culverts. Replacement of the existing culvert with one of the same diameter is predicted to result in an increase in upstream water levels of &gt;100mm. Given there are no sensitive flood risk receptors upstream of the culvert and given flow is unlikely to pose a flood risk to the proposed scheme it has been assigned low risk by the FRA team. No increase in pass forward flow is anticipated due to culvert replacement.</p> <p>The side road culverts have been assessed as being able to convey the design flood flow with flows remaining in bank upstream of the structure. The side road culverts have therefore been assessed as having a negligible impact on flood risk.</p> <p>There is the potential for loss of a small area of flood plain storage due to culvert replacement/new culverts but any impacts are anticipated to be minimal.</p> <p><b>Fluvial Geomorphology:</b> New side roads would alter lateral connectivity of WF 103 and main river Garry (WF100) leading to changes in runoff flow dynamics and sediment processes, particularly during high flows. Three new culverts in combination will lead to a loss of approximately 37m of bed and banks, including existing step-pool sequence and natural cobble and pebble bed substrate.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	medium x moderate = Moderate	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	P05-W32	low x negligible = Neutral	medium x minor = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF105	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement and new cascade. Replacement /enlargement of existing culvert is predicted to result in an increase in upstream headwater levels by approximately 60mm for the 0.5% AEP (200-year) plus CC event. Given there are no sensitive flood risk receptors upstream of the road and the A9 freeboard will remain above 1m the culvert replacement has been assessed as low risk by the FRA team. No increase in downstream flood risk is predicted. There is the potential for loss of a small area of flood plain storage due to culvert replacement but any impacts are anticipated to be minimal.</p> <p><b>Fluvial Geomorphology:</b> New side road and A9 embankments will alter the lateral connectivity potentially leading to changes in runoff, flow dynamics and sediment processes during high flows. New culverts leading to loss of approximately 20m of bed and banks.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF106	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement/new cascade. Replacement of the existing culvert with one of a larger diameter is predicted to result in an increase in upstream water levels of greater than 100mm for the 0.5% AEP (200-year) plus CC event. Given there are no sensitive flood risk receptors upstream of the culvert and given the proposed scheme has been assessed as having sufficient freeboard between the simulated headwater level and the level of the proposed road the FRA has assessed this watercourse as low risk. There is simulated to be no increase in pass forward flow due to the proposed scheme. There is the potential for loss of a small area of flood plain storage due to culvert replacement and the new cascade but any impacts are anticipated to be minimal.</p> <p><b>Fluvial Geomorphology:</b> New side road will alter lateral connectivity, potentially leading to changes in runoff, flow processes and sediment processes during high flows. Culvert extension and new culvert leading to removal of approximately 60m of bed and banks. New outfall has potential to scour and locally affect natural sediment processes at the confluence of WF 106 with R Garry.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x moderate = Slight	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF107	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement. Culvert replacement is predicted to increase upstream water levels by &gt;100mm for the 0.5% AEP (200-year) plus CC event. The A9 is however raised at this location and is therefore not assessed as being at risk of flooding for the design flood event. There are no other sensitive flood risk receptors in this location. Any out of channel flow has been assessed as likely to follow a roadside ditch into WF106. The FRA has therefore assessed this watercourse as low risk.</p> <p><b>Fluvial Geomorphology:</b> Culvert extension leading to loss of approximately 10m of bed and banks. New embankment will alter lateral connectivity, potentially leading to changes in runoff, flow dynamics and sediment processes during high flows.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF108	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement/cascade. Culvert replacement is predicted to decrease upstream water levels by greater than 100mm for the design 0.5% AEP (200-year) plus CC event. This has been simulated to result in a decrease in flood risk to the proposed scheme, however, would result in an increase in flow downstream of the culvert. Given there are no sensitive flood risk receptors located downstream of the road and the risk of flooding to the proposed scheme is reduced (from the baseline) this has been assessed in the FRA as low risk.</p> <p><b>Fluvial Geomorphology:</b> New culvert leading to loss of approximately 9m of bed and banks. New embankment will alter lateral connectivity, potentially leading to changes in runoff, flow dynamics and sediment processes during high flows.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x negligible = Neutral	low x minor = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	P05-W33	high x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF109	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement/cascade. Culvert replacement is predicted to decrease upstream water levels by approximately 90mm for the design 0.5% AEP (200-year) plus CC event. This would, however, result in an increase in flow downstream of the culvert. Given there are no sensitive flood risk receptors located downstream of the road this has been assessed in the FRA as low risk.</p> <p><b>Fluvial Geomorphology:</b> New embankment will alter lateral capacity, potentially leading to changes in runoff, flow dynamics and sediment processes during high flows.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF110	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement/new cascades and one new culvert. The replacement of the existing culvert with a new enlarged culvert is predicted to result in a reduction in headwater level by approximately 12mm for the design 0.5% AEP (200-year) plus CC event. The proposed scheme has been assessed as not being at flood risk post scheme construction due to culvert enlargement. There is also simulated to be no increase in pass forward flow. The FRA has therefore assessed this watercourse as being at low risk. The side road culvert has also been simulated to be free flowing and flow has been assessed as remaining in bank upstream of the culvert for the design flood event. The side road culvert has therefore been assessed as having a negligible impact on flood risk. There is the potential for loss of a small area of floodplain storage due to culvert replacement/the construction of a new culvert/new cascades but any impacts are anticipated to be minimal.</p> <p><b>Fluvial Geomorphology:</b> New side road will alter lateral connectivity potentially leading to changes in runoff flow processes and sediment processes particularly during high flows. New culverts will lead to a combined loss of approximately 38m of bed and banks.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF111	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement/new cascade and operation of one new culvert. The replacement of the existing culvert with a new enlarged culvert is predicted to result in a reduction in headwater level by &gt;100mm for the design 0.5% AEP (200-year) plus CC event. The proposed scheme has been assessed as not being at flood risk post scheme construction due to culvert enlargement. This may result in a slight increase in downstream water level but there are no sensitive flood risk receptors downstream before the confluence with the River Garry. The FRA has therefore assessed this watercourse as being at low risk. The side road culvert has also been simulated to be free flowing and flow has been assessed as remaining in bank upstream of the culvert for the design flood event. The side road culvert has therefore been assessed as having a negligible impact on flood risk.</p> <p><b>Fluvial Geomorphology:</b> New side road alters the floodplain connectivity leading to potential changes in runoff, flow dynamics and sediment processes, particularly during high flow. New culvert leading to permanent loss of a length of dynamic bed and banks. Potential for alteration to channel downstream of culvert (including erosion or deposition). Channel realignment and culvert extension leading to removal of approximately 18m of natural cobble and pebble bed (and associated step-pool sequence) and banks.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x negligible = Neutral	medium x moderate = Moderate	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	P05-W34	high x negligible = Neutral	medium x minor = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF112	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement, new cascade and operation of one new culvert. The replacement of the existing culvert with a new enlarged culvert is predicted to result in a reduction in headwater level by &gt;100mm for the design 0.5% AEP (200-year) plus CC event. The proposed scheme has been assessed as not being at flood risk post scheme construction due to culvert enlargement. This may result in a slight increase in downstream water level but there are no sensitive flood risk receptors downstream before the watercourse confluence with the River Garry. The FRA has therefore assessed this watercourse as being at low risk. The side road culvert has been simulated to be free flowing for the design flood event. The side road culvert has therefore been assessed as being of negligible flood risk. There is the potential for loss of a small area of floodplain storage due to culvert replacement/a new cascade/the construction of a new culvert but any impacts are anticipated to be minimal.</p> <p><b>Fluvial Geomorphology:</b> New side road alters the floodplain connectivity potentially leading to changes in runoff flow dynamics and sediment processes, during high flow. New culverts result in a combined loss of approximately 30m of bed and banks.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		high x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF113	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement, new cascade and operation of one new culvert. The replacement of the existing culvert with a new enlarged culvert is predicted to result in a reduction in headwater level by greater than 100mm for the design 0.5% AEP (200-year) plus CC event. The proposed scheme has been assessed as not being at flood risk post scheme construction due to culvert enlargement. This may result in a slight increase in downstream water level but there are no sensitive flood risk receptors downstream before the watercourses confluence with the River Garry. The FRA has therefore assessed this WF as being at low risk. The side road culvert has also been simulated to be free flowing for the design flood event. The side road culvert has therefore been assessed as having a negligible impact on flood risk. There is the potential for loss of a small area of floodplain storage due to culvert replacement/a new cascade/the construction of a new culvert but any impacts are anticipated to be minimal.</p> <p><b>Fluvial Geomorphology:</b> New side road alters the floodplain connectivity potentially leading to changes in runoff, flow dynamics and sediment processes, during high flow. New culverts will lead to a combined loss of approximately 17m of bed and banks.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		high x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF114	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement, new cascade and channel realignment. The replacement of the existing culvert with a new enlarged culvert is predicted to result in a reduction in headwater level by &gt;100mm for the design 0.5% AEP (200-year) plus CC event. This may, however, result in a slight increase in downstream water level but there are no sensitive flood risk receptors before the watercourse confluence with the River Garry. The FRA has therefore assessed this watercourse as being at low risk. There is the potential for loss of a small area of floodplain storage due to culvert replacement/new cascade/channel realignment but any impacts are anticipated to be minimal.</p> <p><b>Fluvial Geomorphology:</b> Culvert extension leading to loss of approximately 18m of bed and banks. Cascade required to drop channel into new culvert could alter flow and sediment processes. Realignment of small tributary to main channel has potential to alter flow pathways and subsequently flow processes in the main channel.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	medium x moderate = Moderate	medium x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	P05-W44	low x negligible = Neutral	medium x minor = Slight	medium x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF115	<p><b>Flood Risk:</b> The increase of impermeable areas within the catchment and the operation of two new road drainage outfalls (from SuDS ponds G and H) into the watercourse have the potential to increase peak flows into the river, increasing the risk of flooding. However, attenuation of flows within SuDS ponds will ensure that discharge rates into the watercourse are limited to the greenfield runoff rate (50%AEP/2-year flow). Alterations to flood risk due to: bridge abutments and SuDS ponds encroaching into the 0.5% AEP (200-year) flood extent outline therefore reducing floodplain storage. It is estimated that the proposed scheme will result in a net loss of approximately 10,900m<sup>3</sup> of floodplain storage on the eastern floodplain and the loss of 20,600m<sup>3</sup> of net floodplain storage on the western floodplain of the Allt Bhaic for the 0.5% AEP (200-year) plus CC event. The FRA has assessed this as resulting in minor and major adverse impacts on the River Tay SAC due to increased flood depths. The River Tay SAC, however, is not believed to be sensitive to this increase in peak flood levels. There is also simulated to be a 30mm increase in peak water level on the B8079 underpass of the Highland Main Line railway for the 0.5% AEP plus CC event. This receptor is however simulated to flood to a depth of approximately 500mm in the baseline. The proposed scheme is not assessed as being at flood risk as it is proposed to raise the road at this location. For further details, refer to the FRA.</p> <p><b>Fluvial Geomorphology:</b> New bridge abutments. Complete removal of area of eroding bank and deposition. The channel at this location appears to be adjusting due to impacts of the existing bridge and historical modification; similar impacts could occur upstream of the new bridge. Current channel has undermined gabions and existing farm passageway. Two outfalls removing a length of natural bank and altering localised flow processes, potentially leading to scour.</p> <p><b>Water Quality:</b> HAWRAT 'Pass' for dissolved copper, HAWRAT 'Fail' for dissolved zinc pollutants. HAWRAT 'Fail' for sediment-bound pollutants during operation at Tier 1. HAWRAT 'Pass' for sediment-bound pollutants during operation at Tier 2. Risk of pollution from spillage &lt;0.5% during operation.</p>	very high x major = Very Large	high x moderate = Moderate	high x minor = Moderate	low x minor = Slight	very high x minor = Large*	P05-W27, P05-W35, P05-W43	very high x major = Very Large	high x minor = Slight	high x negligible = Neutral	low x negligible = Neutral	very high x negligible = Neutral
WF116	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement and channel regrading. The replacement of the existing culvert with a new enlarged culvert is predicted to result in a reduction in headwater level by &gt;100mm for the 0.5% AEP (200-year) plus CC event. This may, however, result in a slight increase in downstream water level but there are no sensitive flood risk receptors before the watercourse's confluence with the River Garry other than an access track which has been simulated to be flooded during the baseline assessment. The construction of the proposed scheme would reduce the flood risk to the A9 and has been assessed as having a negligible impact by the FRA to overall flood risk for this watercourse. There is the potential for loss of a small area of flood plain storage due to culvert replacement/channel regrading but any impacts are anticipated to be minimal.</p> <p><b>Fluvial Geomorphology:</b> New culvert leading to the loss of approximately 65m of bed and banks. New embankment will alter floodplain connectivity, potentially leading to changes in runoff, flow dynamics and sediment processes during high flows.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		high x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF117	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement. It is proposed to replace the existing culvert with a culvert of the same diameter but with extended length to accommodate the widening of the road at this location. Detailed 1D-2D hydraulic modelling indicates that post scheme construction out of bank flow will still occur; however, flood extents have been simulated to decrease. Flood depths along a local access road have, however, been simulated to increase by approximately 15mm for the 0.5% AEP (200-year) plus CC event. The local access road has still been assessed as passable by vehicle during the 0.5% AEP (200-year) plus CC event. The flood hazard has therefore been assessed in the FRA as low. The proposed scheme also includes raising the proposed road level and therefore the proposed scheme has been assessed as not being at flood risk post scheme construction. This has been assessed as a major beneficial impact as the existing A9 has been assessed as being at flood risk. The side road culvert has been assessed as being free flowing for the design flood event. The culvert has therefore been assessed as having a negligible impact on flood risk.</p> <p><b>Fluvial Geomorphology:</b> New culverts leading to loss of a combined length of approximately 70m of bed and banks.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x minor = Slight*	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		high x minor = Slight*	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF118	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement. Replacement of existing culvert is predicted to result in an increase in upstream water levels by &gt;100mm for the design 0.5% AEP (200-year) plus CC event. There is simulated to be no increase in pass forward flow and there are no sensitive flood risk receptors located upstream of the proposed road. The FRA has therefore assessed the impacts of the proposed scheme as low risk. Upstream water levels are further simulated to stay in bank for the design 0.5% AEP (200-year) plus CC event post culvert replacement and therefore sensitivity has been reduced to low. There is the potential for loss of a small area of floodplain storage due to culvert replacement.</p> <p><b>Fluvial Geomorphology:</b> New culvert leading to the loss of approximately 40m of bed and banks.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF119	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement/cascade/ditch realignment. Replacement/extension of the existing culvert is predicted to result in an increase in upstream water levels of approximately 30mm for the 0.5% AEP (200-year) plus CC event. However, the freeboard to the A9 will be greater than 1m and the culvert will have sufficient capacity to pass the design event flood flow. There are also no sensitive flood risk receptors located upstream of the culvert. The sensitivity of the watercourse will decrease post construction as the culvert invert level will be lowered and therefore flood risk to the A9 will be reduced. There is the potential for loss of a small area of flood plain storage due to culvert replacement/extension but any impacts are offset by a deeper channel.</p> <p><b>Fluvial Geomorphology:</b> Culvert extension leading to loss of approximately 30m of bed and banks. Realignment of tributary to main channel, with potential changes to flow pathways and subsequent flow processes.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF120	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement/channel realignment/new cascade/new culverts on tributaries. Replacement of the existing culvert is predicted to result in a reduction in upstream water levels by &gt;100mm for the design 0.5% AEP (200-year) plus CC event. However, there is simulated to be no increase in pass forward flow downstream of the culvert. There is the potential for loss of a small areas of floodplain storage due to culvert replacement/new culverts/cascade but any impacts are likely to be negligible. The side road culvert has also been assessed as being free flowing with water levels remaining in bank upstream of the structure for the design flood event. The side road culvert has therefore been assessed as having a negligible impact on flood risk.</p> <p><b>Fluvial Geomorphology:</b> Removal of approximately 20m of channel due to extended culvert to avoid the proposed attenuation pond. Channel realignment leading to removal of a length of bed and banks. New embankment and SuDS pond will alter floodplain connectivity, potentially leading to changes in runoff, flow dynamics and sediment processes during high flows.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x major = Slight*	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x moderate = Slight	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF121	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement/new cascade/ new access track culvert. Replacement/extension of the existing culvert is predicted to result in a reduction in the upstream water levels for the 0.5% AEP plus CC event by &gt;100mm. This may result in a slight increase in pass forward flow but any impacts are considered negligible as there are no sensitive flood risk receptors downstream before the watercourse's confluence with the River Garry. The culvert has been assessed as being able to convey the 0.5% AEP (200-year) plus CC event with upstream water levels being simulated to stay in-bank. The A9 is also not assessed as being at risk for the design event simulation. There is the potential for loss of a small area of flood plain storage due to culvert replacement/extension but any impacts are offset by a deeper channel. The side road culvert is also simulated to be free flowing for the design flood event, with flows remaining in bank upstream of the structure. The impact on flood risk has therefore been assessed as negligible.</p> <p><b>Fluvial Geomorphology:</b> New culverts leading to combined loss of 50m of channel, including gravel and cobble bed, with associated step-pool sequence and banks. New embankment will alter floodplain connectivity, potentially leading to changes in runoff, flow dynamics and sediment processes during high flows.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	medium x minor = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	P05-W47	low x negligible = Neutral	medium x minor = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF123	<p><b>Flood Risk:</b> Potential loss of a small area of flood plain storage due to side road operation within/in close proximity to the watercourse. The impact on flood risk has been assessed as negligible.</p> <p><b>Fluvial Geomorphology:</b> Loss of riparian zone habitat features.</p> <p><b>Water Quality:</b> None anticipated.</p>	very high x negligible = Neutral	high x negligible = Neutral	high x negligible = Neutral	low x negligible = Neutral	very high x negligible = Neutral		very high x negligible = Neutral	high x negligible = Neutral	high x negligible = Neutral	low x negligible = Neutral	very high x negligible = Neutral
WF125/ WF126	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert replacement/channel realignment. Replacement of the existing culvert is predicted to result in a reduction in the upstream water levels for the 0.5% AEP (200-year) plus CC event by greater than 100mm. This may result in a slight increase in pass forward flow but any impacts are considered negligible as there are no sensitive flood risk receptors downstream before the watercourse's confluence with the River Garry. Upstream water levels are simulated to stay in bank for the 0.5% AEP (200-year) plus CC event and the watercourse is no longer assessed as being at flood risk to the A9 for the design flood event. The sensitivity of the watercourse has remained the same post construction due to there still being sensitive flood receptors upstream of the proposed scheme such as the Highland Main Line railway. There is the potential for loss of a small area of flood plain storage due to culvert replacement/realignment but any impacts are considered to be negligible.</p> <p><b>Fluvial Geomorphology:</b> Culvert extension leading to complete removal of approximately 110m of bed and banks. The extension would also potentially alter lateral connectivity with the floodplain. Channel realignment to accommodate culvert would alter existing flow and sediment processes. Drainage outfall would lead to changes in flow processes and removal of a localised length of bank.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x negligible = Neutral	low x major = Slight*	low x negligible = Neutral	high x negligible = Neutral	low x negligible = Neutral		high x negligible = Neutral	low x major = Slight*	low x negligible = Neutral	high x negligible = Neutral	low x negligible = Neutral
WF127	<p><b>Flood Risk:</b> The culvert replacement is simulated to result in a decrease in upstream water levels by &gt;100mm for the 0.5% AEP (200-year) plus CC event. Pass forward flow is simulated to increase but there are no sensitive flood risk receptors downstream before the watercourses confluence with the River Garry. The proposed culvert is simulated to be free flowing for the design event but out of bank flooding has still been simulated to occur upstream of the culvert. The A9 is however no longer assessed at flood risk for the design event. There is the potential for loss of a small area of floodplain storage due to operation of the new culvert but any impacts are not considered significant.</p> <p><b>Fluvial Geomorphology:</b> New culvert leading to the loss of approximately 105m of cobble and gravel bed and banks. The culvert and embankment will also alter lateral connectivity with the floodplain.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x negligible = Neutral	low x moderate = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral		high x negligible = Neutral	low x minor = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF128	<p><b>Flood Risk:</b> Alterations to flood risk due to: construction of side road culverts/extension of culvert under the existing A9/channel realignment. The side road culverts will be designed to convey the design 0.5% AEP (200-year) plus CC event and therefore impacts on flow will be negligible. The proposed scheme will therefore not be at flood risk for the design flood event. The culvert extension may result in an increase in pass forward flows for the design flood event but given there are no sensitive flood risk receptors located downstream of the road this has been assessed as having a negligible impact on flood risk. There is the potential for loss of a small area of floodplain storage due to operation of the side road culverts but any impacts are not considered significant.</p> <p><b>Fluvial Geomorphology:</b> Permanent loss of approximately 35m of bed and banks from new culverts. Lateral connectivity with the floodplain altered as a consequence of the new culvert</p> <p><b>Water Quality:</b> None anticipated.</p>	high x negligible = Neutral	low x moderate = Slight	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		high x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF129	<p><b>Flood Risk:</b> Alterations to flood risk due to channel diversion. There is the potential for loss of a small area of floodplain storage due to operation of the diverted channel but any impacts are not considered significant as the channel will be designed to appropriate standards.</p> <p><b>Fluvial Geomorphology:</b> Culvert extension leading to removal of approximately 26m of bed and banks. Need for a small diversion to tie channel into culvert, leading to a change in channel gradient locally and potential impacts on flow and sediment processes. The extension would also alter the lateral connectivity with the floodplain. New pond removes a length of existing channel.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x moderate = Slight	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF131	<p><b>Flood Risk:</b> Alterations to flood risk due to: replacement culvert under the proposed scheme and channel realignment. Operation of replacement culvert with a catch pit at the inlet but with the same size pipe has been assessed to result in a decrease in flood risk to the A9 for the 0.5% AEP (200-year) plus CC event. There is also simulated to be no increase in downstream flow for the design flood event. There is the potential for loss of a small area of flood plain storage due to operation of the replacement culvert/channel realignment but any impacts are not considered significant.</p> <p><b>Fluvial Geomorphology:</b> New culvert leading to loss of approximately 30m of bed and banks. The culvert would also alter the lateral connectivity with the floodplain. Potential for change in flow regime from new realignment. Changes to the gradient of the channel; however, this was observed to be dry at the time of survey.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	P05-W36	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF132	<p><b>Flood Risk:</b> Alterations to flood risk due to: replacement of culvert under the proposed scheme. Operation of replacement culvert is predicted to result in no change to upstream water levels for the design flood event. Detailed 1D-2D hydraulic modelling of WFs132/134/136 indicate that post scheme construction there will be a moderate to negligible beneficial impact on flood risk through Calvine for the design flood event. The proposed scheme has also not been assessed as being at flood risk for the design 0.5% AEP (200-year) plus CC event for WFs 132/134/136. There is the potential for loss of a small area of floodplain storage due to operation of the replacement culvert but any impacts are not considered significant.</p> <p><b>Fluvial Geomorphology:</b> Potential for alteration to the channel downstream of the culvert (including erosion or deposition) as a result of channel adjustment in response to the modifications.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x negligible beneficial = Neutral*	medium x minor = Slight	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	P05-W37	high x negligible beneficial = Neutral	medium x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF133	<p><b>Flood Risk:</b> None anticipated.</p> <p><b>Fluvial Geomorphology:</b> None anticipated.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x negligible = Neutral	medium x negligible = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral		high x negligible = Neutral	medium x negligible = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF134	<p><b>Flood Risk:</b> Alterations to flood risk due to operation of: a replacement culvert under the proposed scheme and Calvine Underpass in close proximity to the watercourse. Operation of the replacement culvert is predicted to result in a reduction in upstream water levels with the culvert being simulated to have sufficient capacity to convey the design 0.5% AEP plus CC flood event. The proposed scheme is simulated to not be at flood risk during operation. Detailed 1D-2D hydraulic modelling of WFs132/134/136 indicate that here will be a moderate to negligible beneficial impact on flood risk through Calvine for the design flood event</p> <p><b>Fluvial Geomorphology:</b> New culvert leading to the loss of approximately 44m of natural bed and banks. Removal of riparian vegetation. The new culvert would also alter capacity and lateral connectivity with the floodplain. New side road bridge would alter lateral connectivity but maintain the existing channel bed and banks. Potential for change in flow and sediment processes from new realignment. Changes to the gradient of the channel, altering flow and morphological processes.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x minor beneficial = Moderate* (beneficial)	low x moderate = Slight	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	P05-W37	high x minor beneficial = Moderate* (beneficial)	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF136	<p><b>Flood Risk:</b> Alterations to flood risk due to: operation of replacement culvert/cascade and channel realignment. Operation of the replacement culvert is predicted to result in a significant reduction in flood extent resulting in six properties being no longer at flood risk during the design flood event. The culvert has been simulated to have sufficient capacity to convey the design 0.5% AEP plus CC flood event. The proposed scheme is simulated to not be at flood risk. Detailed 1D-2D hydraulic modelling of WFs132/134/136 indicate that there will be a moderate to negligible beneficial impact on flood risk through Calvine for the design flood event. The B847 will have a 57mm (moderate adverse) increase in flood depth for the design flood event due to the behaviour of the culvert. However, the increase in flood depth will be from a baseline depth of 58mm for the 0.5% AEP (200-year) plus CC event). The increase in flood risk to the B847 would only increase predicted flood depths to 115mm indicating that access would still be possible. The FRA (Appendix 11.3) has assessed that the flood frequency and hazard would remain unchanged from the baseline.</p> <p><b>Fluvial Geomorphology:</b> New culvert leading to a loss of approximately 20m of natural bed and banks including riparian vegetation. Embankment extension would also alter the lateral connectivity with the floodplain. Potential for change in flow and sediment processes from new realignment. Minor change to the gradient of the channel, altering flow and morphological processes. Outfall would locally alter flow processes and potentially lead to scour.</p> <p><b>Water Quality:</b> HAWRAT 'Fail' for soluble pollutants and sediment-bound pollutants during operation. Exceedance of AA-EQS for dissolved copper. Risk of pollution from spillage &lt;0.5% during operation.</p>	high x moderate adverse to moderate beneficial = Moderate* (adverse) to Large* (beneficial)	low x moderate = Slight	low x major = Moderate*	low x major = Moderate*	low x major = Moderate*		high x moderate adverse to moderate beneficial = Moderate* (adverse) to Large* (beneficial)	low x minor = Neutral	low x moderate = Slight	low x moderate = Slight	low x moderate = Slight
WF137	<p><b>Flood Risk:</b> Alterations to flood risk due to: operation of replacement culvert/cascade/channel realignment. Operation of replacement culvert is predicted to result in an increase in upstream water levels (&gt;100mm for the design 0.5% AEP plus CC event). There are no sensitive flood risk receptors located upstream of the culvert and the proposed scheme has not been assessed as being at risk as there is sufficient freeboard between the design flood event headwater level and the level of the road. There is also simulated to be no increase in water levels downstream of the proposed scheme. The FRA has therefore assessed this WF as being low risk. There is the potential for loss of a small area of floodplain storage due to culvert extension but any impacts are likely to be offset by a deeper channel at the invert.</p> <p><b>Fluvial Geomorphology:</b> Culvert extension leading to a loss of approximately 25m of natural bed and banks including riparian vegetation. Extension would also alter lateral connectivity with the floodplain. Potential for channel adjustment to new alignment downstream of outlet.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF139	<p><b>Flood Risk:</b> Alterations to flood risk due to: replacement culvert and channel realignment. Replacement of the existing culvert is predicted to result in an increase in headwater levels of greater than 100mm for the design 0.5% AEP (200-year) plus CC event upstream of the culvert. The replacement culvert has been assessed as having sufficient capacity to convey the design flood flow with water level being simulated to remaining in-bank upstream of the culvert. Adequate freeboard is simulated and the proposed scheme has not been assessed as being at flood risk (a freeboard of 1.3m is simulated). There are no sensitive flood risk receptors located upstream of the culvert and there is simulated to be no increase in downstream flow due to the proposed scheme. The FRA has therefore assessed this watercourse as low risk. There is the potential for loss of a small area of floodplain storage due to culvert extension but any impacts are likely to be minimal.</p> <p><b>Fluvial Geomorphology:</b> Culvert and embankment extension leading to loss of approximately 105m of natural bed and banks including riparian vegetation. Extension would also alter the catchment lateral connectivity with the moorland across the watercourse and drains. Potential for change in flow and sediment processes from new realignment. Changes to the gradient of the channel, altering flow and morphological processes.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x moderate = Slight	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x moderate = Slight	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF140	<p><b>Flood Risk:</b> Alterations to flood risk due to: replacement culvert, cascade and channel realignment. Operation of replacement culvert is likely to result in a decrease in upstream water levels of &gt;100mm for the 0.5% AEP (200-year) plus CC event but a minor increase in downstream water levels is predicted. There is a local access road downstream of this location. There are no other sensitive receptors nearby. The impact of the proposed scheme on the access track is likely to be negligible as flood water is simulated in the baseline scenario to overtop the existing A9 for the design flood event and re-join the watercourse downstream. There is the potential for loss of a small area of flood plain storage due to culvert replacement but any impacts are likely to be minimal.</p> <p><b>Fluvial Geomorphology:</b> Realignment resulting in loss of approximately 18m of small drains entering the main channel. Potential to alter the length and gradient of the drains. Potential to alter fluvial processes and morphological features in main channel. Culvert extension leading to loss of approximately 17m of bed and banks to the north of the A9 carriageway. The extension would also alter lateral connectivity with the floodplain. Potential for changes in the watercourse corridor (i.e. v-shaped valley) from culvert structure.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x negligible = Neutral	medium x minor = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	P05-W48	high x negligible = Neutral	medium x minor = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF141	<p><b>Flood Risk:</b> Alterations to flood risk due to: replacement culvert, pipe down cut slope and channel realignment. Operation of the replacement culvert is predicted to result in an increase in upstream water levels by approximately 60mm for the 0.5% AEP (200-year) plus CC event. This watercourse has been assessed as having a lack of freeboard to the proposed scheme but this is a direct result of the culvert inlet being located above the level of the proposed scheme main road. This watercourse is in free flowing conditions during the 0.5% AEP (200-year) plus climate change event, and the risk of flood to the proposed scheme is low. There is simulated to be no increase in pass forward flow downstream of the culvert. Given there are no sensitive flood risk receptors upstream of the culvert and the proposed scheme has not been assessed as being at risk impacts on flood risk have been assessed as negligible.</p> <p>There is the potential for loss of a small area of flood plain storage due to culvert replacement but any impacts are likely to be minimal.</p> <p><b>Fluvial Geomorphology:</b> Culvert extension leading to removal of approximately 4m of natural bed and banks including riparian vegetation. Embankment extension would also alter the lateral connectivity with the floodplain. Drainage channel realignment has potential to change length and gradient of the tributaries, altering flow, sediment and morphological processes.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x moderate = Slight	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF142	<p><b>Flood Risk:</b> Alterations to flood risk due to: new bridge abutments potentially causing restriction in flood flows. There is the potential for loss of a small area of floodplain storage due to the new bridge abutments potentially encroaching into the floodplain. The FRA has assessed the impact of the new bridge as negligible.</p> <p><b>Fluvial Geomorphology:</b> Proposed bridge abutments set at the top of the vertical bedrock banks causing removal of localised sediment source.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	very high x negligible = Neutral	high x negligible = Neutral	low x negligible = Neutral	high x negligible = Neutral		low x negligible = Neutral	very high x negligible = Neutral	high x negligible = Neutral	low x negligible = Neutral	high x negligible = Neutral
WF143	<p><b>Flood Risk:</b> Alterations to flood risk due to: replacement culvert, regraded channel and realigned drainage ditch. Operation of replaced culvert with one of the same diameter but a steeper gradient has been assessed as result in a minor increase in upstream water levels by approximately 11mm for the 0.5% AEP (200-year) plus CC event. There are no sensitive flood risk receptors located upstream of the proposed scheme in close proximity to the culvert. The culvert has been assessed as having sufficient capacity to convey the design flood event with sufficient freeboard. No increase in downstream flow has been simulated to occur. There is the potential for loss of a small area of flood plain storage due to the new culvert but any impacts are likely to be minimal.</p> <p><b>Fluvial Geomorphology:</b> New culvert leading to removal of approximately 15m of natural bed and banks including riparian vegetation. The culvert and embankment extensions would also alter lateral connectivity with the floodplain. The channel has a steep gradient and there is the potential for channel adjustment and erosion as a consequence of modification upstream.</p> <p><b>Water Quality:</b> None anticipated.</p>	medium x negligible = Neutral	low x moderate = Slight	medium x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		medium x negligible = Neutral	low x minor = Neutral	medium x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF144	<p><b>Flood Risk:</b> Alterations to flood risk due to: replacement culvert and channel regrading. Operation of the replacement culvert is predicted to result in an increase in upstream water levels of &gt;100mm for the 0.5% AEP (200-year) plus CC event but no impact is anticipated on downstream water levels. Given there are no sensitive upstream flood risk receptors the FRA has assessed this watercourse as low risk. There is also simulated to be sufficient freeboard between the design flood event headwater level and the level of the proposed road.</p> <p><b>Fluvial Geomorphology:</b> Culvert extension leading to removal of a length of natural bed and banks. Removal of riparian vegetation. Embankment extension would also alter the lateral connectivity with the floodplain.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x minor = Neutral	medium x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF145	<p><b>Flood Risk:</b> Alterations to flood risk due to: new replacement culverts, regraded channel, access road culvert and side road/associated culvert. Operation of replacement culvert under the A9 with increased diameter is predicted to result in a reduction in upstream water levels of &gt;100mm for the 0.5% AEP (200-year) plus CC event. Flow from water features 145 and 146 would be conveyed through the replacement culvert. Modelling indicates that the proposed scheme would result in an increase in pass forward flow and that peak flood depths on the local access road would increase by approximately 40mm for the design flood event. The local access road has, however, been assessed as remaining passable by vehicle during the design flood event. The proposed scheme is not assessed as being at flood risk for the 0.5% AEP (200-year) plus CC event. The increase in peak flow has been simulated to not adversely affect Clunes Cottage with flows being simulated to remain in-channel at this location for the design flood event. There is the potential for loss of a small area of flood plain storage due to the new culverts but any impacts are likely to be minimal. The side road culvert has also been assessed as being free flowing for the design flood event and therefore impacts to flood risk due to this culvert have been assessed as negligible.</p> <p><b>Fluvial Geomorphology:</b> New culverts and side road alter the floodplain connectivity and flow pathways leading to changes in runoff and potential flow and sediment processes, particularly during high flows. Combined length of culvert would lead to loss of approximately 32m of natural bed and banks, including riparian vegetation.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x minor = Neutral	low x moderate = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral		low x minor = Neutral	low x minor = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF147	<p><b>Flood Risk:</b> Alterations to flood risk due to: replacement culvert, bridge, realigned channel, side road and SuDS basin. The existing A9 culvert is proposed to be replaced with one of the same diameter resulting in an increase in upstream water depths of approximately 60mm for the 0.5% AEP (200-year) plus CC event. The proposed scheme has not been assessed as being at flood risk for the design flood event and no other sensitive flood risk receptors have been identified upstream of the culvert. There has also been simulated to be no increase in downstream water levels due to the proposed scheme. The FRA has therefore assessed this WF as being at low risk. There is the potential for loss of a small area of floodplain storage due to the new culvert/bridge/construction in close proximity to the watercourse but any impacts are likely to be minimal. Given the realigned section of channel will be appropriately designed there is not anticipated to be an increase in flood risk due to channel realignment.</p> <p><b>Fluvial Geomorphology:</b> New side road and A9 embankments alter the floodplain connectivity potentially leading to changes in runoff, flow and sediment processes, particularly during high flows. Culvert extension and new culvert would lead to loss of approximately 20m natural bed and banks, riparian vegetation. Potential for change in flow and sediment processes from new realignment. Changes to the gradient of the channel, altering flow and morphological processes.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x moderate = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral		low x negligible = Neutral	low x minor = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF148	<p><b>Flood Risk:</b> Alterations to flood risk due to: replacement culvert. Culvert replaced with one of the same diameter. An increase in head water depth of greater than 100mm is predicted upstream of the culvert for the 0.5% AEP (200-year) plus CC event but no increase in pass forward flow has been predicted downstream of the culvert. Given the proposed scheme has been assessed as not at flood risk for the design flood event and there are no sensitive upstream flood risk receptors the FRA have assessed this watercourse as low risk. There is the potential for loss of a small area of flood plain storage due to culvert replacement but any impacts are likely to be minimal.</p> <p><b>Fluvial Geomorphology:</b> Culvert extension and will alter the floodplain connectivity potentially leading to changes in runoff, flow and sediment processes. New realignment and changes to the gradient of this currently heavily modified concrete channel also have potential to change flow and sediment processes.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF149	<p><b>Flood Risk:</b> Alterations to flood risk due to: new bridge abutments potentially causing restriction in flood flows. The FRA has assessed the impact of the bridge extension as negligible.</p> <p><b>Fluvial Geomorphology:</b> Extension of bridge downstream removing bedrock step/pool. Removal and alteration of natural channel form through new proposed culvert extension and modified cascade to re-grade channel. Removal of some lateral connectivity from culvert extension and embankment potentially leading to high flows being passed through the length quicker. Bedrock channel so would be unlikely to have a significant impact on banks. Current man-made bed eroding, potential for similar impacts on proposed design.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	medium x minor = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	P05-W33	low x negligible = Neutral	medium x minor = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF150	<p><b>Flood Risk:</b> Given the realigned sections of channel will be appropriately designed there is not anticipated to be an increase in flood risk due to channel realignment.</p> <p><b>Fluvial Geomorphology:</b> Culvert extension leading to the loss of approximately 30m of channel, natural bed and banks including riparian vegetation. Extension would also alter the lateral connectivity with the floodplain. Potential for changes in flow, gradient, sediment processes and morphological features from the channel realignment.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x negligible = Neutral	low x moderate = Slight	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		high x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF151	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert extension and channel diversion. Operation of the extended culvert beneath the A9 is predicted to result in a small increase (30mm) in upstream water levels for the 0.5% AEP plus CC event but no change to downstream flood risk is anticipated. Flow is simulated to stay in bank upstream of the culvert and there are no sensitive flood risk receptors in this location. The FRA has therefore assessed this watercourse as low risk. There is the potential for loss of a small area of floodplain storage due to the culvert extension/channel diversion but any impacts are likely to be minimal.</p> <p><b>Fluvial Geomorphology:</b> The culvert extension would remove existing lateral connectivity of the watercourse with its floodplain and the vegetated riparian corridor. The culvert extension would be located approximately 20m upstream of a knickpoint, which could potentially continue migrating upstream and undermine the A9 structure. The rate of upstream retreat may also be exacerbated by the additional modification to the watercourse bed and banks. Changes in fluvial processes would potentially lead to further erosion.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	medium x moderate = Moderate	medium x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	P05-W38	low x negligible = Neutral	medium x minor = Slight	medium x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF152	<p><b>Flood Risk:</b> Alterations to flood risk due to: new culvert. Replacement of the existing culvert with one of the same diameter is predicted to result in an increase in upstream water levels of &gt;100mm for the 0.5% AEP (200-year) plus CC event. However, the culvert has sufficient capacity to convey the design flows with a large level of freeboard and there are no sensitive receptors other than the A9 upstream of the culvert. No change to downstream flood risk is anticipated. The FRA has therefore assessed this watercourse as low risk. There is the potential for loss of a small area of floodplain storage due to the new culvert but any impacts are likely to be minimal.</p> <p><b>Fluvial Geomorphology:</b> Total loss of approximately 44m of the watercourse to the south of the A9 carriageway. Culvert extension would alter lateral connectivity of the watercourse with the local floodplain.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF153	<p><b>Flood Risk:</b> Alterations to flood risk due to: culvert extension. Extension of the existing culvert is predicted to result in an increase in upstream water levels by approximately 33mm for the 0.5% AEP (200-year) plus CC event. Flow is, however, simulated to stay in-bank. The flood risk downstream is not anticipated to be impacted by culvert extension and there are no sensitive flood risk receptors located in close proximity to the culvert upstream. The proposed scheme is also only considered to be at low flood risk for the design flood event. The FRA has therefore assessed this watercourse as low risk.</p> <p>There is the potential for loss of a small area of flood plain storage due to culvert extension but any impacts are likely to be minimal.</p> <p><b>Fluvial Geomorphology:</b> Culvert extension downstream of the A9, leading to loss of approximately 25m of naturalised channel with gravel beds and earth banks. Embankment extension will alter the lateral connectivity with the floodplain. Potential for channel adjustment and a risk that the culvert extension will prevent the channel recovery and re-naturalisation that is currently occurring.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x minor = Neutral	medium x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x minor = Neutral	medium x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF88/ WF167	<p><b>Flood Risk:</b> Alterations to flood risk due to: new bridge abutments potentially causing restriction in flood flows/potential resulting in the loss of a small area of floodplain storage. Attenuation of flows within SuDS pond will help control runoff rates entering the watercourse.</p> <p><b>Fluvial Geomorphology:</b> Potential increase in silt from increased carriageway width with potential to change sediment processes and structure of the bed substrate. The new bridge abutments would alter the existing channel cross-section, with removal of some lateral connectivity; although the channel is confined within a valley downstream. Bridge design requires the new structure to span further downstream over an established bar, with some flow directed to the left bank which is currently eroding.</p> <p><b>Water Quality:</b> HAWRAT 'Fail' for dissolved zinc and sediment-bound pollutants during operation. Risk of pollution from spillage &lt;0.5% during operation.</p>	medium x negligible = Neutral	medium x minor = Slight	low x moderate = Slight	low x moderate = Slight	low x moderate = Slight	P05-W43, P05-W50	medium x negligible = Neutral	medium x minor = Slight	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF154	<p><b>Flood Risk:</b> Alterations to flood risk due to: new culvert and cascade. Culvert replaced and enlarged resulting in a predicted negligible decrease in upstream water levels and a negligible impact on downstream flows. There is the potential for loss of a small area of floodplain storage due to culvert replacement but any impacts are likely to be minimal.</p> <p><b>Fluvial Geomorphology:</b> New culvert would lead to the loss of approximately 42m of natural bed and banks including riparian vegetation. New culvert would also alter the lateral connectivity with the floodplain. New realignments would potentially lead to changes in channel gradient, flow and sediment processes and morphological features. Potential for channel adjustment upstream and downstream as a direct consequence of new culvert and realignments due to the steeper nature of the watercourse.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	medium x moderate = Moderate	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	P05-W39	low x negligible = Neutral	medium x minor = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF155	<p><b>Flood Risk:</b> Alterations to flood risk due to: new culverts and channel realignment. Replacement of the A9 culvert with one of the same diameter is predicted to result in an increase in upstream water levels of &gt;100mm for the 0.5% AEP (200-year) plus CC event. The new A9 culvert has been simulated as having 1.61m freeboard for the design flood event and the culvert is predicted to convey the flow with adequate freeboard. There is also simulated to be no increase in pass forward flow due to the new culvert. Given there are no sensitive flood risk receptors located in close proximity upstream of the culvert and given the proposed scheme has been assessed as not being at flood risk the FRA has assessed this watercourse as low risk. There is the potential for loss of a small area of flood plain storage due to the new culverts/channel realignment but any impacts are likely to be minimal.</p> <p><b>Fluvial Geomorphology:</b> New side road and embankment alters the floodplain connectivity potentially leading to changes in runoff, flow and sediment processes particularly during high flow. Combined culvert extension and new culverts would lead to the loss of approximately 47m of bed and banks including the riparian vegetation. Potential for change in flow and sediment processes from new realignments of tributaries into main channel. Changes to the gradient of the channel, altering flow processes and morphology. Potential for channel adjustment upstream and downstream as a direct consequence of new/extended structures within the watercourse, particularly due to the steeper nature of the channel.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x moderate = Slight	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF156	<p><b>Flood Risk:</b> Alterations to flood risk due to: new culverts, cascade, channel realignment and regrading. Replacement of the existing pipe culvert with an enlarged box culvert is predicted to reduce upstream water levels but increase pass forward flows. Detailed 1D-2D hydraulic modelling has indicated that this does not result in flooding to a local property at Dalreoch during the 0.5% AEP (200-year) plus CC event but does increase the area of flooding around the local access road. Debris clearance of this culvert (U521) will be undertaken as part of the proposed scheme works. Flood depth are simulated to decrease by approximately 30mm along the local access road for the 0.5% AEP (200-year) plus CC event. The FRA notes that the road has been assessed as inaccessible in the baseline and therefore with debris clearance flood frequency is likely to reduce. The FRA therefore assessed the impact of the proposed scheme as having a negligible flood impact. There is the potential for loss of a small area of floodplain storage due to the new culverts/channel realignment/regrading but any impacts are likely to be minimal. The side road culvert has been assessed as being free flowing for the design flood event and therefore impacts to flood risk due to this culvert have been assessed as negligible.</p> <p><b>Fluvial Geomorphology:</b> New side road and embankments would alter the floodplain connectivity leading to changes in runoff and potential flow and sediment processes, particularly during high flow. Two new culverts would lead to the loss of approximately 45m of the natural bed and banks, as well as disturbing the natural step-pool sequence. Permanent removal of riparian vegetation. Potential for change in flow and sediment processes from new realignments. Changes to the gradient of the channel, altering flow processes and morphology. Potential for channel adjustment upstream and downstream as a direct consequence of new/extended structures within the watercourse, particularly due to the steeper nature of the channel.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x minor = Slight*	medium x moderate = Moderate	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	P05-W28, P05-W40	high x minor = Slight*	medium x minor = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF157	<p><b>Flood Risk:</b> Alterations to flood risk due to: new culverts and channel realignment. Replacement of the existing A9 culvert with one of the same diameter is predicted to result in an increase in upstream water levels of 53mm for the 0.5% AEP (200-year) plus CC event. No change is predicted to downstream flood risk. Upstream flow is simulated to stay in bank for the design flood event and there is simulated to be sufficient freeboard. There are no sensitive flood receptors upstream other than the side road proposed as part of the scheme. The FRA has therefore assessed this watercourse as low risk. There is the potential for loss of a small area of floodplain storage due to the new culverts/channel realignment but any impacts are likely to be minimal. The side road culvert has also been assessed as being free flowing for the design flood event with flows being simulated to remain in bank upstream of the culvert. The impact to flood risk due to the side road culvert have therefore been assessed as negligible.</p> <p><b>Fluvial Geomorphology:</b> Culvert extension leading to loss of approximately 25m of natural bed and banks including riparian vegetation. Extension would alter capacity and lateral connectivity with the floodplain. Realignment of drains feeding into main channel has potential for change in channel gradient, flow and sediment processes and morphological features. The watercourse is already adjusting and incising due to historical modification and this may be exacerbated upstream and downstream by the scheme.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x minor = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral		low x negligible = Neutral	low x minor = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF158	<p><b>Flood Risk:</b> Alterations to flood risk due to: bridge replacement/new bridge over watercourse and new side roads. There is the potential for loss of a small area of flood plain storage and restrictions in flood flows due to the new bridge abutments and the new side road encroaching into the floodplain of this watercourse. This may increase flood risk locally and be susceptible to damage. The FRA has assessed the impact of the bridge replacement/new bridge as negligible. Increase in impermeable area within the catchment as a result of routing road runoff into this watercourse via outfalls Q and R has the potential to increase peak flows in the watercourse and hence flood risk. However, attenuation of flows within SuDS ponds will ensure that discharges rates into the watercourse are limited to greenfield runoff rates (i.e. the 50% AEP/2-year flow).</p> <p><b>Fluvial Geomorphology:</b> The watercourse is located within a bedrock gorge; therefore, flow energy is likely to be high. In this context further constriction could generate increased erosive energy at high flows locally. This would be of particular importance around bridges or outfall structures and banks downstream where bedrock is not present. Realignment of drains feeding into main channel. Potential for change in flow and sediment processes from new realignment. Two outfalls altering flow processes from discharges in a length with mobile deposits, potentially altering localised morphological processes.</p> <p><b>Water Quality:</b> HAWRAT 'Pass' for soluble pollutants. HAWRAT 'Fail' for sediment-bound pollutants during operation. Risk of pollution from spillage &lt;0.5% during operation.</p>	medium x negligible = Neutral	high x minor = Slight*	high x minor = Moderate*	low x minor = Neutral	medium x minor = Slight	P05-W33, P05-W43	medium x negligible = Neutral	high x negligible = Neutral	high x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF159	<p><b>Flood Risk:</b> Alterations to flood risk due to: new culvert and channel realignment. Replacement of the existing A9 culvert with one of the same diameter is predicted to result in an increase in upstream water levels of &gt;100mm for the 0.5% AEP (200-year) plus CC event. No change is predicted to downstream flood risk for the design flood event. The proposed scheme is not assessed as being at flood risk and there are no sensitive flood risk receptors located in close proximity to the culvert other than an underpass. The FRA has therefore assessed this watercourse as low risk.</p> <p><b>Fluvial Geomorphology:</b> Culvert extension leading to removal of a minimum of 25m of natural bed and banks including riparian vegetation. Extension would also alter the lateral connectivity of the channel with the floodplain. New realignments would alter channel gradient and length, potentially changing flow and sediment processes, and morphology.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x negligible = Neutral	medium x minor = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	P05-W49	high x negligible = Neutral	medium x minor = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF160	<p><b>Flood Risk:</b> Alterations to flood risk due to: new culverts and channel realignment. The existing A9 culvert is proposed to be replaced with one of a slightly larger diameter. This is simulated to result in a 28mm increase in upstream water levels for the 0.5% AEP (200-year) plus CC event. No increase in downstream flows are anticipated. Given there are no sensitive flood risk receptors upstream of the culvert and given the proposed scheme is not assessed as being at risk during the design flood event the FRA has assessed this watercourse as low risk. There is the potential for loss of a small area of flood plain storage due to the new culvert/channel realignment but any impacts are likely to be minimal. Given the realigned sections of channel will be appropriately designed there is not anticipated to be any increase in flood risk due to channel realignment.</p> <p><b>Fluvial Geomorphology:</b> Combined culvert extension and new culvert leading to loss of approximately 74m of bed and banks. Embankment extension would also alter capacity and lateral connectivity of watercourse with the floodplain. New realignments would alter channel gradient and length, with potential to change flow/sediment processes and morphology.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF161	<p><b>Flood Risk:</b> Alterations to flood risk due to: a new culvert. The existing A9 culvert is proposed to be replaced with one of a slightly larger diameter. This is simulated to result in a minor reduction (of approximately 20mm) in upstream water levels for the 0.5% AEP plus CC event. Given there is simulated to be no increase in downstream flow for the design flood event the FRA has assessed this watercourse as low risk. There is the potential for loss of a small area of floodplain storage due to the new culvert but any impacts are likely to be minimal. Given the realigned sections of channel will be appropriately designed there is not anticipated to be any increase in flood risk due to channel realignment.</p> <p><b>Fluvial Geomorphology:</b> New culvert leading to removal of approximately 15m of bed and banks.</p> <p><b>Water Quality:</b> None anticipated.</p>	high x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		high x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral
WF162	<p><b>Flood Risk:</b> Alterations to flood risk due to: a new culvert/regraded channel and realigned drainage ditches. The replacement of the existing A9 culvert with one of the same diameter has been simulated to result in an increase in upstream water levels of approximately 80mm for the 0.5% AEP (200-year) plus CC event. There is simulated to be no increase in pass forward flow for the design flood event. Given the proposed scheme is assessed as not being at flood risk and that there are no sensitive flood risk receptors located upstream of the road the FRA has assessed this watercourse as low risk. There is the potential for loss of a small area of floodplain storage due to the new culvert/channel realignment/regrading but any impacts are likely to be minimal.</p> <p><b>Fluvial Geomorphology:</b> Culvert extension leading to removal of approximately 15m of natural bed and banks. Embankment extension would also alter the lateral connectivity of watercourse with the floodplain. New realignments would alter channel gradient and length, potentially changing flow and sediment processes, and morphology.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x moderate = Slight	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral		low x negligible = Neutral	low x minor = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF163	<p><b>Flood Risk:</b> Alterations to flood risk due to: a new culvert, cascade and channel realignment. The culvert is proposed to be replaced with one of the same diameter. There is simulated to be a small increase in upstream flood level (11mm) for the 0.5% AEP (200-year) plus CC event but no increase in downstream flood risk is predicted. Flows are also simulated to stay in-bank upstream of the culvert, there are no sensitive flood risk receptors in this location and the proposed scheme is not assessed as being at risk. The FRA has therefore assessed this watercourse as low risk. There is the potential for loss of a small area of floodplain storage due to the new culvert/cascade/realignment but any impacts are likely to be minimal.</p> <p><b>Fluvial Geomorphology:</b> Culvert extension leading to loss of approximately 12m of naturalised bed and banks. Extension would also alter lateral connectivity of watercourse with the floodplain. New realignments would alter channel gradient and length, potentially changing flow and sediment processes, and morphology.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	low x minor = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral		low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral	low x negligible = Neutral

Water Feature	Potential Operational Impacts	Impact Significance: Pre Mitigation					Specific Mitigation	Impact Significance: Post Mitigation				
		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity		Flood Risk & Hydrology	Fluvial Geomorphology	Water Quality (Water Supply)	Dilution & Removal of Waste Products	Biodiversity
WF164	<p><b>Flood Risk:</b> Alterations to flood risk due to: bridge extension. There is the potential for loss of a small area of floodplain storage and restrictions in flood flows due to the extended bridge abutments potentially encroaching into the floodplain of this watercourse. This could increase flood risk locally and be susceptible to damage. The FRA has assessed the impacts of the new bridge as negligible as flow has been simulated to remain in bank for the design flood event. Increase in impermeable area within catchment as a result of routing road runoff into watercourse via outfall S has potential to increase runoff rates. However, attenuation of flows within a SuDS pond will ensure that discharges rates into the watercourse are limited to greenfield runoff rates (i.e. the 0.5% AEP/2-year flow).</p> <p><b>Fluvial Geomorphology:</b> The bridge design requires extension of the abutments on both banks potentially confining high flows and increasing hydraulic energy and the risk of localised bed and/or bank scour. Downstream the bridge abutment extension would remove a short additional length of natural bank that is currently eroding. There would be the potential to alter the existing deposit at the toe of the bank. New outfall located upstream of existing local route bridge may potentially lead to scour as discharges alter flow processes around new and existing structures.</p> <p><b>Water Quality:</b> No risk identified by HAWRAT (Pass both soluble and sediment-bound pollutants) during operation. Risk of pollution from spillage &lt;0.5% during operation.</p>	high x negligible = Neutral	high x minor = Slight*	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral	P05-W33, P05-W43	high x negligible = Neutral	high x minor = Slight*	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral
WF165	<p><b>Flood Risk:</b> None anticipated.</p> <p><b>Fluvial Geomorphology:</b> No permanent structures are located within the channel, with mainline widening located over 65m from the watercourse. No impact anticipated.</p> <p><b>Water Quality:</b> None anticipated.</p>	low x negligible = Neutral	medium x negligible = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral		low x negligible = Neutral	medium x negligible = Neutral	medium x negligible = Neutral	low x negligible = Neutral	medium x negligible = Neutral