10 ROAD DRAINAGE AND THE WATER ENVIRONMENT

10.1 Introduction

10.1.1 *Purpose & Scope of the Assessment*

This chapter addresses the potential effects on the water environment as a result of the proposed A96 Inveramsay Bridge Improvement Scheme ("the Scheme"). The water environment includes surface waters (e.g. rivers, burns, static water bodies etc.) and groundwater (e.g. shallow and deep aquifers). The assessment process comprised of characterisation of the existing water environment, identification and prediction of potential effects, and recommendations for any mitigation measures required to offset any significant adverse effects.

10.1.2 *Legislation & Guidance*

Apart from general statutory and planning requirements for a Scheme of this nature, the water environment aspects are regulated by a number of EU, Scottish and Local instruments ,and guidance documents, as in Table 10.1 outlined below.

Table 10.1 – Legislation and Guidance

Scope	Legislation or guidance document
European Legislation	▪ Water Framework Directive (2001/60/EEC) ▪ Fresh Water Fish Directive 2006/44/EC
Scottish Legislation	▪ Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR ▪ Water Environment and Water Services (Scotland) Act 2003 ▪ Flood Risk Management (Scotland) Act 2009 ▪ Private Water Supplies (Scotland) Regulations 2006 ▪ Surface Waters (Fishlife) (Classification) (Scotland) Regulations 1997 ▪ Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003
Scottish Government policy and advice documents	▪ SPP (Scottish Planning Policy), Flooding & Drainage and Environmental Impact Assessment; ▪ PAN 61 Planning and Sustainable Urban Drainage Systems; ▪ PAN 69 Planning and Buildings Standards Advice on Flooding; ▪ PAN 79 Water and Drainage. ▪ Aberdeen City and Shire Structure Plan (2009), ▪ Proposed Aberdeen City & Shire Strategic Development Plan (2013), ▪ The Aberdeenshire Local Development Plan (2012).
SEPA guidance Documents	▪ SEPA PPGs ▪ SEPA Policy No. 41: Planning Authority Protocol, Development at Risk of Flooding: Advice and Consultation ▪ SEPA Interim Position Statement on Planning and Flooding ▪ Indicative River & Coastal Flood Map (Scotland). ▪ SEPA Policy No. 19: Groundwater Protection Policy for Scotland V3 (2009) ▪ Managing River Habitats for Fisheries, 2002. ▪ Culverting of Watercourses, WAT-PS-06-02, 2006. ▪ Wastewater drainage position statement, 2008. ▪ Controlled Activities Regulations: A Practical Guide, 2008. ▪ Temporary Construction Methods, WAT-SG-29, 2009. ▪ Technical flood risk guidance for stakeholders, SS-NFR-P-002, 2010. ▪ Engineering in the water environment: good practice guide; River crossings, 2010.

Scope	Legislation or guidance document
	▪ Environmental Standards for River Morphology, WAT-SG-21, 2011. ▪ The Water Environment (Controlled Activities) (Scotland) Regulations 2011; A practical guide, 2011. ▪ Special Requirements for Civil Engineering Contracts for the Prevention of Pollution, Version 2, 2006.
Other guidance	▪ River Crossing and Migratory Fish: Design, Scottish Executive (2000) ▪ Construction Industry Research and Information Association (CIRIA) C502 ▪ Environmental Good Practice on Site. ▪ CIRIA C515 Groundwater Control - Design and Practice. ▪ CIRIA C521 Sustainable Urban Drainage Systems Design Manual for Scotland and Northern Ireland. ▪ CIRIA C532 Control of Water Pollution from Construction Sites. ▪ CIRIA C648&649 Control of Water Pollution from Linear Construction Projects. ▪ CIRIA C650 Environmental Good Practice on Site (Expansion of C502) ▪ CIRIA C689 Culvert Design and Operation Guide. ▪ CIRIA C697 The SUDS Manual. ▪ Methodology for the Water Framework Directive, Scotland and Northern Ireland Forum for Environmental Research, Project WFD 28 Final Report 2004. ▪ A handbook on environmental impact assessment; Guidance for Competent Authorities, ▪ Consultees and others involved in the Environmental Impact Assessment Process in Scotland. SNH, 2009. ▪ Private Water Supplies: Technical Manual, Scottish Executive, 2006. ▪ River Crossings and Migratory Fish: Design Guidance, A Consultation Paper, The Scottish Executive. ▪ UK Technical Advisory Group on the WFD, UK Environmental Standards and Conditions (Phase 2), Final, March 2008.

This legislation & guidance aims to protect and enhance the status of aquatic ecosystems, prevent further deterioration to such ecosystems, promote sustainable use of available water resources, and contribute to the mitigation of floods and droughts.

The resultant influence of the key pieces of legislation is discussed in Section 10.3.7 in deriving a set of key issues and constraints for the water resource aspects of the Scheme.

10.1.3 *Study Area*

The section of road under consideration is on the A96 approximately 3km northwest of Inverurie (see Figure 10.1- Water Resources Study Area). The general topography of the land is such that slopes fall from the surrounding hills towards the River Urie, which lies to the north east of this section of the A96. The existing A96 is elevated some 5 – 10m above the River Urie along the section of road under consideration. All surrounding surface water features to the south of the A96 tend to drain at approximately 90 degrees to the A96, and then drain straight into the River Urie after passing through one or more culverts under the A96 and the existing and redundant railway embankments.

In the context of these proposals, there are five water environment features that have been identified as part of this assessment (see Figure 10.1- Water Resources Study Area).). Within the 250m boundary considered for surface water features and the 500m boundary considered for groundwater features around the proposed Scheme the significant water environment features include: -

- River Urie,
- Two Unnamed Watercourses (flowing into the River Urie),
- Disused Quarry / Seasonal Pond to south of A96,
- The Groundwater beneath the proposed Scheme.

10.1.4 ***Water Environment Related Proposals***

A full description of the Scheme is included in Chapter 2 – The Proposed Scheme, but details that have an effect on this assessment are highlighted / expanded upon under the following headings.

General Scheme Overview

The Scheme involves realignment of the existing single carriageway road from Milton of Inveramsay to a point near Pitcaple Castle, in order to enable the removal of the traffic light controlled section through Inveramsay Bridge, where there is insufficient road width for safe two way traffic. The scope of work includes: -

- New two lane section of road over a length of approximately 1.45km including road embankments, drainage, and other associated infrastructure,
- Construction of a new bridge to carry the road over the railway line,
- Construction of a new accommodation underpass for Milton of Inveramsay Farm,
- Reconnection of existing accesses to / from the A96 for local traffic.

Existing Road Drainage & Outfalls

To put the new proposals into context, it is necessary to understand the existing road drainage along the section of A96 between Pitcaple Castle and Milton of Inveramsay. A site walkover indicated that the majority of the road carriageway has grassed verges, with drainage along this section of the A96 predominantly via roadside gullies. There does not appear to be any existing treatment of surface water run off prior to discharge.

A formal drainage survey was carried out between 27th and 31st August 2012 to identify the existing road drainage and outfalls. The survey concludes that there are two drainage systems serving the existing section of A96, draining the road north and south from the high point at the Milton of Inveramsay junction. The survey identified that the drainage to the north drains to the low lying point below the existing railway bridge, however was unable to clarify its outfall location. The survey identified an outfall (in poor condition) to the River Urie (some 230m downstream/south of the Scheme development site) which appears to be linked to the southern road drainage. The remaining section of the existing A96 between Station Cottage and Inveramsay Bridge was not investigated, but may drain to Unnamed Watercourse 1.

Proposed Road Drainage & Outfalls

As is standard for all new roads schemes, SEPA has requested that Sustainable Drainage System (SuDS) principles are applied where possible (see SEPA letter dated 11/07/12). Aberdeenshire Council have stated that the system would be required to attenuate a 1:30 post-development event to the 1:10 (pre-development) greenfield runoff rate with no properties to be affected by the 1:200 flood event.

The format of the drainage scheme should be in accordance with the technical guidance set out in CIRIA Report C697 “The SUDS manual”. In response to this, the proposed road drainage design incorporates two levels of treatment (refer to Figure 10.2 – Drainage Proposals and Flood Storage Compensation for full details).

The drainage proposals will see the collection of surface run-off via two networks at the edge of the road using filter drains (providing the first level of SuDS treatment) and discharging into two detention basins/elongated swales (providing the second level of SuDS treatment). The main detention basin serving most of the proposed road will be situated at ch. 500m of the Scheme, draining a road length of some 1100m. This basin will then discharge to the River Urie at the start of the meander bend, parallel to ch. 580m of the Scheme. A second basin/swale will be situated at the southern end of the Scheme, and will collect surface runoff to the south of the proposed bridge crossing, draining a road length of 450m. The basin/swale will discharge to the River Urie immediately downstream of the existing road bridge situated downstream of the Aberdeen to Inverness Railway Bridge.

These measures have been discussed with SEPA and Aberdeenshire Council (refer to email dated 04/08/10 and 09/11/12 Meeting Minutes in Appendix D of the FRA Report (Appendix 10.2 – Flood Risk Assessment)). It should be noted that although the drainage design is provisional at this stage and the final design will likely see minor modifications, its philosophy (2 levels of treatment) and targeted level of attenuation will not alter.

Watercourse Crossings

There are no existing bridges carrying the A96 over the River Urie within the study area. Unnamed Watercourse 1, however, currently passes under the A96 by way of a 500x500mm (approx.) culvert. The proposed Scheme would cross Unnamed Watercourse 1 to the north of the disused railway, where it flows in a small channel towards the River Urie, and will therefore require an extension to the existing culvert. At this stage it is estimated the culvert extension would be in the region of 35m.

10.2 Approach & Methods

The assessment methodology used in this Chapter is based on the generic methodology presented within Chapter 4 – Assessment Methodology. Into this methodology, the guidance and techniques presented within the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 10 “Road Drainage and the Water Environment” have been incorporated. The following section gives further detail in regard to how the potential effects on the water environment, which may arise from the construction and operation of the Scheme, were identified and assessed.

10.2.1 *Establishment of Baseline Conditions*

Water environment features within the study area were identified initially from Ordnance Survey maps, a desktop review of previous reports and other background information, and data collected from a site visit. This initial review was supplemented by consultations with statutory organisations and further consideration of available data. The study area assessed extends 250m around the Scheme for surface water features, whilst groundwater features were considered over an area extending 500m around the Scheme.

Surface Waters

Geo-morphological and Hydrological Data

Geo-morphological conditions for the water environment features were evaluated from Ordnance Survey mapping, data collected during the field surveys for this ES, data collected from a review of the Chapter 6 –Nature Conservation, and information from the ground investigations completed for the engineering design.

Hydrological data was available for the River Urie from the Pitcaple Gauging Station, which is operated by SEPA. This data was gathered from SEPA and has been subsequently used to assess flows in the River Urie for the Flood Risk Assessment. No hydrological data was available for either of the small watercourses and therefore assessments of the potential flows in these watercourses was made using standard hydrologic techniques (Institute of Hydrology

Report 101 “Low flow estimation in Scotland”) where necessary. It is noted that all flows have been derived for the purposes of this assessment only, and the road designers will be responsible for assessing the flows and providing adequate attenuation within the road drainage system as required.

Initial flooding information was gained from the SEPA Indicative River & Coastal Flood Map (Scotland) for the surrounding area to enable an assessment of whether the proposals may affect any identified floodplains. SEPA have also provided historical flooding information for the River Urie where it flows adjacent to the development site. A Flood Risk Assessment has also been undertaken to define the baseline flooding extents associated with the River Urie and Unnamed Watercourse 1 and assess the impact of the proposed Scheme and flood mitigation proposals on the existing flooding regime

Water Quality Data

SEPA have developed a classification system in line with the requirements of the Water Framework Directive, which is applied to all significant water bodies in Scotland. This system is based on an assessment of key chemical and ecological indicators. The classification system categorizes water bodies into the following bands; High, Good, Moderate, Poor, and Bad (a full description of this system is available on the SEPA website http://www.sepa.org.uk/water/monitoring_and_classification.aspx).

The River Urie currently possesses a classification of “Good” for the reach of interest to this assessment. However, the small watercourses do not possess a formal SEPA classification. Therefore, the evaluation of baseline water quality in this Chapter for the small watercourses has been estimated based on them possessing the same water quality classification as the River Urie (i.e. the small watercourses have been assigned a classification of “Good”).

Groundwater

Groundwater data was sourced from:

- Consultations with SEPA,
- Details from the Ground Investigations undertaken for the engineering design of the Scheme (including borehole and trial pit logs, groundwater level measurements, desktop ground investigation, etc.),
- The following mapping derived by SEPA for the characterisation of groundwater for the WFD – “Groundwater Vulnerability Map”, “Superficial Aquifer Map”, and the “Bedrock Aquifer Map”, and
- The groundwater data sheets published by SEPA showing the current classification of the groundwater for the area.

Private Water Supplies

Data regarding private water supplies within the study area has been gathered from the local Environmental Health Officer from Aberdeenshire Council.

10.2.2 *Impact Identification*

Identification of the possible range and location of potential impacts was based on: -

- The guidance within DMRB Volume 11, Section 3, Part 10 “Road Drainage and the Water Environment”,
- The professional experience of the assessment team,
- Consultation with relevant statutory and non-statutory organisations,
- Desk and site based research,

- An EIA scoping report and a DMRB Stage 2 report previously prepared, and
- Liaison with other chapter authors, and in particular the authors of Chapter 6 - Nature Conservation.

From this work a list of impacts considered to have potential to cause adverse effects on the water environment features was derived (see Section 12.4). It is noted that environmental effects on the water environment features may also lead to other impacts (such as changes to the aquatic ecology), which are addressed separately in the ES (Chapter 6 –Nature Conservation).

10.2.3 *Impact Assessment*

Impact assessment was based on the generic assessment methodology presented in Chapter 4 – Assessment Methodology and the guidance and techniques presented within DMRB Volume 11, Section 3, Part 10 “Road Drainage and the Water Environment”.

Sensitivity of Receptor

The sensitivity of a water environment feature is a synthesis of its environmental importance, socio-economic value, recreational value, and also its resilience to cope with change. The sensitivity of a water environment feature was evaluated using the guidance provided in Tables A4.1 “Water Features: Attributes and Indicators of Quality” & A4.3 “Estimating the Importance of Water Environment Attributes” (DMRB). From this guidance the following objective tests have been used in this Chapter to assess sensitivity: -

- The environmental importance of the water environment feature; e.g. if it has a designation at an international or national level (e.g. Special Area of Conservation, SSSI, etc.) or if the water body has a high or good status and is therefore a valuable pristine habitat, then this would tend to increase the sensitivity value of the receptor,
- The socio-economic value of the water body e.g. if the water body has notable aquatic ecological resources (e.g. an important local or national fishery) or if the surface water or groundwater is in a drinking water protected area as defined in the SEPA WFD Protected Areas Register, then this would tend to increase the sensitivity value of the receptor,
- The recreational value of the water body e.g. if an area is a SEPA designated bathing area or if a watercourse is an important local fishery this would tend to increase the sensitivity value of the receptor, and
- The size of the water body and its ability to buffer flow and water quality changes e.g. if a water body has high dilution characteristics compared to a small proposed discharge then its sensitivity value would tend to be lower.

In accordance with the generic methodology provided in Chapter 4 – Assessment Methodology, sensitivity has been scaled from Negligible to Low to Medium to High to Very High. In this Chapter a Negligible or Low sensitivity attribute are both considered to be equivalent to the Low Importance stated in Table A4.3 (DMRB). To ensure the transparency of this assessment, the key environmental, socio-economic, recreational, and resilience indicators used to derive the sensitivity of each water body are identified in Section 10.3 “Baseline Conditions”.

Impact Magnitude

The magnitude of a potential effect on the water resources features was evaluated using the criteria provided in Table A4.4 “Estimating the Magnitude of an Impact on an Attribute” (DMRB), with the addition of the following criteria to cover areas not specifically dealt with in the DMRB criteria. It is noted that impact magnitudes described below are all phrased

assuming adverse impacts, but these general classifications have also been used, where appropriate, to describe beneficial impacts from the Scheme: -

Severe – (equivalent to "Major Adverse" in DMRB see below for DMRB "typical examples") – results in loss of attribute and / or quality and integrity of attribute.

Surface Water: Failure of both soluble and sediment-bound pollutants in HAWRAT (Method A, Annex I) and compliance failure with EQS values (Method B). Calculated risk of pollution from a spillage >2% annually (Spillage Risk Assessment, Method D, Annex I). Loss or extensive change to a fishery. Loss or extensive change to a designated Nature Conservation Site.

Groundwater: Loss of, or extensive change to an aquifer. Potential high risk of pollution to groundwater from routine runoff – risk score >250 (Groundwater Assessment, Method C, Annex I). Calculated risk of pollution from spillages >2% annually (Spillage Risk Assessment, Method D, Annex I). Loss of, or extensive change to, groundwater supported designated wetlands.

Flood Risk: Increase in peak flood level (1% annual probability) >100 mm (Hydrological Assessment of Design Floods and Hydraulic Assessment, Methods E and F, Annex I).

Additional criteria used in this assessment: -

- Degrading of the existing water quality classification,
- Loss of or serious effect on the integrity of an internationally or nationally designated aquatic ecological resource,
- Gross changes to geo-morphological or hydraulic characteristics e.g. loss of natural bank and bed over a length of 50m or more, reduction in flow capacity of an existing river channel by 20% or more, and
- Widespread effect on groundwater movement with a gross change to overall groundwater transfer from up gradient to down gradient resources. Widespread and gross effects on groundwater quality.

Moderate – (equivalent to "Moderate Adverse" in DMRB see below for DMRB "typical examples") – results in effect on integrity of attribute or loss of part of attribute.

Surface Water: Failure of both soluble and sediment-bound pollutants in HAWRAT (Method A, Annex I) but compliance with EQS values (Method B). Calculated risk of pollution from spillages >1% annually and <2% annually. Partial loss in productivity of a fishery.

Groundwater: Partial loss or change to an aquifer. Potential medium risk of pollution to groundwater from routine runoff – risk score 150-250. Calculated risk of pollution from spillages >1% annually and <2% annually. Partial loss of the integrity of groundwater supported designated wetlands.

Flood Risk: Increase in peak flood level (1% annual probability) >50 mm

Additional criteria used in this assessment:

- Degrading of either the combined chemical or ecological status indicators (in the case of watercourses) one or more classifications, but no change in overall classification,
- Slight impact on an internationally or nationally designated aquatic ecological resource, or a loss or serious effect on the integrity of a nationally or locally important aquatic ecological resource that is not designated,
- Significant, but not gross, changes to geo-morphological or hydraulic characteristics e.g. loss of natural bed and bank over a length of 20m or more, reduction in the area of an existing watercourse channel by less than 20%, and

- Widespread effects on groundwater movement with a measurable, but not gross, effect on overall groundwater transfer from up gradient to down gradient resources. Widespread, but not gross, effects on groundwater quality.

Slight – (equivalent to "Minor Adverse" in DMRB see below for DMRB "typical examples") – results in some measurable changes in attributes quality or vulnerability.

Surface Water: Failure of either soluble or sediment-bound pollutants in HAWRAT Calculated risk of pollution from spillages >0.5% annually and <1% annually.

Groundwater: Potential low risk of pollution to groundwater from routine runoff – risk score <150. Calculated risk of pollution from spillages >0.5% annually and <1% annually. Minor effects on groundwater supported wetlands.

Flood Risk: Increase in peak flood level (1% annual probability) >10mm

Additional criteria used in this assessment:

- Degrading of two or more chemical or ecological status indicators (in the case of watercourses), but with no change in either overall or the individual water or biological quality classifications,
- Slight impact on a nationally or locally important aquatic ecological resource, or the loss of a moderate area of an abundant aquatic ecological resource,
- Minor changes to some geo-morphological or hydraulic characteristics e.g. loss of natural bed and bank over a length of less than 20m, reduction in the area of an existing watercourse channel by less than 5%, and
- Localised effect on groundwater movement but no measurable effect on overall groundwater transfer from up gradient to down gradient resources. Localised, measurable but not gross, effects on groundwater quality.

Negligible – (equivalent to "Negligible" in DMRB see below for DMRB "typical examples") – results in effect on attribute, but of insufficient magnitude to affect the use or integrity.

Surface Water: No risk identified by HAWRAT (Pass both soluble and sediment-bound pollutants). Risk of pollution from spillages <0.5%.

Groundwater: No measurable impact upon an aquifer and risk of pollution from spillages <0.5%.

Flood Risk: Negligible change in peak flood level (1% annual probability) <+/- 10 mm

Additional criteria used in this assessment:

- Degrading of one individual chemical or ecological status indicators (in the case of watercourses), but with no change in either the overall or the chemical or ecological quality classifications,
- Slight impact on a small area of an abundant aquatic ecological resource,
- Highly localised but not measurable changes in some geo-morphological or hydraulic characteristics, and
- Highly localised effect on groundwater movement but no effect on overall groundwater transfer from up gradient to down gradient resources. Localised, but not measurable, effects on groundwater quality.

Impact Significance

Overall Significance is considered to be a product of both the sensitivity of the receptor and the magnitude of the effect. Significance is scaled from Negligible to Minor, and Moderate, to Substantial. In assessing the product of sensitivity and magnitude, a Matrix for Determination of Level of Impact has been adopted, see Chapter 4 – Assessment Methodology and presented in Table 10.2 below. This is in lieu of Table A4.5 Matrix for Estimating the Significance of Potential Effects in the DMRB. This approach provides a transparent assessment for each water resources feature.

Table 10.2: Matrix for Determination of Level of Impact

MAGNITUDE OF EFFECT	SENSITIVITY OF RECEPTOR				
	Very High	**High**	**Medium**	**Low**	**Negligible**
SEVERE	Substantial	Substantial	Moderate	Minor	Negligible
MODERATE	Moderate	Moderate	Minor	Minor	Negligible
SLIGHT	Moderate	Minor	Minor	Negligible	Negligible
NEGLIGIBLE	Negligible	Negligible	Negligible	Negligible	Negligible

Only impacts that are “Moderate” or “Substantial” (shaded) are considered to be Significant. The significance of a potential effect on the water resources features has been evaluated using the guidance provided in Table A4.6 “Qualifying Conditions for Overall Assessment Scores” (DMRB).

It is also valuable to attribute a level of confidence to the predicted impact assessment. Unless otherwise stated the impacts described in this Chapter are given at a high confidence level. Where impacts are given at a low confidence level, a reason shall be stated for this e.g. lack of detailed design data.

Mitigation

Mitigation measures considered appropriate for the avoidance and minimisation of effects on water environment features will be proposed in accordance with the generic guidance provided in Chapter 4 – Assessment Methodology.

No mitigation has been included in Section 10.4 “Predicted Impacts”. Mitigation requirements are subsequently noted in Section 10.5, and the Residual Impacts are subsequently assessed in Section 10.7. Mitigation measures are typically assigned on a hierarchy, starting with the application of standard conditions that would be applied by SEPA or measures that a designer or contractor would be expected to take based on current best practice, and then proceeding to Scheme specific mitigation measures, if required, to offset any significant potential environmental effects.

10.2.4 *Assessment Years*

The baseline established for this assessment has been assumed to remain constant up to the time when the Scheme is put in place (2016), and this is because the full implementation of improvement measures identified in the first round of River Basin Management Plans will not have significantly progressed. As the River Urie has a current status of “Good”, and therefore meets the requirements of the Water Framework Directive, the main objective set by SEPA for over the next 20 years is to ensure that no deterioration occurs (based on 2010 data from SEPA RBMP Water body information sheet for water body 23283 in North East Scotland).

10.3 Baseline Conditions

10.3.1 *River Urie*

The principal water environment feature within the study area is the River Urie, which has a mean flow of approximately 3.4m^3/s and a catchment area of some 200km^2, at Pitcaple just upstream of the study area. The River Urie catchment is predominantly rural upstream of the study area and used mostly for agricultural purposes. There are no major lochs / reservoirs or hydro schemes within the upstream catchment which would act to regulate flows within the River Urie. The River Urie joins the River Don approximately 9km downstream of the study area. The River Urie contains a wide variety of biodiversity, including Atlantic Salmon, Otters, and Water Voles within the study area. These aspects are discussed more fully in Chapter 6 - Nature Conservation. The river margins in the vicinity of the proposal are heavily vegetated immediately adjacent to the watercourse with agricultural land beyond the top of bank. The river itself is not known to be an important source of drinking water; however it is understood to be used for recreational fishing, and falls within the River Don Freshwater Fish Protection Area UKS7865939.

The River Urie is currently classified by SEPA under the Water Framework Directive, with the river possessing a "Good" status with High confidence. Environmental objectives have been set by SEPA for the River Urie over future River Basin Management Planning cycles in order to sustainably maintain its status as "Good" through to 2027 (based on data from SEPA Water body Information Sheets). There are no pressures currently noted along this reach of the River Urie. The study area lies within a groundwater Drinking Water Protection Zone as defined in the SEPA WFD Interactive Map.

Table 10.3 – River Urie Baseline

Receptor	**River Urie**
Water Supply / Quality	No known water supply abstract-ions & WFD status assessed as "Good" with chemistry status as "Pass" **High**
Dilution and Removal of Waste Products	Only known discharges within study area are relatively minor outfalls serving parts of the existing A96 **Low**
Recreation	Used for recreational fishing **High**
Value to Economy	Used for recreational fishing & not known to be a significant drinking water supply **Medium**
Conveyance of Flow	Two very minor water-courses flow into the River Urie within the study area. Serves as important floodplain within study area **High**
Biodiversity	WFD ecological Status assessed as "Good". Study area falls within Freshwater Fish Protection Area UKS7865939. Supports Salmon, Otters, & Water Vole within study area **High**
Overall Sensitivity	**High**

10.3.2 *Two Small Watercourses*

There are two small watercourses which lie within the study area as shown on Figure 10.1 – Water Resources Study Area. Both watercourses are unnamed and are herein referred to as Unnamed Watercourse 1 and 2. The proposed Scheme will cross over Unnamed

Watercourse 1 but not Unnamed Watercourse 2, however the second watercourse is included in this assessment since it is within the study area boundary.

Unnamed Watercourse 1 drains the farmland to the south west of the proposed Scheme. The watercourse crosses under the existing A96, the Aberdeen to Inverness Rail Line, and the disused railway embankment by way of a single 500mm square culvert, flowing from south west to north east. Unnamed Watercourse 1 then continues north east as an open channel for a short distance before discharging to the River Urie. The watercourse drains an area of approximately 0.75km^2 and has an average daily flow of approximately 0.01m^3/s. The catchment upstream (south east) of the existing A96 is relatively steep farmland. During a site visit, a resident of Govals Farm advised that field drains feed into Unnamed Watercourse 1 and that the watercourse is used as a water supply for the farm, albeit this is understood to occur well upstream of the existing A96. A pipe inflow also drains to Unnamed Watercourse 1 at the culvert entrance to the south east of the A96. Based on a site inspection, it is believed that this inflow is from the existing road drainage, but this has not been confirmed.

Unnamed Watercourse 2 is to the north east of the River Urie, and also has a relatively small catchment area of approximately 1.1km^2 and has an average daily flow of approximately 0.014m^3/s. The upstream catchment is mixed agricultural land and woodland and generally comprises steeply sloping ground.

There are not understood to be any particular ecological interests within these small watercourses (refer to Chapter6 - Nature Conservation for more information).

In terms of water quality, the watercourses are not monitored by SEPA and therefore a classification has had to be derived for the purposes of this assessment based on the water quality classification of the River Urie and the overall setting of the watercourses. Given the following: -

- The WFD status of the River Urie is “Good”,
- The catchments of the small watercourses themselves appear to be mixed rural land and grazing land with no visual evidence of major sources of diffuse or point pollution.

These watercourses have been assigned a WFD status of “Good” for the purposes of this assessment.

Table 10.4 – Unnamed Watercourses 1 and 2 Baseline

Receptor	**Unnamed Water-courses 1 and 2**
Water Supply / Quality	Possible minor private water supply. WFD status assumed as “Good” with chemistry status as “Pass” as per River Urie. **High**
Dilution and Removal of Waste Products	Possible minor surface water discharges from surrounding roads **Low**
Recreation	No known recreational use Low
Value to Economy	No known recreation-al use. Possible minor private water supply **Medium**
Conveyance of Flow	No incoming water-courses with both draining relatively small catchments around 1km^2 **Low**
Biodiversity	WFD Ecological Status assumed “Good” as per River Urie. Likely to support some species as

	noted for River Urie. **Medium**
Overall Sensitivity	**Medium**

10.3.3 ***Disused Quarry / Seasonal Pond***

Ordinance Survey 1:25,000 mapping shows a disused quarry / pond within Pitcaple Wood to the south of the A96. In relation to the adjacent section of the A96, the pond / disused quarry is elevated approximately 5m above the road and at around the same level as the adjacent section of the Aberdeen to Inverness Rail Line. During two site inspections dated 19/08/11 and 08/08/12 no evidence of a permanent pond was found, however the land to the south of the woodland pathway is relatively low lying and 'land-locked', in comparison to the steep surrounding topography, and is likely to be susceptible to ponding. Pondage would likely occur after continuous heavy rainfall, and may also be influenced by water table levels. A local walker advised, during the site visit, that ponding does occur in the winter and recalled of pondage up to the level of the woodland pathway. The exact area of the quarry / seasonal pond was difficult to determine on site due to the dense nature of the woodland. It is not considered that such a temporal feature would support a significant aquatic ecological interest, and the feature is not monitored by SEPA.

Table 10.5 – Disused Quarry/Seasonal Pond Baseline

Receptor	**Disused Quarry / Seasonal Pond**
Water Supply / Quality	Not used as a water supply and no water quality assigned given temporal status **Low**
Dilution and Removal of Waste Products	No known surface water discharges **Low**
Recreation	No known recreational use **Low**
Value to Economy	No specific value **Low**
Biodiversity	No WFD status. No formal designations. No direct connectivity to watercourses. No fisheries given temporal status. **Low**
Overall Sensitivity	**Low**

10.3.4 ***Groundwater***

Groundwater data was sourced from: -

- A desktop geological report (from the British Geology Society) shows that the site is underlain by bedrock which likely varies between 0-5m below the surface, and consists of norite and gabbronorite at the north end of the Scheme, hornfelsed psammite and hornfelsed semipelite & psammite and semipelite in the middle of the scheme, and migmattic psammite and migmattic semipelite at the south end of the Scheme. The superficial deposits are expected to comprise of alluvium along the floodplain of the River Urie, river terrace deposits, and glacio-fluvial sheet deposits. It appears that the Scheme will pass through areas of glaciofluvial sheet deposits present on the higher land, i.e. gravel sand and silt. The BGS Report provides no information of historical water wells.
- The SEPA "Bedrock Aquifers" map classifies the bedrock as "fracture flow with very low productivity". The SEPA "Superficial Aquifer Map" records "intergranular flow with low productivity" in this area. The SEPA "Vulnerability of Groundwater in the Uppermost Aquifer Map" records the area as "Category 4b" i.e. moderate to high vulnerability.

- Based on a review of desktop information and a site visit by a geotechnical engineer the following additional information is noted in regard to the bedrock. The underlying solid geology across the study area comprises Dalradian age metasedimentary rocks of the Aberdeen Formation and Ordovician age igneous rocks of the Insch and Lawel Hill Intrusions. The site is split by these two distinct groups approximately from east to west, to the north of Milton of Inveramsay.
- The Ground Investigation information collected for the Scheme confirms the presence of shallow groundwater (i.e. less than 6m below ground level) in most locations and frequently less than 2m below the surface in lower lying areas. Bedrock varies between 2m and 10m below the surface along the route, with the average depth being 4 – 6m. The superficial deposits are generally a mixture of sands and gravels with varying proportions of clay.
- The area is a "Drinking Water Protection Zone" as defined in the SEPA WFD Protected Areas Register, and currently passes the DWPA status. There are known local drinking water supplies taken from the area immediately surrounding the proposed Scheme (refer to Figure 10.1 – Water Resources Study Area) identified by consultations with the local Environmental Health Officer, three of which are known to be sourced from groundwater.
- There are some groundwater dependant habitats within the study area, and these are located around the Disused Quarry / Seasonal Pond and on either bank of the River Urie upstream of the old railway bridge adjacent to where the northern end of the Scheme ties back onto the existing carriageway.
- The groundwater data sheets published by SEPA showing the current classification of the groundwater for the area - classified as "Good" with a "High" level of confidence, by SEPA under the Water Framework Directive for the area of the proposed Scheme (based on SEPA Water body Data Sheets). The RBMP for this water body is to maintain the current WFD status. There are no particular pressures noted on this water body.

Table 10.6 – Ground water Baseline

Receptor	Ground water
Water Supply / Quality	No ground-water status assigned. A number of small private water supplies abstracting from groundwater exist in the study area. Overall catchment is a Drinking Water Protection Zone. **Medium**
Soak-away	No known soak-aways or dis-charges to the ground. **Low**
Vulnerability	Vulnerability is likely to be 'moderate' / 'high' in relation to the uppermost aquifer **Medium**
Value to Economy	Small private water supplies only; no specific known employ-ment **Low**
Conveyance of Flow	Likely that groundwater does support River Urie to an extent. Existing road and railway embank-ments may already influence groundwater movement **Medium**
Biodiversity	Chapter 6 – Nature Conservation has identified a small number of isolated ground-water dependent

	habitats **Medium**
Overall Sensitivity	**Medium**

10.3.5 ***Flooding***

A review of the Indicative River and Coastal Flood Map (Scotland) published by SEPA indicated that the proposed route for the A96 in this location could potentially fall within the 1:200year flood extents. SEPA have recorded flooding in this area in September 1995 and November 2002 from the River Urie. As part of the EIA for the proposed road development, a Flood Risk Assessment (FRA) has been undertaken to determine the baseline flooding extents associated with the River Urie. SEPA also requested that a FRA be undertaken to assess the impact of the Scheme on the flooding regime. Aberdeenshire Council have advised that the 1:200+CC flood event should be adopted as the design event for the Scheme. The FRA Report is contained in Appendix 10.2 – Flood Risk Assessment.

The FRA predicts that the fields adjacent to the River Urie would act to store floodwater during the design event , and the flooding is predicted to extend to the alignment of the Scheme in two locations (ch. 350-650m and 900-1000m) (refer to Appendix 10.2 – Flood Risk Assessment - Figure 7). The baseline (1:200+CC) flooding at the site is primarily influenced by the flow restriction and backwatering caused by the two bridges at the downstream end of the proposed Scheme. The modelling undertaken as part of the FRA predicts flood depths in the order of 0.3-1m where the proposed Scheme alignment will pass through the 1:200+CC flooding extents (see Appendix 10.2 – Flood Risk Assessment - Figure 8).

The FRA also predicts the baseline flooding conditions for Unnamed Watercourse 1. The FRA has assessed that the existing A96 and surrounding land would be at risk of flooding from Unnamed Watercourse 1 due to the insufficient capacity of the existing Culvert on the watercourse under the A96 and railway line. For the 1:200+CC event, the FRA predicts that floodwater would pond on the existing A96 in the vicinity of the bridge under the railway to depths in excess of 1m and then flow into the field to the north towards the River Urie (see Appendix 10.2 - Flood Risk Assessment - Figure 9). The FRA also shows that the insufficient capacity of the existing Farm Track Culvert, immediately downstream of the existing A96 Culvert, would result in localised out-of-bank flooding.

Rural land in an open flood plain (attribute conveyance of flow) is considered as having a **Low** sensitivity to increased flood risk, but residential and industrial properties within and adjacent to the flood plain are considered as having a **High** sensitivity to increased flood risk.

10.3.6 ***Private Water Supplies***

Upon contacting the Environmental Health Department of Aberdeenshire Council, it is understood that there are a number of Type A and Type B (as defined by the Private Water Supplies (Scotland) Regulations 2006) private water supplies within a 500m radius of the proposed Scheme, mostly for domestic purposes. The location of these supplies are shown on Figure 10.1 – Water Resources Study Area. Aberdeenshire Council have advised that the source of these supplies is largely unknown, although some are indicated as being abstractions from groundwater. The closest private water supplies to the proposed Scheme are at Milton of Inveramsay.

10.3.7 ***Plans & Policies***

Overarching Legislation

The WFD, enacted in Scotland by the Water Environment & Water Services Act (2003) aims to: protect and enhance the status of aquatic ecosystems; prevent further deterioration to such ecosystems; promote sustainable use of available water resources; and contribute to the mitigation of floods and droughts. A review of the SEPA WFD Interactive Map identified a

number of designations for surface and groundwater features, and these have been noted in the Sections 10.3.1 - 10.3.4 and taken into account in the assessment of sensitivity.

SPP

SPP provides the current context for planning controls and includes the specific controls in relation to flood risk. SPP states as a general principle that "Development which would have a significant probability of being affected by flooding or would increase the probability of flooding elsewhere should not be permitted".

Structure and Local Development Plans

Aberdeen City and Shire Structure Plan (2009)

Sustainable Development and Climate Change

Issues:

- 4.8 – Areas of Aberdeen and Aberdeenshire are already at risk from flooding, but increased risk comes about through changing and more unpredictable weather patterns and rising sea levels. We will need to take account of the scale of these changes when we consider what new developments should be built and where they should be located.

Targets:

- To avoid developments on land which is at an unacceptable risk from coastal or river flooding (as defined by the 'Indicative River and Coastal Flood Map for Scotland' or through a detailed flood risk assessment), except in exceptional circumstances.

How to meet the targets:

- Local development plans should not identify sites for new development which are at an unacceptable risk from flooding, except for brown-field sites which have appropriate flood prevention measures in place. Unacceptable risk will normally be a probability of one flood every 200 years, although this will vary with the type of development being proposed.

Quality of the Environment

Issues:

- 4.20 – The built, natural and cultural environment is a valuable resource, but one which needs to be protected. The way in which sites are chosen, and high quality design, will make sure that development does not lead to the decline of the North East's built, natural and cultural assets.
- 4.21 – Biodiversity, wildlife habitats and landscape can be vulnerable to the effects of new development. As a result, we need to focus on maintaining and improving them, especially where there are plans for development. In particular, we need to take care over the possible effects of development on Natura 2000 sites and the Cairngorms National Park.
- 4.22 – Not all water bodies in the area meet the quality standards under the Water Framework Directive. River Basin Management Plans are being prepared in partnership to deal with these issues.

Targets:

- To make sure that development improves and does not lead to the loss of, or damage to, built, natural or cultural heritage assets.

- To avoid new development preventing water bodies achieving 'good ecological status' under the Water Framework Directive.

How to meet the targets:

- Both councils will take part in the River Basin Management Planning process, particularly as it relates to new development.
- Both councils will take account of biodiversity, wildlife habitats, landscape, greenspace and other sensitive areas in identifying land for development, preparing masterplans and assessing development proposals.

Proposed Aberdeen City & Shire Strategic Development Plan (2013)

Sustainable Development and Climate Change

Issues:

- 4.6 – To reduce the causes of climate change (mitigation) and put in place a number of measures to limit the consequences of climate change as well (adaptation).
- 4.11 – Areas of Aberdeen and Aberdeenshire are already at risk from fl ooding, but increased risk comes about through changing and more unpredictable weather patterns and rising sea levels. Avoiding fl ood risk is an important measure to adapt to climate change. We will need to take account of the scale of these changes when we consider what new developments should be built and where they should be located.

Targets

- To avoid developments on land which is at an unacceptable risk from coastal or river flooding (as defined by the 'Indicative River and Coastal Flood Map for Scotland' or through a detailed flood risk assessment), except in exceptional circumstances.

How to meet the targets

- Local development plans should not identify sites for new development which are at an unacceptable risk from flooding, except for brownfield sites which have appropriate flood prevention measures in place. Unacceptable risk will normally be more than a 1 in 200 (0.5%) chance of a flood happening in any year, although this will vary with the type of development being proposed.

Aberdeenshire Local Development Plan (2012)

Policy 8 – Layout, siting and design of new development

The broad objectives of this policy include: -

- recognising all the factors that influence design;
- creating a process by which we can take account of all the relevant issues in the emerging design at the appropriate stage;
- developing a method through which we can include the interests of those who have a major stake in the process (including the developers themselves and the local community); and
- a standardised process of assessment.

In relation to the water environment, the Plan provides (Policy SG LSD8 – Flooding and Erosion) as supplementary guidance and stipulates : -

We will refuse any new development on land at risk from flooding, including on any functional flood plain, or on land that may be required for long term managed retreat or that is at risk from erosion, unless:

- 1) a hydrological, drainage impact and/or flood risk assessment or geomorphology assessment, which includes an allowance for freeboard and climate change where appropriate, is provided at the applicant's expense, and demonstrates that the risk is neither medium nor high risk as defined by Appendix 2; OR
- 2) it is for flood or erosion prevention measures; OR
- 3) it is development that is consistent with the flood storage function of flood plains or would otherwise be unaffected by flooding; OR
- 4) it would be for essential infrastructure or otherwise inappropriate to locate it elsewhere; OR
- 5) it is within a built-up area and flood prevention or erosion measures to the appropriate standard will exist at the time the development is occupied.

In these cases and if development is to be permitted on land at risk from flooding, then, subject to other policies, it must be designed:

- a) to incorporate flood resilient design measures, water resistant materials and construction methods to assist in the evacuation of people and to minimise damage from flooding; AND
- b) not to impede the ability of any flood plain to store water or flood naturally, nor to reduce the capacity of flood defences or of any other arrangement for flood management; AND
- c) not to result in a significant increase in the risk or severity of flooding elsewhere through altering flood storage capacity or the pattern of flow of flood waters; AND
- d) to avoid any water courses being culverted, unless there is no practicable alternative and it will not impede the passage of amphibians or fish species; AND
- e) to provide for maintenance buffer strips for any water body; AND
- f) to include land-raising and/or excavations with the proposal, only if:
- i) it is for a flood alleviation measure; and
- ii) it is linked to the provision and maintenance of direct or indirect compensatory flood water storage to replace the lost capacity of the functional flood plain; and
- iii) it will not create a need for flood prevention measures elsewhere; and
- iv) it will not create any island or islands of development within the functional flood plain that could become inaccessible during a flood.

Due to the continuing changes in climatic patterns, the precautionary principle will apply when reviewing any application for development in an area at risk from inundation by flood water or erosion.

Policy 14 – Safeguarding of resources and areas of search

Aberdeenshire Council will not support developments that sterilise, degrade or otherwise make unavailable key strategic resources, including the water environment, important mineral deposits, prime agricultural land, open space, trees and woodlands. Other key strategic resources include sites that may reasonably be required in the future for the delivery of transportation improvements, waste facilities or energy generation, including the ability of Peterhead power station to adapt and expand.

In relation to the water environment, the Plan provides (Policy SG Safeguarding 1 – Protection and conservation of the water environment) as supplementary guidance and stipulates : -

We will only approve new development, including aquatic engineering works, which will generate discharges or other impacts on existing water bodies, or which could affect the water quality, quantity, flow rate, ecological status, riparian habitat, protected species or flood plains of water bodies including their catchment area, subject to other policies, if:

- 1) it has been demonstrated that it will not prejudice the ability of water bodies to maintain good status; or, for those water bodies not currently achieving good status, that it will not cause any further deterioration in status nor prevent them from being able to achieve good ecological status in the future; AND
- 2) it contributes to the objectives and targets within the Local Biodiversity Action Plan relating to the freshwater environment; AND
- 3) when required, it includes the creation, enhancement and management of new habitats; AND
- 4) it has been demonstrated that both during construction and after completion:
- i) it would not adversely affect water quality or flows in adjacent watercourses or areas downstream; AND
- ii) adequate buffer strips have been provided adjacent to water bodies, so that they can be accessed and maintained all year round.

All aquatic engineering works must be accompanied by a technical report prepared by a suitably qualified individual. When required, the applicant must also produce a construction method statement to demonstrate compliance with criterion 4.

Where development is allowed, the applicant is encouraged to improve the ecological status of water bodies whenever possible, particularly where a water body is currently at less than good ecological status. This could be achieved through criteria 2), 3) and/or 4)(ii).

10.3.8 *Consultations*

Table 10.7 below provides a summary of the water environment related issues highlighted during the consultation exercise completed for this ES, full details of all responses received can be found in Chapter 3- Scoping and Consultation and Appendix 3.1 – Consultation Responses.

Table 10.7 –Consultations

Consultee	Consultee Response Summary
SEPA	**Flood Risk** – Flooding has been previously recorded by SEPA in the area affected by the Scheme. SEPA encouraged the undertaking of a Flood Risk Assessment (FRA), and also expressed concern at the possibility of areas of floodplain being cut off, increasing the risk of flooding. Their opinion is that the development within the functional floodplain should be avoided. If this is not possible, SEPA require detailed assessment of the potential impacts of the Scheme, along with detailed information on proposed mitigation measures. Upon receiving the preliminary modelling results on the impact of the Scheme during its operation, SEPA have requested that compensatory flood storage be provided to counter-act the potential effects of the Scheme on the River Urie flooding regime. **Surface Water Drainage** – Treatment of surface water by sustainable drainage systems (SUDS) is a legal requirement for most forms of development. Adequate space to accommodate SUDS must be provided in the site layout. Two levels of SUDS would be required for this development, and particular care is needed if any SUDS elements are positioned in the functional flood plain. Refer to the SUDS manual or SEPA website.

Consultee	Consultee Response Summary
	Construction phase – all aspects of site work that might impact upon the environment should be identified, along with any preventative measures and mitigation. A draft Schedule of Mitigation should be produced. SEPA recommend using a Construction Environmental Management Document to achieve this. **Water Framework Directive** – SEPA consider that the proposed design is unlikely to adversely affect the "Good" status of the River Urie, but warn that the construction process may do so if not managed properly. **Sewerage functions** – Care must be taken to ensure that private drainage elements or water supply features are not adversely affected by the development. **Controlled Activities Regulations** – A CAR engineering licence would be required for the road embankment. No formal authorisation under CAR will be required for the culvert extension.
SNH	SNH did not have anything to add to the comments they had made during the scoping report stage.
Aberdeenshire Council	In regards to flood risk, Aberdeenshire Council have advised that the 1:200yr plus climate change event should be investigated for design requirements.
Don District Salmon Fishery Board	The board note that the Scheme is unlikely to have an adverse effect on the River Urie and fish stocks in it. The Board has provided a copy of the Board's code of conduct relating to works in or close to watercourses, which should be taken account of in regard to potential mitigation measures.

10.4 Predicted Impacts (pre-mitigation)

As a result of the consultations, site visits and desktop studies, the issues requiring consideration in this assessment were identified as being those in Table 10.8 below. The range of potential effects expected, their magnitude and the overall significance based on the sensitivity of the receptor are set out in the following sections. The effects are split into construction and operation stage effects.

Table 10.8 – Predicted Impacts

General Issue	Specific Issues	Receptor/s
Surface Water Quality	Sediment mobilisation and spillage or discharge of other pollutants into watercourses (Construction Phase)	River Urie, Unnamed Watercourses, Quarry / Seasonal Pond
	Discharge of road run off to watercourses (Operational Phase)	River Urie
	Other road and infrastructure maintenance (Operational Phase)	River Urie, Unnamed Watercourses, Quarry / Seasonal Pond
Flooding	Flood risk to surrounding land from development (Construction Phase)	Surrounding land & infrastructure
	Flood Risk to surrounding land from development (Operational Phase)	Surrounding land & infrastructure
Geomorphology and Hydrology	Alteration of water bodies (Construction Phase)	River Urie, Unnamed Watercourses, & Quarry / Seasonal Pond
	Alteration of water bodies (Operational Phase)	River Urie, Unnamed Watercourses, & Quarry / Seasonal Pond

General Issue	Specific Issues	Receptor/s
	Alteration to land drainage patterns (Construction and Operation Phase)	River Urie, Unnamed Watercourses, Quarry / Seasonal Pond
	Alteration to hydrology of water bodies (Operational Phase)	River Urie, Unnamed Watercourses, Quarry / Seasonal Pond
Groundwater	Disturbance of groundwater movement (Construction Phase)	Groundwater within the study area
	Contamination of groundwater (Construction Phase)	Groundwater within the study area
	Disturbance of groundwater movement from the new road (Operational Phase)	Groundwater within the study area
	Contamination of groundwater (Operational Phase)	Groundwater within the study area

10.4.1 ***Construction Stage***

Surface Water Quality

The following assessment, Table 10.9, considers the potential for sediment release and spillage / discharge of pollutants (e.g. oils, fuels, chemicals) to surrounding waters during the construction phase, and the potential impacts that such a release may have on surface water quality.

Table 10.9 – Surface Water Quality Predicted Impact Assessment (Construction)

Receptor(s)	River Urie, Unnamed Watercourses, & Quarry / Seasonal Pond
Relevant Scheme Information	The proposals involve significant earth / rock moving activities during construction to form the new road embankment to the north of the railway line. The toe of the road embankment will come as close as 30m to the River Urie at its nearest point, but there may be a construction access strip required alongside the toe of the embankment bringing the works area closer to the River Urie. This presents a risk of surface water runoff eroding bare slopes or material stockpiles and soils being disturbed by heavy machinery, which can lead to increased suspended solids in watercourses. The proposals also involve minor works in and next to Unnamed Watercourse 1, in particular for the extension of the existing culvert. The construction phase generally presents the potential for fuels, oils, and other chemicals to be spilled via an accident, improper usage, or poor storage. These could reach the receptors directly via discharge of polluted run off or via seepage into the shallow groundwater. Construction workforce sewage and washing effluent should be contained and taken offsite. Based on the adoption of appropriate storage and pumping to a road tanker the risk of spillage to watercourses is considered to be negligible and this potential impact is therefore not considered further.
Sensitivity of Receptor(s) & their attributes (see baseline section)	**River Urie** **Overall Sensitivity - High** **Sensitivity of Individual Attributes** Water Supply / Quality – High; Dilution & Removal of Waste Products – Low; Recreation – High; Value to Economy – Medium; Conveyance of Flow – High; Biodiversity – High **Unnamed Watercourse 1 and 2** **Overall Sensitivity - Medium** **Sensitivity of Individual Attributes** Water Supply / Quality – High; Dilution & Removal of Waste Products – Low; Recreation – Low; Value to Economy – Medium; Conveyance of Flow – Low; Biodiversity – Medium **Quarry / Seasonal Pond**

	Overall Sensitivity - Low **Sensitivity of Individual Attributes** Water Supply / Quality – Low; Dilution & Removal of Waste Products – Low; Recreation – Low; Value to Economy – Low; Biodiversity – Low
Magnitude (and Type) of Effect	**Overall Magnitude of Effect - Slight Adverse** (direct impact on reach (River Urie and Unnamed Watercourse 1) adjacent to road embankment works, where culvert crossing will be extended, and reach of River Urie downstream of the site, temporary) – the proposals include the creation of a significant earth embankment in close proximity to the River Urie and this introduces a potential source of sediment, which could be disturbed by surface water run off and the use of heavy machinery and migrate into the watercourses. There is also the potential for spillages and leakages (e.g. oil, fuel, etc.) directly or indirectly into the watercourses from site stores and plant. Refer to section 6.9.5 of the Chapter 6 - Nature Conservation for potential impacts on water habitats from surface water quality – predicted at server to moderate adverse but unlikely to occur (pre-mitigation)) There is not expected to be any impact on the Quarry / Seasonal pond during the construction phase as it is elevated well above the site and runoff from the development site would be unable to reach this location. Neither is there expected to be any impact on Unnamed Watercourse 2, as this is on the opposite bank from the works. Therefore no assessment of potential effects on attributes required. **Magnitude of Effect on Individual Attributes (River Urie and Unnamed Watercourse 1)** Water Supply / Quality – Slight Adverse (direct impact on reach (River Urie and Unnamed Watercourse 1) due to the potential for spillages & sediment release Dilution & Removal of Waste Products – Slight Adverse (direct, local to downstream reach of each construction stage outfall, & temporary) Recreation – Slight Adverse (direct impact on reach (River Urie and Unnamed Watercourse 1, & temporary) due to potential effects on water quality and therefore local fishery. Value to Economy – Slight Adverse (direct impact on reach (River Urie and Unnamed Watercourse 1, & temporary) due to potential effects on local fishery noted above. Conveyance of Flow – Not applicable to this assessment Biodiversity - Slight Adverse (direct impact on reach (River Urie and Unnamed Watercourse 1, & temporary) due to potential effects on water quality
Overall Significance	**Overall Significance of Effect - Minor Adverse** for River Urie **Significance of Effect on Individual Attributes** Water Supply / Quality – Minor Adverse; Dilution & Removal of Waste Products – Negligible Adverse; Recreation – Minor Adverse; Value to Economy – Minor Adverse; Conveyance of Flow – Not applicable to this assessment; Biodiversity – Minor Adverse **Overall Significance of Effect - Minor Adverse** for Unnamed Watercourse 1 **Significance of Effect on Individual Attributes** Water Supply / Quality – Minor Adverse; Dilution & Removal of Waste Products – Negligible Adverse; Recreation – Negligible Adverse; Value to Economy – Minor Adverse; Conveyance of Flow – No effects; Biodiversity – Minor Adverse

Flooding

This part of the assessment, Table 10.10, considers whether or not the construction activities could affect the level of flood risk to surrounding land and infrastructure.

Table 10.10 – Flooding Predicted Impact Assessment (Construction)

Receptor(s)	Floodplain including surrounding land and infrastructure located adjacent to the River Urie, including areas upstream and downstream and on the adjacent bank

Relevant Scheme Information	During construction there will be pre-loading and embankment formation works close to and within the 1:200year flood extents of the River Urie, and works within the channel of Unnamed Watercourse 1 to extend the existing culvert. Additionally plant and machinery will move through the floodplain between the development site and the River Urie. At this stage it is assumed that the construction works would not take up any more space on the flood plain than the final embankment profile. The construction of the culvert on Unnamed Watercourse 1 will involve excavation of the channel and installation of a pipe or half barrel culvert. This may involve a temporary bypass channel over 35m or so to allow the culvert to be formed in the dry. It is anticipated that the final culvert will be installed at the outset of the construction works to allow free access for construction plant over this small watercourse. There are various properties (residential and non-residential) in the vicinity of the Scheme and adjacent to the River Urie, which may be affected by changes to the flooding regime.
Sensitivity of Receptor(s) and Attribute	Rural land in an open flood plain is considered as having a **Low** sensitivity to increased flood risk, but residential and industrial properties within and adjacent to the flood plain are considered as having a **High** sensitivity to increased flood risk.
Magnitude (and Type) of Effect	**Slight Adverse** (direct, local to and downstream of the Scheme, temporal i.e. during storm events only) for the River Urie. The FRA Report assesses the effect of the Scheme during its operation; however it is anticipated that the effects on the River Urie flooding regime would be very similar during its construction since the footprint and associated earthworks would be very similar and there would be no works on the River itself. At this stage there are no designated stockpiling areas for the Scheme which would have the potential to remove flood storage within the River Urie floodplain, therefore the effects during construction are considered (at this stage) to be the same as during its operation, i.e. with the construction works having the potential to affect floodplain flow conveyance. Table 10.16 outlines the effects of the Scheme during its operation in which the same conclusions can be drawn for the Scheme during its construction. **Slight Adverse (**direct, localised only to Scheme, temporal i.e. during storm events only) for Unnamed Watercourse 1. Similarly to the Rive Urie, the construction effects of the Scheme on the flooding regime will likely be very similar to the operational effects (Table 10.16). The FRA Report assesses that there is an existing flood risk to the low lying section of the A96 and surrounding land, and the geometrical changes introduced by the Scheme may act force this floodwater to spill south-eastwards along the southern edge of the proposed road and to then verge and overtop the Scheme at the low point in the proposed A96 and into the field to the north. Given the likely similarity during construction, these conclusions from the FRA Report can be adopted. It is noted however that the Scheme may impact on the existing flooding regime differently during the construction phase since the culvert extension works on the channel downstream of the A96 may temporarily reduce channel capacity. This may have an increased impact during construction by causing direct out-of-bank flooding from Unnamed Watercourse 1 or may affect the flow efficiency of the existing A96 Culvert.
Overall Significance	**Minor Adverse** for River Urie and Unnamed Watercourse 1 **No Effect** for Unnamed Watercourse 2 and Quarry / Seasonal Pond

Geomorphology & Hydrology

This assessment, Table 10.11, considers the potential effects of the construction works on the structure of the bed and bank of affected watercourses, the flow conveyance of affected watercourses, and the movement of run off towards watercourses and other surface water features.

Table 10.11 – Geomorphology & Hydrology Predicted Impact Assessment (Construction)

Receptor(s)	River Urie, Unnamed Watercourses, & Quarry / Seasonal Pond
Relevant Scheme Information	Geomorphology – during construction there will be localised disturbance to the channel of Unnamed Watercourse 1 to replace the existing culvert under the farm access track and extend it (total new culvert length approx. 35m) to accommodate the crossing of the proposed Scheme. The construction of the Scheme is not anticipated to involve any works within the River Urie channel or within approx. 20m of the bank top, and therefore no changes to the structure of its bed and bank are expected. There is not expected to be any works near Unnamed Watercourse 2 or the Quarry / Seasonal Pond that would affect their geomorphology. Hydrology – during construction there may be localised effects on the passage of flows down Unnamed Watercourse 1 due to the construction of the new culvert including the potential use of a temporary bypass channel. There is not anticipated to be any affect on the passage of normal in bank flows down the River Urie or Unnamed Watercourse 2, as no construction works are anticipated in these watercourses. The Quarry / Seasonal Pond is significantly upslope of the construction works and therefore run off into and out of this feature will not be affected. The formation of the new road embankment will separate a small part of the River Urie catchment (the area between the railway and the new road embankment) over a length of around 700m from the River Urie.
Sensitivity of Receptor(s) & their attributes (see baseline section)	**River Urie** **Overall Sensitivity - High** **Sensitivity of Individual Attributes** Water Supply / Quality – High; Dilution & Removal of Waste Products – Low; Recreation – High; Value to Economy – Medium; Conveyance of Flow – High; Biodiversity – High **Unnamed Watercourse 1 and 2** **Overall Sensitivity - Medium** **Sensitivity of Individual Attributes** Water Supply / Quality – High; Dilution & Removal of Waste Products – Low; Recreation – Low; Value to Economy – Medium; Conveyance of Flow – Low; Biodiversity – Medium **Quarry / Seasonal Pond** **Overall Sensitivity - Low** **Sensitivity of Individual Attributes** Water Supply / Quality – Low; Dilution & Removal of Waste Products – Low; Recreation – Low; Value to Economy – Low; Biodiversity – Low
Magnitude (and Type) of Effect	**Overall Magnitude of Effect** Geomorphology – **Moderate Adverse** (direct, localised, and temporary) for Unnamed Watercourse 1 as around 35m of this feature will be subject to direct disturbance of the bed and banks. **No Effects** for the River Urie, Unnamed Watercourse 2, or the Quarry / Seasonal Pond as there is not expected be any disturbance to the form of these features. Therefore no assessment of potential effects on the attributes of these features is required. Hydrology – **Moderate Adverse** (direct, localised, and temporary) for Unnamed Watercourse 1 as the passage of flows will be altered during the works. **Negligible Adverse** (indirect, highly localised, and temporary) for the River Urie as surface water run off patterns over a short reach will be affected, but the catchment area concerned is around 0.014km^2 in the context of an overall catchment of around 200km^2 and is therefore unlikely to give rise to any significant effect on flows reaching the watercourse. **No effects** on Unnamed Watercourse 2 or the Quarry / Seasonal Pond, since these are hydrologically separated from the works. Therefore no assessment of potential effects on the attributes of these features is required. **Magnitude of Effect on Individual Attributes (Unnamed Watercourse 1)** Geomorphology Water Supply / Quality – Slight Adverse (direct, localised, and temporary) since changes introduced by culvert extension may result in sediment release Dilution & Removal of Waste Products – Slight Adverse (direct, localised, and

	temporary) since changes introduced by culvert extension works could affect existing discharges Recreation – Moderate Adverse (direct, localised, and temporary) since a reach of the watercourse banks and channel (35m) will be affected by the culvert extension works Value to Economy – Moderate Adverse (direct, localised, and temporary) since a small of the watercourse banks and channels (35m) will be lost due to the culvert extension works Conveyance of Flow – Moderate Adverse (direct, localised, and temporary) since the culverting works will alter the conveyance of flow in the watercourse. Biodiversity – Moderate Adverse (direct, localised, and temporary) since changes will disrupt channel and banks which supports aquatic life along this reach <u>Hydrology</u> Water Supply / Quality – Slight Adverse (direct, localised, and temporary) since changes introduced by culvert extension may result in sediment release Dilution & Removal of Waste Products – Slight Adverse (direct, localised, and temporary) since changes introduced by culvert extension works could affect existing discharges Recreation – Moderate Adverse (direct, localised, and temporary) since the flows in the watercourse will be temporarily altered during the works for the culvert extension Value to Economy – Moderate Adverse (direct, localised, and temporary) since the flows in the watercourse will be temporarily altered during the works for the culvert extension Conveyance of Flow – Moderate Adverse (direct, localised, and temporary) since the culvert extension works will alter the conveyance of flow in the watercourse Biodiversity – Moderate Adverse (direct, localised, and temporary) since the works will temporarily alter flows in the watercourse **Magnitude of Effect on Individual Attributes (River Urie)** <u>Hydrology</u> Water Supply / Quality – Negligible Adverse (indirect, highly localised, and temporary) since minor changes to surface water run off patterns Dilution & Removal of Waste Products – Negligible Adverse (indirect, highly localised, and temporary) since minor changes to surface water run off patterns Recreation – Negligible Adverse (indirect, highly localised, and temporary) since minor changes to surface water run off patterns Value to Economy – Negligible Adverse (indirect, highly localised, and temporary) since minor changes to surface water run off patterns Conveyance of Flow – Negligible Adverse (indirect, highly localised, and temporary) since minor changes to surface water run off patterns Biodiversity – Negligible Adverse (indirect, highly localised, and temporary) since minor changes to surface water run off patterns
Overall Significance	**<u>Geomorphology</u>** **Overall Significance of Effect - Minor Adverse for Unnamed Watercourse 1** **Significance of Effect on Individual Attributes** Water Supply / Quality – Minor Adverse; Dilution & Removal of Waste Products – Negligible Adverse; Recreation – Minor Adverse; Value to Economy – Minor Adverse; Conveyance of Flow – Minor Adverse; Biodiversity – Minor Adverse **No Effect** for the River Urie, Unnamed Watercourse 2, and the Quarry / Seasonal Pond. **<u>Hydrology</u>** **Overall Significance of Effect - Minor Adverse for Unnamed Watercourse 1** **Significance of Effect on Individual Attributes** Water Supply / Quality – Minor Adverse; Dilution & Removal of Waste Products – Negligible Adverse; Recreation – Minor Adverse; Value to Economy – Minor Adverse; Conveyance of Flow – Minor Adverse; Biodiversity – Minor Adverse **Overall Significance of Effect - Negligible Adverse for the River Urie** **Significance of Effect on Individual Attributes**

	Water Supply / Quality – Negligible Adverse; Dilution & Removal of Waste Products – Negligible Adverse; Recreation – Negligible Adverse; Value to Economy – Negligible Adverse; Conveyance of Flow – Negligible Adverse; Biodiversity – Negligible Adverse **No Effect** for Unnamed Watercourse 2 and the Quarry / Seasonal Pond.

Groundwater

This assessment, Table 10.12, considers the potential effects of the construction works on the **movement** of the groundwater.

Table 10.12 – Groundwater Movement Predicted Impact Assessment (Construction)

Receptor(s)	Groundwater
Relevant Scheme Information	The main works with a potential impact on the movement of groundwater are: - 1) The slight cuttings between chainage 0 – 100m & 600 – 900m may encounter some groundwater. The main section of cutting between chainage 600 – 900m the ground water levels recorded are around 4 - 5m below the surface at these locations and the road cutting is only proposed on the south side of the road to a depth of around 1.5 - 2m, so it appears unlikely that the small amount of cut proposed will go into the groundwater surface, 2) The presence of the road embankment may serve to compact the underlying superficial deposits and potentially alter groundwater movement in these layers. In this regard it is noted that the groundwater surface appears to generally lie within the superficial deposits (i.e. above rock head), 3) Localised foundations for the bridge over the railway, which may intrude into the groundwater zone (no details of the proposed foundations are available at this stage).
Sensitivity of Receptor & attributes	**Overall Sensitivity - Medium** **Sensitivity of Individual Attributes** Water Supply / Quality – Medium; Soak-away – Low; Vulnerability – Medium; Economic value – Low; Conveyance of Flow – Medium; Biodiversity - Medium
Magnitude (and Type) of Effect	**Overall Magnitude of Effect - Slight Adverse** (direct, localised, and temporary) – the areas of cut look likely to stay above the ground water surface and therefore should not impede groundwater movement across these relatively short lengths. The localised foundations for the bridge over the railway are unlikely to present a significant obstruction to ground water movement as they are a relatively isolated feature. The progressing road embankment construction is likely to slightly compact the underlying superficial deposits (mainly sands and gravels), and given the groundwater surface appears to sit within the drift deposits this may affect groundwater movement in the drift deposits over a length of around 1000m. However, immediately up gradient of the road embankment is the existing A96, the existing railway embankment, and the old railway embankment, all of which are linear features on the same alignment as the proposed road embankment. These existing features will already influence the groundwater regime in the drift deposits, and may restrict the “natural” movement of groundwater towards the River Urie over the length of the study area in any case. It is therefore considered that the addition of the new road embankment downslope of these features will not introduce a significant new obstruction to groundwater movement, and the length affected (1km) is relatively small in the context of overall groundwater movement towards the River Urie channel. **Magnitude of Effect on Individual Attributes** Water Supply / Quality – Slight Adverse (direct, localised to length of Scheme, and temporary) as works may effect shallow groundwater movement Soak-away – No effects, as no known existing discharges to the ground Vulnerability – Slight Adverse (direct, localised to length of Scheme, & temporary) as works may effect shallow groundwater movement Economic value – Slight Adverse (direct, localised to length of Scheme, &

	temporary) as there a number of water supply boreholes in the study area Conveyance of Flow – Slight Adverse (direct, localised to length of the Scheme, and temporary) as works may effect shallow groundwater as noted above Biodiversity – Slight Adverse (indirect, localised to length of Scheme, and temporary) since flow to groundwater supported habitats may be affected
Overall Significance	**Overall Significance of Effect - Minor Adverse for groundwater movement** **Significance of Effect on Individual Attributes** Water Supply / Quality – Minor Adverse; Soakaway – No Effects; Vulnerability – Minor Adverse; Economic Value – Negligible Adverse; Conveyance of Flow – Minor Adverse; Biodiversity – Minor Adverse

This assessment, Table 10.13, considers the potential effects of the construction works on the **quality** of the groundwater.

Table 10.13 – Groundwater Quality Predicted Impact Assessment (Construction)

Receptor(s)	Groundwater
Relevant Scheme Information	The construction work will likely involve earth moving plant, rock breaking plant, road surfacing plant, generators, and other construction machinery. This introduces a risk of spillage of fuels, oils, concrete, and other chemicals, which can seep into the shallow groundwater within the drift deposits. The project will also require at least one major construction compound, providing welfare facilities for the Contractor, and these are likely to retain a store of fuels, oils, and other chemicals.
Sensitivity of Receptor & attributes	**Overall Sensitivity - Medium** **Sensitivity of Individual Attributes** Water Supply / Quality – Medium; Soak-away – Low; Vulnerability – Medium; Economic value – Low; Conveyance of Flow – Medium; Biodiversity - Medium
Magnitude (and Type) of Effect	**Overall Magnitude of Effect - Slight Adverse** (indirect, localised to development site, temporary) – based on the potential for significant quantities of contaminants being released into the shallow groundwater through spillage or poor site controls. **Magnitude of Effect on Individual Attributes** Water Supply / Quality – Slight Adverse (direct, localised to length of Scheme, and temporary) due to potential for construction stage contaminants Soak-away – No effects, as no known existing discharges to the ground Vulnerability – Slight Adverse (direct, localised to length of Scheme, & temporary) due to potential for construction stage contaminants Economic value – Slight Adverse (direct, localised to length of Scheme, & temporary) due to a number of private water supply boreholes in the study area Conveyance of Flow – Not applicable to this assessment Biodiversity – Slight Adverse (indirect, localised to length of Scheme, and temporary) since groundwater supported habitats could be affected
Overall Significance	**Overall Significance of Effect - Minor Adverse for groundwater quality** **Significance of Effect on Individual Attributes** Water Supply / Quality – Minor Adverse; Soakaway – No Effects; Vulnerability – Minor Adverse; Economic Value – Negligible Adverse; Conveyance of Flow – Not applicable to this assessment; Biodiversity – Minor Adverse

10.4.2 ***Operational Stage***

Surface Water Quality

Discharge of Road Run Off

At this stage it is proposed that the new road drainage will drain through two levels of SUDS provisions, as required by SEPA in their consultation response, to a single outfall into the River Urie (refer to Section 10.1.4 for further details).

The main contaminants that can be carried into the watercourses from road run-off include suspended solids (including grit, mud, & metal particles), copper and zinc (from deterioration

of vehicles), organic materials and hydrocarbons (such as rubber, bitumen, grease, oil and fuel), and salt.

DMRB Volume 11, Section 3, Part 10, HD 45/09 provides a number of assessment methods to gauge the potential impact of run-off from roads on the water environment. HD 45/09 also provides guidance on suitable mitigation measures that can be applied when the above assessments indicate a risk of pollution to the water environment.

Assessment of Potential Impacts of Routine Run Off

With regard to the potential contamination from discharge of routine road run off into a watercourse, HD 45/09 requires that a "Simple Assessment" be made initially to determine whether the watercourse is at risk of pollution and if pollution mitigation measures are needed in specific circumstances. Highways Agency Water Risk Assessment Tool (HAWRAT), a excel worksheet has been developed for this "Simple Assessment". This assessment involves determining toxicity thresholds by first examining the run off quality based on the predicted AADT and the climatic region. The second stage involves entering data on the flow within the watercourse, the permeable area draining to the watercourse, and the impermeable area of road drainage to the outfall. The results are assessed on a pass / fail basis against the soluble toxicity and sediment toxicity content. Step 3 of the assessment includes assessing the effectiveness of pollution control measures to mitigate unacceptable risk (full details of the methodology are within HA 45/09).

If this "Simple Assessment" puts a watercourse in the "pass" category then no further assessment is required.

Based on the road layout and outline drainage design provided the "Method A" Simple Assessment calculations have been undertaken. Two sets of calculations were undertaken, one assuming the whole road drain to a single outfall, and the other based on the latest drainage design showing two separate outfalls. The daily volume of flow (at low flow conditions (Q95)) in the River Urie has been estimated using information from the National River Flow Archive (NRFA) as 0.94m^3/s. The 24hour peak Two Way AADT in 2011 on the A96 at Inveramsay Bridge is approximately 9,180 vehicles. This falls into the lowest assessment traffic band of between 10,000 and 50,000. No growth factor has been considered, as it is very unlikely that any traffic growth would move the AADT into the next band (i.e. Two Way AADT above 50,000 vehicles).

Using "Method A" calculations both of the above scenarios showed a "Pass" of soluble toxicity thresholds and flagged an Alert for the protected area in regard to sediment deposition from routine run off for the River Urie on the basis that the River Urie is a Freshwater Fish protected area. According to the guidance in HD 45/09 this alert does not constitute a failure, but merely indicates to the assessor that further consideration of potential sediment impacts may be required depending on the downstream receptor. Further consideration of this issue is given in the mitigation section. Therefore, a detailed assessment using "Method B" was not required. A copy of the Method A calculations are included within Appendix 10.1 – Road Drainage the Water Environment Calculations.

De-icing salts will commonly be used on roads between the months from November to March. It is noted that the concurrent flows in watercourses are relatively high during these months, and therefore the salts would be subject to reasonable dilution and dispersion on entering a watercourse. From PPG 10 (Pollution Prevention Guidelines) it is noted that the "…use of salt on highways is unlikely to lead to levels in the water environment that could affect aquatic life or drinking water supplies". There is no specific assessment within the Advice Note for the potential impacts of de-icing salts on watercourses.

Assessment of Potential Impacts from Spillages

With regard to the potential contamination of the watercourses from an accidental spillage on the revised section of the A96, HD45/09 requires an "Assessment of Pollution Impacts from Accidental Spillages" to be undertaken. This involves consideration of the probability of a spillage accident with an associated risk of serious pollution occurring. HD 45/09 states that watercourses should be protected such that the risk of a serious pollution incident has an annual probability less than 1%.

The assessment method was followed based on the proposed surface water drainage arrangements (refer to Section 10.1.4). The annual probability of a spillage incident was calculated to be 0.023%, which is significantly less than 1% and therefore no additional protection measures are required (a copy of the Method D calculations are included within Appendix 10.1 – Road Drainage and the Water Environment Calculations).

Based on the above assessments the following summary of the effects on surface water quality has been derived, see Table 10.14.

Table 10.14 – Surface Water Quality (Road Run-off) Predicted Impact Assessment (Operation)

Receptor(s)	River Urie (assuming road drainage discharges are only to River Urie)
Relevant Scheme Information	The Scheme will introduce a more formal road drainage arrangement than is currently present on the existing section of the A96 which is to be replaced. Based on the latest available drainage design for the Scheme (refer to Figure 10.2 – Drainage Proposals and Flood Storage Compensation and Appendix 10.2 – Flood Risk Assessment), this will comprise of two levels of SuDS treatment (road edge filter drains and two detention basins/swales) to treat and attenuate runoff from the proposed road.
Sensitivity of Receptor & attributes	**Overall Sensitivity - High** (River Urie) **Sensitivity of Individual Attributes** Water Supply / Quality – High; Dilution & Removal of Waste Products – Low; Recreation – High; Value to Economy – Medium; Conveyance of Flow – High; Biodiversity - High
Magnitude (and Type) of Effect	**Overall Magnitude of Effect - Slight Adverse** (direct, local to downstream reach of watercourse, permanent) see Table A4.4 of HA 45/09 - in this case no risk has been identified by HAWRAT for a single outfall (Method A). Predicted Copper and Zinc levels are within the EQS limits, and spillage risk is considerably less than 0.5%. However, the HAWRAT method highlights an alert under sediment impacts due to the presence of a protected area. However, it is noted that the sediment is not judged to be accumulating from a Tier 2 assessment, and is not therefore thought to be of particular concern. (Refer to section 6.8.20 of the Chapter 6 - Nature Conservation for potential impacts on water habitats from surface water quality – predicted at severe to moderate adverse but unlikely to occur (pre-mitigation)). Multiple outfall analyses were also undertaken using the HAWRAT method of the two proposed outfalls and this also predicted Copper and Zinc levels would fall within the EQS limits, although an alert was similarly predicted as the single outfall assessment, in regards to thee presence of a protected zone. **Magnitude of Effect on Individual Attributes** Water Supply / Quality – Slight Adverse (direct, local to downstream reach of each outfall, & permanent) due to result of HAWRAT assessment noted above. Dilution & Removal of Waste Products – Slight Adverse (direct, local to downstream reach of each outfall, & permanent) due to result of proposed surface water drainage discharges. Recreation – Slight Adverse (direct, local to downstream reach of each outfall, & permanent) due to potential effects on water quality and therefore local fishery. Value to Economy – Slight Adverse (direct, local to downstream reach of each outfall, & permanent) due to potential effects on local fishery noted above. Conveyance of Flow – Negligible Adverse (direct, local to each outfall location, & permanent) due to very minor flow inputs from surface water drainage outfalls. Biodiversity - Slight Adverse (direct, local to downstream reach of each outfall, & permanent) due to potential effects on water quality
Overall	**Overall Significance of Effect - Minor Adverse** for River Urie

Significance	**Magnitude of Effect on Individual Attributes** Water Supply / Quality – Minor Adverse; Dilution & Removal of Waste Products – Negligible Adverse; Recreation – Minor Adverse; Value to Economy – Minor Adverse; Conveyance of Flow – Negligible Adverse; Biodiversity – Minor Adverse

Other road and infrastructure maintenance

This assessment, Table 10.15, considers whether the maintenance of the road, drainage infrastructure, and soft landscaping is likely to have any effect on the water quality of the surrounding water bodies. There is no specific guidance within DMRB HA 45/09 on assessing the potential impacts from this source of pollution.

Table 10.15 – Surface Water Quality (Maintenance) Predicted Impact Assessment (Operation)

Receptor(s)	River Urie, Unnamed Watercourses 1 & 2, & Quarry / Seasonal Pond
Relevant Scheme Information	During the operation of the Scheme the principal maintenance activities are likely to be road pavement maintenance (anticipated to be minimal during first 10years), clearing debris from the culverts (possibly annual), cleaning of the road drainage systems (e.g. filter drains, SUDS pond/swale, etc.) (possibly annual), maintenance of roadside verges (e.g. clearing debris, removing invasive species, etc), etc. There will be a moderate increase in the area of carriageway and embankments to be maintained compared to the existing situation, as the existing road is to remain in place as a local access road.
Sensitivity of Receptor(s) & their attributes (see baseline section)	**River Urie** **Overall Sensitivity - High** **Sensitivity of Individual Attributes** Water Supply / Quality – High; Dilution & Removal of Waste Products – Low; Recreation – High; Value to Economy – Medium; Conveyance of Flow – High; Biodiversity – High **Unnamed Watercourse 1 and 2** **Overall Sensitivity - Medium** **Sensitivity of Individual Attributes** Water Supply / Quality – High; Dilution & Removal of Waste Products – Low; Recreation – Low; Value to Economy – Medium; Conveyance of Flow – Low; Biodiversity – Medium **Quarry / Seasonal Pond** **Overall Sensitivity - Low** **Sensitivity of Individual Attributes** Water Supply / Quality – Low; Dilution & Removal of Waste Products – Low; Recreation – Low; Value to Economy – Low; Biodiversity – Low
Magnitude (and Type) of Effect	**Overall Magnitude of Effect – Slight Adverse** (direct, localised, & temporal) for the River Urie and Unnamed Watercourse 1 – clearing of debris from the extended culvert is likely to cause only minor disturbance at the entrance and exit of the culvert and the vehicles / plant are assumed to work from the road with the appropriate traffic control measures in place or from the adjacent farm access track. This presents little change from the existing situation, as in theory the existing culvert would need to have been maintained in a similar manner. In terms of the Controlled Activities Regulations such work falls under the General Binding Rules category, which is for activities considered to have a low risk to the water environment. Repair of road infrastructure may involve repainting of bridge parapets or use of other potentially polluting materials and this presents a risk of materials entering watercourses via the road drainage system through spillages or improper use. Although it is noted that none of this sort of work should take place over or immediately adjacent to the receptors under consideration. It is understood that the landscape design for the road verges is to replant with native grass and therefore there is not expected to be any significant ongoing requirement for the use of herbicides to maintain these areas. Maintenance to road drainage systems (e.g. cleaning drains, removal of sediment from SUDS pond/swale, etc.) is expected to have a minimal impact on the water resources features, as material would be flushed towards the two SUDS ponds/swales and controlled at that point prior to discharge into a

	watercourse (TBC based on drainage design). **No Effect** for Unnamed Watercourse 2 or the Quarry / Seasonal Pond, as these features are hydrologically separated from any run off from the road and its embankments. Therefore no assessment of potential effects on attributes required. **Magnitude of Effect on Individual Attributes (River Urie and Unnamed Watercourse 1)** Water Supply / Quality – Slight Adverse (direct, local to downstream reach of each outfall, & temporal) due to potential for release of contaminants Dilution & Removal of Waste Products – Slight Adverse (direct, local to downstream reach of each outfall, & temporal) due to potential for release of contaminants Recreation – Slight Adverse (direct, local to downstream reach of each outfall, & temporal) due to potential effects of maintenance on water quality and therefore local fishery. Value to Economy – Slight Adverse (direct, local to downstream reach of each outfall, & temporal) due to potential effects of maintenance on local fishery noted above. Conveyance of Flow – Negligible Adverse (direct, local to each outfall location, & temporal) due to due to potential blockages during works Biodiversity - Slight Adverse (direct, local to downstream reach of each outfall, & permanent) due to potential effects on water quality
Overall Significance	**Overall Significance of Effect - Minor Adverse for River Urie** **Magnitude of Effect on Individual Attributes** Water Supply / Quality – Minor Adverse; Dilution & Removal of Waste Products – Negligible Adverse; Recreation – Minor Adverse; Value to Economy – Minor Adverse; Conveyance of Flow – Negligible Adverse; Biodiversity – Minor Adverse **Overall Significance of Effect - Minor Adverse for Unnamed Watercourse 1** **Significance of Effect on Individual Attributes** Water Supply / Quality – Minor Adverse; Dilution & Removal of Waste Products – Negligible Adverse; Recreation – Negligible Adverse; Value to Economy – Minor Adverse; Conveyance of Flow – Negligible Adverse; Biodiversity – Minor Adverse **No Effect** for Unnamed Watercourse 2 and Quarry / Seasonal Pond

Flooding

This part of the assessment, Table 10.16, considers whether or not the proposed works would affect the flood risk within any identified floodplains.

Table 10.16 – Flooding Predicted Impact Assessment (Operation)

Receptor(s)	Floodplain including surrounding land and infrastructure located adjacent to the River Urie, including areas upstream and downstream and on the adjacent bank
Relevant Scheme Information	The completed Scheme will consist of the main road embankment and a vehicular farm access west of Unnamed Watercourse 1. The completed works will also involve the lengthening of the culvert on the channel of Unnamed Watercourse 1 and the discharge of surface water run off from the road into a surrounding watercourse. Note – the effects of road drainage on the hydrology of the Watercourses is separately considered in the assessment of Geomorphology and Hydrology below. Some parts of the proposed road embankment are potentially within the 1:200yr flood envelope shown on the SEPA Indicative River & Coastal Flood Map and therefore a separate Flood Risk Assessment (FRA) has been carried as requested by SEPA. The FRA (attached in Appendix 10.2 – Flood Risk Assessment) determines the baseline flooding extents at the development site and assesses the detriment associated with the Scheme on the flooding regime.

	There are various properties (residential and non-residential) in the vicinity of the Scheme and adjacent to the River Urie, which may be affected by changes to the flooding regime.
Sensitivity of Receptor(s) and Attribute	Rural land in an open flood plain is considered as having a **Low** sensitivity to increased flood risk, but residential and industrial properties within and adjacent to the flood plain are considered as having a **High** sensitivity to increased flood risk.
Magnitude (and Type) of Effect	**Slight Adverse** (direct, local to and downstream of the Scheme, temporal i.e. during storm events only) for the River Urie – the FRA (attached in Appendix 10.2 – Flood Risk Assessment) shows that the Scheme would have a slight effect on the River Urie flooding regime at the development site and upstream and downstream of the Scheme. The FRA shows that ch.350-650m and 900-1000m of the Scheme would encroach on the River Urie floodplain and remove some 4228m^3 of flood storage for the 1:200+CC design event. The FRA has assessed that this removal of storage may act to marginally increase flood levels within the modelled reach and may marginally increase flows in the watercourse at the downstream end of the modelled reach, therefore affecting the performance of the floodplain in conveying flows. The FRA also indicates that there would be no effect to Unnamed Watercourse 2 which feeds into the River Urie on the opposite bank at ch. 600m of the proposed Scheme. **Slight Adverse (**direct, localised only to Scheme, temporal i.e. during storm events only) for Unnamed Watercourse 1 – The FRA indicates that the removal of the Farm Track Culvert and extension of the A96 Culvert (which a larger culvert section) to accommodate the Scheme crossing would actually slightly reduce the flow overtopping onto the existing A96 and subsequently reduce the flood level on the existing A96 and surrounding land. However, the FRA indicates that the geometrical changes introduced by the Scheme would force floodwater to spill south-eastwards along the southern edge of the proposed road and overtop the Scheme at the low point in the proposed A96 and into the field to the north, Assuming standard best practice design, the extension to the culvert should be able to be carried out with no permanent effect on the passage of flows. With regard to the discharge of road run off, the designers should ensure that discharges from the system are in accordance with the guidance provided in CIRIA Report C697 for rates of run off (see further discussion on mitigation measures in Section 10.5.2). Without mitigation, the development would not comply with the requirements of SPP and Policy 4.8 of the Aberdeen City and Shire Structure Plan (2009), which requires that a development does not increase flood risk to land or property, since there is the potential for the Scheme to increase flows downstream in the River Urie and the Scheme would experience some flooding from Unnamed Watercourse 1.
Overall Significance	**Minor Adverse** for River Urie and Unnamed Watercourse 1 **No Effect** for Unnamed Watercourse 2 and Quarry / Seasonal Pond

Geomorphology & Hydrology

This assessment, Table 10.17, considers the potential effects of the proposed works on the structure of the bed and bank of affected water features.

Table 10.17 – Geomorphology Predicted Impact Assessment (Operation)

Receptor(s)	River Urie, Unnamed Watercourses, & Quarry / Seasonal Pond
Relevant Scheme Information	River Urie – the proposed Scheme does not involve any permanent intrusions into the River Urie channel and does not come within 30m of the river channel. The FRA Report indicates that the new road embankment does take up some space on the flood plain on the southern bank of the river. Unnamed Watercourse 1 – lengthening of an existing culvert by around 35m along existing channel alignment under the new road embankment.

	Unnamed Watercourse 2 – the proposed Scheme is all on the opposite bank from this watercourse and there will be no permanent intrusions into this watercourse. Quarry / Seasonal Pond – none of the permanent works for the proposed Scheme will come within 50m of this feature.
Sensitivity of Receptor(s) & Attributes	**River Urie** **Overall Sensitivity - High** **Sensitivity of Individual Attributes** Water Supply / Quality – High; Dilution & Removal of Waste Products – Low; Recreation – High; Value to Economy – Medium; Conveyance of Flow – High; Biodiversity – High **Unnamed Watercourse 1 and 2** **Overall Sensitivity - Medium** **Sensitivity of Individual Attributes** Water Supply / Quality – High; Dilution & Removal of Waste Products – Low; Recreation – Low; Value to Economy – Medium; Conveyance of Flow – Low; Biodiversity – Medium **Quarry / Seasonal Pond** **Overall Sensitivity - Low** **Sensitivity of Individual Attributes** Water Supply / Quality – Low; Dilution & Removal of Waste Products – Low; Recreation – Low; Value to Economy – Low; Biodiversity – Low
Magnitude (and Type) of Effect	**Overall Magnitude of Effect – Moderate Adverse** (direct, localised, and permanent) for Unnamed Watercourse 1 as around 35m of the bed and banks of this feature will be lost due to extension of the existing culvert. **Magnitude of Effect on Individual Attributes (Unnamed Watercourse 1)** Water Supply / Quality – Not applicable to this assessment Dilution & Removal of Waste Products – Negligible Adverse (direct, localised, & permanent) since geomorphological changes introduced by culvert extension could affect flow conveyance Recreation – Moderate Adverse (direct, localised, and permanent) since a reach of the watercourse banks and channel (35m) will be lost due to the culvert Value to Economy – Moderate Adverse (direct, localised, and permanent) since a reach of the watercourse banks and channel (35m) will be lost due to the culvert Conveyance of Flow – Moderate Adverse (direct, localised, and permanent) since the culverting works will alter the conveyance of flow in the watercourse Biodiversity – Moderate Adverse (direct, localised, and permanent) since changes will disrupt channel and banks which supports aquatic life along this reach **Overall Magnitude of Effect - Negligible Adverse** (temporal, i.e. during storm events only) on the River Urie since the Scheme will remove some floodplain storage and may have some effect on the floodplain flow regime. The FRA however indicates that since the Scheme alignment is on the peripheral extents of the floodplain and flow velocities are low, therefore the Scheme would likely have a negligible influence on effects within the floodplain. The FRA indicates that the proposed field access would cause some energy losses to flows moving eastwards on the floodplain and cause flood levels to increase marginally. It is however expected that this would have a negligible effect on River Urie out-of-bank geomorphological processes, i.e. in resulting in higher sedimentation. It is also noted that there are significant bends / meanders in the river channel that will continue to evolve gradually over time (based on no extensive erosion of river banks observed during site visit), and there appears to be sufficient space for these processes to continue unhindered by the proposed road embankment. **Magnitude of Effect on Individual Attributes (River Urie)** Water Supply / Quality – Not applicable to this assessment Dilution & Removal of Waste Products – Negligible Adverse (direct, localised, & permanent) since geomorphological changes could affect flow conveyance Recreation – Negligible Adverse (direct, localised, and permanent) since there will only be very minor changes to the accessibility of the reach Value to Economy – Negligible Adverse (direct, localised, and permanent) since there will only be very minor changes to the potential use of the river reach Conveyance of Flow – Slight Adverse (temporal, i.e. during storm events only)

	since the Scheme will remove some floodplain storage Biodiversity – Negligible Adverse (direct, localised, and permanent) since there will only be very minor changes to the floodplain and not the channel itself **No Effect** on Unnamed Watercourse 2, or the Quarry / Seasonal Pond as these features are not physically altered by the proposals, and the permanent works are a minimum of 50m from these features at the closest point. Therefore no assessment of potential effects on attributes required.
Overall Significance	**Overall Significance of Effect - Minor Adverse for Unnamed Watercourse 1** **Significance of Effect on Individual Attributes** Water Supply / Quality – Not applicable; Dilution & Removal of Waste Products – Negligible Adverse; Recreation – Minor Adverse; Value to Economy – Minor Adverse; Conveyance of Flow – Negligible Adverse; Biodiversity – Minor Adverse **Overall Significance of Effect – Negligible Adverse for River Urie** **Magnitude of Effect on Individual Attributes** Water Supply / Quality – Not applicable; Dilution & Removal of Waste Products – Negligible Adverse; Recreation – Negligible Adverse; Value to Economy – Negligible Adverse; Conveyance of Flow – Slight Adverse; Biodiversity – Negligible Adverse **No Effect** for Unnamed Watercourse 2, or Quarry / Seasonal Pond

This assessment, Table 10.18, considers the potential effects of the presence of the Scheme alignment on the natural surface drainage patterns of the surrounding land. Given the similarities in effects between construction and operational phases, namely potential severance of overland flow between upslope and down slope, both phases have been considered in this assessment.

Table 10.18 – Natural Drainage Patterns Predicted Impact Assessment (Operation)

Receptor(s)	River Urie, Unnamed Watercourses, & Quarry / Seasonal Pond
Relevant Scheme Information	Between ch.400 - 1100m the Scheme will involve a mixture of embankment and cutting, which will separate a small part of the River Urie catchment (the area between the railway and the new road embankment) from the river channel. The presence of the new road embankment and the culvert extension will not allow surface water runoff to enter Unnamed Watercourse 1 over a length of approximately 35m immediately downstream of the disused railway embankment. Unnamed Watercourse 2 is on the opposite bank from the Scheme and run off into this watercourse will therefore not be affected. The Quarry / Seasonal Pond is significantly upslope of the Scheme and therefore run off into and out of this feature will not be affected.
Sensitivity of Receptor(s) & Attributes	**River Urie** **Overall Sensitivity - High** **Sensitivity of Individual Attributes** Water Supply / Quality – High; Dilution & Removal of Waste Products – Low; Recreation – High; Value to Economy – Medium; Conveyance of Flow – High; Biodiversity – High **Unnamed Watercourse 1 and 2** **Overall Sensitivity - Medium** **Sensitivity of Individual Attributes** Water Supply / Quality – High; Dilution & Removal of Waste Products – Low; Recreation – Low; Value to Economy – Medium; Conveyance of Flow – Low; Biodiversity – Medium **Quarry / Seasonal Pond** **Overall Sensitivity - Low** **Sensitivity of Individual Attributes** Water Supply / Quality – Low; Dilution & Removal of Waste Products – Low;

	Recreation – Low; Value to Economy – Low; Biodiversity – Low
Magnitude (and Type) of Effect	**Overall Magnitude of Effect – Negligible Adverse** (direct, highly localised, & permanent) for Unnamed Watercourse 1 as the surface water run off to the watercourse from the adjacent ground will be altered due to the new road embankment over a length of around 35m. However, this effect is occurring over a short length at the downstream end of the watercourse (i.e. 100m from outfall into the River Urie) so the overall flow in the watercourse is unlikely to be significantly altered. **Magnitude of Effect on Individual Attributes (Unnamed Watercourse 1)** Water Supply / Quality – Not applicable to this assessment Dilution & Removal of Waste Products – Negligible Adverse (direct, highly localised, & permanent) since changes introduced by culvert extension could affect flow in watercourse Recreation – Negligible Adverse (direct, highly localised, and permanent) since a short reach of the watercourse will be disconnected from natural drainage Value to Economy – Negligible Adverse (direct, highly localised, and permanent) since a short reach of the watercourse will be disconnected from natural drainage Conveyance of Flow – Negligible Adverse (direct, highly localised, & permanent) since changes introduced by culvert extension could affect flow in watercourse Biodiversity – Negligible Adverse (direct, highly localised, and permanent) since changes will disrupt flow supports aquatic life along this reach **Overall Magnitude of Effect - Negligible Adverse** (direct, localised, & permanent) for the River Urie as the surface water run off pattern over a short reach will be affected, but the area of catchment concerned is around 0.014km^2 in the context of an overall catchment of around 200km^2 and is therefore unlikely to give rise to any significant effect on flows reaching the watercourse. **Magnitude of Effect on Individual Attributes (River Urie)** Water Supply / Quality – Not applicable to this assessment Dilution & Removal of Waste Products – Negligible Adverse (direct, localised, & permanent) since changes introduced by road embankment could affect flow Recreation – Negligible Adverse (direct, localised, and permanent) since a short reach of the watercourse will have altered natural drainage patterns Value to Economy – Negligible Adverse (direct, localised, and permanent) since a short reach of the watercourse will have altered natural drainage patterns Conveyance of Flow – Negligible Adverse (direct, localised, & permanent) since changes introduced by road embankment could affect flow Biodiversity – Negligible Adverse (direct, highly localised, and permanent) since changes will disrupt flow supports aquatic life along this reach **No effects** on Unnamed Watercourse 2 or the Quarry / Seasonal Pond, as these features are hydro-logically separated from the works. Therefore no assessment of potential effects on attributes required.
Overall Significance	**Overall Significance of Effect – Negligible Adverse for Unnamed Watercourse 1** **Significance of Effect on Individual Attributes** Water Supply / Quality – Not applicable; Dilution & Removal of Waste Products – Negligible Adverse; Recreation – Negligible Adverse; Value to Economy – Negligible Adverse; Conveyance of Flow – Negligible Adverse; Biodiversity – Negligible Adverse **Overall Significance of Effect – Negligible Adverse for River Urie** **Magnitude of Effect on Individual Attributes** Water Supply / Quality – Not applicable; Dilution & Removal of Waste Products – Negligible Adverse; Recreation – Negligible Adverse; Value to Economy – Negligible Adverse; Conveyance of Flow – Negligible Adverse; Biodiversity – Negligible Adverse **No Effect** for Unnamed Watercourse 2 and the Quarry / Seasonal Pond

This assessment, Table 10.19, considers the potential effects on the hydrology of the watercourses from the Scheme.

Table 10.19 – Hydrology Predicted Impact Assessment (Operation)

Receptor(s)	River Urie, Unnamed Watercourses, & Quarry / Seasonal Pond
Relevant Scheme Information	The River Urie will receive one or more surface water drainage discharges from the Scheme, which will include run off from the carriageway (impermeable areas) and embankments (permeable areas) via toe drains, etc. Although the drainage design is outline at this stage, it currently demonstrates that two levels of SUDS treatment (filter drains and two detention basins/swales) will attenuate the 1:30 post-development runoff rate to the 1:10 pre-development (greenfield) runoff rate. The extended culvert for approximately 35m on Unnamed Watercourse 1 will introduce localised effects on the hydraulics of this watercourse channel along this reach. There is not anticipated to be any affect on the passage of normal in bank flows down the River Urie or Unnamed Watercourse 2, as no permanent works are anticipated in these watercourses. The Quarry / Seasonal Pond is significantly upslope of the permanent works and therefore run off into and out of this feature will not be affected.
Sensitivity of Receptor(s) & Attributes	**River Urie** **Overall Sensitivity - High** **Sensitivity of Individual Attributes** Water Supply / Quality – High; Dilution & Removal of Waste Products – Low; Recreation – High; Value to Economy – Medium; Conveyance of Flow – High; Biodiversity – High **Unnamed Watercourse 1 and 2** **Overall Sensitivity - Medium** **Sensitivity of Individual Attributes** Water Supply / Quality – High; Dilution & Removal of Waste Products – Low; Recreation – Low; Value to Economy – Medium; Conveyance of Flow – Low; Biodiversity – Medium **Quarry / Seasonal Pond** **Overall Sensitivity - Low** **Sensitivity of Individual Attributes** Water Supply / Quality – Low; Dilution & Removal of Waste Products – Low; Recreation – Low; Value to Economy – Low; Biodiversity – Low
Magnitude (and Type) of Effect	**Overall Magnitude of Effect – Slight Adverse** (direct, highly localised, temporal during / after rainfall) for the River Urie on the basis that a more formal road drainage arrangement has the potential to increase the rate at which surface water runoff from the road will reach the receiving watercourse. However, it is noted that the area drained to the new surface water drainage arrangements is small in comparison to the overall catchment of the River Urie of 200km^2. **Magnitude of Effect on Individual Attributes (River Urie)** Water Supply / Quality – Not applicable to this assessment Dilution & Removal of Waste Products – Slight Adverse (direct, localised, & temporal) due to flows from new road drainage outfalls Recreation – Negligible Adverse (direct, localised, & temporal) due to flows from new road drainage outfalls Value to Economy – Negligible Adverse (direct, localised, & temporal) due to flows from new road drainage outfalls Conveyance of Flow – Slight Adverse (direct, localised, & temporal) due to flows from new road drainage outfalls Biodiversity – Negligible Adverse (direct, highly localised, & temporal) since changes could disrupt flow supports aquatic life along this reach **Slight Adverse** (direct, highly localised, permanent) for Unnamed Watercourse 1 based on the extended culvert having the potential to affect the passage of flows down the watercourse. **Magnitude of Effect on Individual Attributes (Unnamed Watercourse 1)** Water Supply / Quality – Not applicable to this assessment Dilution & Removal of Waste Products – Slight Adverse (direct, highly localised, &

	permanent) due to changes introduced by culvert extension on flow Recreation – Negligible Adverse (direct, highly localised, & permanent) due to changes introduced by culvert extension on flow Value to Economy – Negligible Adverse (direct, highly localised, & permanent) due to changes introduced by culvert extension on flow Conveyance of Flow – Slight Adverse (direct, highly localised, & permanent) since changes introduced by culvert extension could affect flow in watercourse Biodiversity – Negligible Adverse (direct, highly localised, and permanent) since changes will disrupt flow supports aquatic life along this reach **No Effect** for Unnamed Watercourse 2 and Quarry / Seasonal Pond as both of these features are hydrologically separate from the permanent works. Therefore no assessment of potential effects on attributes required.
Overall Significance	**Overall Significance of Effect – Minor Adverse for River Urie** **Magnitude of Effect on Individual Attributes** Water Supply / Quality – Not applicable; Dilution & Removal of Waste Products – Minor Adverse; Recreation – Negligible Adverse; Value to Economy – Negligible Adverse; Conveyance of Flow – Minor Adverse; Biodiversity – Negligible Adverse **Overall Significance of Effect – Minor Adverse for Unnamed Watercourse 1** **Significance of Effect on Individual Attributes** Water Supply / Quality – Not applicable; Dilution & Removal of Waste Products – Negligible Adverse; Recreation – Negligible Adverse; Value to Economy – Negligible Adverse; Conveyance of Flow – Negligible Adverse; Biodiversity – Negligible Adverse **No Effect** for Unnamed Watercourse 2 and the Quarry / Seasonal Pond

Groundwater

This assessment, Table 10.20, considers the potential effects on groundwater **movement** from the presence of the Scheme.

Table 10.20 – Groundwater (Movement) Predicted Impact Assessment (Operation)

Receptor(s)	Groundwater
Relevant Scheme Information	The main permanent works with a potential impact on the movement of groundwater are: - 1) The slight cuttings between chainage 0 – 100m & 600 – 900m could permanently intrude into the shallow groundwater. In the main section of cutting between chainage 600 – 900m the ground water levels recorded are around 4 - 5m below the surface at these locations and the road cutting is only proposed on the south side of the road to a depth of around 1.5 - 2m, so it appears unlikely that the cut proposed will go into the groundwater surface, 2) The presence of the road embankment may serve to compact the underlying superficial deposits and potentially alter groundwater movement in these layers. In this regard it is noted that the groundwater surface appears to be generally within the superficial deposits (i.e. above rock head), 3) Foundations for the bridge over the railway, which may intrude into the groundwater (no details of proposed foundations are available at this stage).
Sensitivity of Receptor & attributes	**Overall Sensitivity - Medium** **Sensitivity of Individual Attributes** Water Supply / Quality – Medium; Soakaway – Low; Vulnerability – Medium; Economic value – Low; Conveyance of Flow – Medium; Biodiversity - Medium
Magnitude (and Type) of Effect	**Overall Magnitude of Effect – Slight Adverse** (direct, localised, and permanent) – the areas of permanent cut look likely to stay above the ground water surface and therefore should not impede groundwater movement across these relatively short lengths. The localised foundations for the bridge over the railway are unlikely to present a significant obstruction to groundwater movement, as they are

	a relatively isolated feature. The presence of the road embankment is likely to slightly compact the underlying superficial deposits (mainly sands and gravels), and given the groundwater surface appears to sit within the drift deposits this may affect groundwater movement in the drift deposits over a length of around 1000m. However, immediately up gradient of the road embankment is the existing A96, the existing railway embankment, and the old railway embankment, all of which are linear features on the same alignment as the proposed road embankment. These existing features will already influence the groundwater regime in the drift deposits, and may restrict the "natural" movement of groundwater towards the River Urie over the length of the study area. It is therefore considered that the addition of the new road embankment downstream of these features will not introduce a significant new obstruction to groundwater movement, and the length affected (1000m) is relatively small in the context of overall length of the River Urie channel. In addition, it is noted that the location of these effects are well away from the limited areas of groundwater dependant ecosystem identified, and these features are not anticipated to be affected by the proposed Scheme. **Magnitude of Effect on Individual Attributes** Water Supply / Quality – Slight Adverse (direct, localised to length of Scheme, and temporary) as works may effect shallow groundwater movement Soak-away – No effects, as no known existing discharges to the ground Vulnerability – Slight Adverse (direct, localised to length of Scheme, & temporary) as works may effect shallow groundwater movement Economic value – Slight Adverse (direct, localised to length of Scheme, & temporary) as there a number of water supply boreholes in the study area Conveyance of Flow – Slight Adverse (direct, localised to length of the Scheme, and temporary) as road embankment may effect shallow groundwater Biodiversity – Negligible Adverse (indirect, localised to length of Scheme, and temporary) since flow to groundwater supported habitats may be affected
Overall Significance	**Overall Significance of Effect - Minor Adverse for groundwater movement** **Significance of Effect on Individual Attributes** Water Supply / Quality – Minor Adverse; Soakaway – No Effects; Vulnerability – Minor Adverse; Economic Value – Negligible Adverse; Conveyance of Flow – Minor Adverse; Biodiversity – Negligible Adverse

This assessment, Table 10.21, considers the potential effects on groundwater **quality** from the operation of the road.

Table 10.21 – Groundwater (Quality) Predicted Impact Assessment (Operation)

Receptor(s)	Groundwater
Relevant Scheme Information	The main operational element of the Scheme that has the potential to affect the groundwater quality will be the surface water run off from the new road, which will contain a certain amount of typical road pollutants (e.g. combustion products from fuels & oils, wear & tear of vehicles, etc.). This results in the potential for pollutants to percolate into the shallow groundwater and affect groundwater quality if appropriate mitigation measures are not put in place. In addition, road accidents have the potential to cause spillages of fuel and oil, which is another source of potential groundwater contamination. Another source of potential pollution is from vegetation maintenance alongside the road, where herbicides are used to control invasive species along linear infrastructure features.
Sensitivity of Receptor & Attributes	**Overall Sensitivity - Medium** **Sensitivity of Individual Attributes** Water Supply / Quality – Medium; Soak-away – Low; Vulnerability – Medium; Economic value – Low; Conveyance of Flow – Medium; Biodiversity - Medium
Magnitude (and Type) of Effect	**Overall Magnitude of Effect – Moderate Adverse** (indirect, localised to length of Scheme, permanent) – following Method C within HA 45/09 puts the groundwater below the Scheme at Medium risk of impact (refer to Appendix 10.1 – Road Drainage and the Water Environment Calculations for a copy of the Method C assessment). The calculated risk of pollution from accidental spillages (Method D (see Appendix 10.1 – Road Drainage and the Water Environment Calculations for a copy of the Method D assessment)) is significantly less than 0.5%, which places the groundwater at a negligible risk of impact (Table A4.4 of HD 45/09). Overall

	magnitude has been assigned based on the precautionary principle i.e. the worst case of Method C and Method D assessments. In addition, it is noted that there are no private drinking water supplies abstracted from groundwater immediately down gradient of the new section of road, and there are no groundwater dependant wetlands down gradient of the new section of road. **Magnitude of Effect on Individual Attributes** Water Supply / Quality – Moderate Adverse (indirect, localised to length of Scheme, and permanent) due to potential for road pollutants Soak-away – No effects, as no known existing discharges to the ground Vulnerability – Moderate Adverse (indirect, localised to length of Scheme, and permanent) due to potential for road pollutants Economic value – Slight Adverse (indirect, localised to length of Scheme, & permanent) due to a number of private water supply boreholes in the study area, but these are all up gradient of the road Conveyance of Flow – Not applicable to this assessment Biodiversity – Slight Adverse (indirect, localised to length of Scheme, and permanent) since groundwater supported habitats could be affected
Overall Significance	**Overall Significance of Effect - Minor Adverse for groundwater quality** **Significance of Effect on Individual Attributes** Water Supply / Quality – Minor Adverse; Soakaway – No Effects; Vulnerability – Minor Adverse; Economic Value – Negligible Adverse; Conveyance of Flow – Not applicable to this assessment; Biodiversity – Minor Adverse

10.5 Mitigation

This section describes the mitigation required to address adverse effects noted in Section 10.4. Construction Stage Mitigation Requirements are shown in Table 10.22 and Operational Stage Mitigation Requirements are shown in Table 10.23.

10.5.1 *Construction Stage*

Table 10.22 – Construction Stage Mitigation Requirements

Specific Issues	Mitigation Requirements
Sediment mobilisation and spillage or discharge of other pollutants into water-courses	The Contractor shall produce a Site Management Plan (SMP), which will describe the specific procedures to be put in place to control sediment mobilisation, surface water discharges, and spillages. The SMP shall be discussed and agreed with SEPA prior to commencement of site works, and all staff on site shall be briefed on and trained in the procedures contained within the SMP. The SMP shall incorporate best practice guidance as detailed in PPG's published by SEPA and CIRIA Reports C532 & C648, as a minimum. In particular, the following measures shall be adopted on site: - • A CAR Licence (if required) shall be obtained prior to start on site (note this is a separate consenting regime from the roads order) for the works, and this shall be displayed prominently on a notice board in the site offices, • The Contractor shall apply for a temporary discharge licence under the Controlled Activity Regulations if required by SEPA for the construction stage, • All measures identified by The Don District Salmon Fishery Board in their "River Works Code of Conduct", • Identify and clearly sign all surface water features within the construction site during site set up and brief personnel on their location during induction, • Site compound and site access routes shall be clearly defined during site set up with the minimum number of watercourse crossing points clearly defined. Formal watercourse crossings shall consist of a piped culvert and vehicle access over the top, • The Contractor shall provide bunds around all fuel, oil, and other chemical stores, and shall centralise and minimise the number of these stores, • A formal wheel wash and concrete wash out area shall be set up on site and this shall drain to a lined sump with the surface water either treated on

Specific Issues	Mitigation Requirements
	site or disposed of to a licensed facility off site, • Stripped areas, stockpiles, and areas of new embankment / cutting shall have silt fences placed so as to intercept the surface water run off from these areas. In practice this will mean a properly constructed silt fence from chainage 200 to 1000 running along the perimeter of the construction site i.e. between the new embankment and the River Urie, • The Contractor shall give consideration to creating the sustainable drainage system infrastructure at the outset of construction work, and this could then be used to treat some of the construction stage site run off prior to discharge. If this is not done the Contractor shall provide some other form of treatment to the surface water run off from the site prior to it reaching the watercourses, • Construction materials and other stockpiles shall be stored away from the surface water features (minimum 20m), • Plant shall be stored and maintained away from surface water features, • The Contractor shall instigate re-vegetation of stripped areas and new embankments on a sectional basis as early as possible within the programme to reduce the potential for silt laden run off, The SMP shall identify a clear monitoring regime to confirm the application of the above mitigation requirements. It is anticipated that the Contractor's site management personnel would be made responsible for monitoring, and in practice many of the measures could be monitored based on a daily or weekly inspection of the site and the completion of a "mitigation requirements" tick sheet. These tick sheets would then be retained as auditable evidence of the monitoring of the mitigation requirements.
Flood risk to surrounding land from development	▪ As with most schemes involving flood management works, it is recommended that the major mitigation works (compensatory flood storage and flood relief drainage) (see Table 10.23 and FRA Report for details) shall commence before the main Scheme road alignment works to manage potential flooding impacts to the River Urie and Unnamed Watercourse 1. In this case, it is probable that some of the excavated material from the proposed storage areas could be used as fill for the proposed road embankment, and therefore this could be practical. ▪ The Contractor shall ensure that all new and existing culverts within the site are inspected on a daily basis and shall be kept clear of construction / non-construction debris for the entire duration of the construction period, ▪ The Contractor shall keep close control of permanent and temporary earthworks operations in the vicinity of the River Urie and Unnamed Watercourse 1 to prevent any obstructions of the watercourses or deposits out with the site area, ▪ The Contractor shall not store materials within or immediately adjacent to watercourse channels (minimum distance 20m), ▪ Where works in the watercourse channels are required (i.e. for culvert extension on Unnamed Watercourse 1), the Contractor will be required to provide temporary flow bypass facilities (e.g. temporary damming of the watercourse just upstream and the provision of pumps on a duty and stand by arrangement or a temporary bypass channel) with sufficient capacity to pass the full capacity of the existing culvert upstream, ▪ All engineering works within the watercourse channel of Unnamed Watercourse 1 will need to be carried out in accordance with the Controlled Activities Regulations, ▪ All work within watercourses shall be undertaken in accordance with a detailed construction method statement to be produced by the Contractor and discussed and agreed with SEPA in advance of the works The Contractor's site management personnel will ultimately be responsible for monitoring the application of most of these mitigation requirements. Again it is suggested that the monitoring of the application of mitigation requirements is completed via regular inspections of the site and the completion of a tick sheet which summarises the mitigation measures in a readily useable form for rapid assessment on site.

Specific Issues	Mitigation Requirements
Alteration of water bodies	Geomorphology ▪ The culvert extension on Unnamed Watercourse 1 shall be the minimum length required for the new road embankment, ▪ The culvert shall be detailed in accordance with the best practice guidance contained within CIRIA Report C689 "Culvert design and operation guide" to minimise effects on the watercourse channel at the culvert entrance and exit, ▪ Working areas around and within the watercourse shall be clearly set out prior to commencement of construction works, and these shall be the minimum areas required to safely complete the works, ▪ The Contractor shall not store materials within or immediately adjacent to the watercourse, ▪ Plant movements should be kept to a minimum on the banks of the watercourse, ▪ A survey to record the form and vegetation along the watercourse shall be completed by an ecologist or a water engineering specialist covering the area predicted to be disturbed during the works (i.e. where the culvert will be extended to accommodate the Scheme crossing). This information shall provide sufficient detail to allow the alignment, levels, and form of the channel to be reinstated after the works, ▪ Reinstatement shall include re-vegetation with local plant species to stabilise the structure of the completed banks, ▪ As noted above, all engineering works within the watercourses will need to be carried out in accordance with the Controlled Activities Regulations. Hydrology ▪ Refer to mitigation measures noted above under "Flood Risk" such as keeping the culvert clear of debris, provision of a temporary bypass, etc., which will also act as the mitigation measures to minimise impacts on the hydrology of Unnamed Watercourse 1 during the construction period, ▪ Allowance for installation of a surface water drainage system (be it temporary or part of the permanent works) that prevents surface water run off becoming trapped between the new road embankment and the railway and returns it to its natural drainage route towards the River Urie (refer to "Sediment Mobilisation" above in regard to the provision of construction stage surface water drainage treatment measures to minimise pollution from this run off during the construction stage). It is anticipated that the Contractor's site management personnel would be made responsible for monitoring, and in practice many of the measures could be monitored based on a daily or weekly inspection of the site and the completion of a "mitigation requirements" tick sheet. These tick sheets would then be retained as auditable evidence of the monitoring of the mitigation requirements.
Disturbance of groundwater movement	None proposed at this stage
Contamination of groundwater	As noted above, the Contractor shall produce a Site Management Plan (SMP), which will describe the specific procedures to be put in place to control site discharges and the potential for pollutant spillages. The SMP shall be discussed and agreed with SEPA prior to commencement of site works, and all staff on site shall be briefed on and trained in the procedures contained within the SMP. The SMP shall incorporate best practice guidance as detailed in PPG's published by SEPA and CIRIA Reports C532 & C648, as a minimum. In particular, the following measures shall be adopted on site in relation to mitigating the potential effects on groundwater quality: - ▪ The Contractor shall provide bunds around all fuel, oil, and other chemical stores, and shall centralise and minimise the number of these stores, ▪ The Contractor shall complete all servicing, fuelling, and storage of vehicles at construction compounds, ▪ The Contractor shall provide dedicated wash down areas for concrete and

Specific Issues	Mitigation Requirements
	other delivery vehicles, ▪ The Contractor shall implement drainage control measures at the site to prevent areas of standing surface water that could become contaminated and infiltrate into the shallow groundwater. Where collection of water at the site is unavoidable (e.g. within excavations), provision should be made for this water to be collected and passed through some form of treatment before discharge), ▪ The Contractor shall liaise with SEPA regarding any proposed discharge from the site in respect to the Controlled Activities Regulations. As noted above, these are to be monitored by the Contractor's site personnel and the Client's Agent based on regular inspections using a tick sheet assessment.

10.5.2 ***Operational Stage***

Table 10.23 – Operational Stage Mitigation Requirements

Specific Issues	Mitigation Requirements
Discharge of road run off to water-courses	The new sections of road shall incorporate two levels of SuDS as required by SEPA. These measures shall incorporate both the treatment and attenuation of road run off using the standard techniques set out in the SUDS Manual (CIRIA C697)(e.g. filter drains and a pond). The selected measures shall be designed to provide two full stages of treatment to reduce pollutants and sediment in the road run off.
Other road and infrastructure maintenance	Future maintenance works to the road infrastructure shall be completed under an approved method statement (approved by route manager within maintenance authority) and shall incorporate best practice measures (including the SEPA Pollution Prevention Guidelines, General Binding Rules, and CIRIA Reports C532 & C632) to reduce the risk of significant sediment disturbance and spillages of potential contaminants to the surrounding water resources features. Provisions for monitoring the application of the best practice measures would also need to be noted in the method statement, and in practice this will likely mean that the supervisor of the works will be responsible for ensuring the application of the best practice measures on site.
Flood Risk to surrounding land from development	On account of SPP and discussions held with SEPA, compensatory flood storage is proposed to manage the impact of the Scheme on the River Urie floodplain. SEPA have requested that compensatory flood storage is provided for the design 1:200+CC event at the correct elevation on a like for like basis for the area removed. For the Scheme, it is possible to provide compensatory flood storage a short distance from where the land-raising for the Scheme will occur (see Appendix 10.2 – Flood Risk Assessment - Figure 12), and therefore mitigation will be provided on a level-volume basis. Area 1 compensatory storage area is proposed to compensate for the 3717m^3 of flood storage lost between ch. 350-650m of the Scheme and Area 2 would compensate for the 511m^3 of flood storage lost between ch. 900-1000m. The designers will ensure that the geometrical design of each storage area is in line with the respective elevation-volume requirements specified in the FRA Report, and should be matched or bettered to comply with SPP and SEPA requirements. The tie-in of the storage areas to the surrounding landform should be such that manageable slopes are created which do not provide a detrimental effect to existing land users (i.e. agricultural machinery). Based on SEPA comments on review of the provisional FRA modelling results, the proposed field access shall be realigned to descend eastwards onto the River Urie floodplain to reduce the effect of the access on out-of-bank flood flows from the River Urie. It is acknowledged that during design development since the completion of the

Specific Issues	Mitigation Requirements
	FRA Report the compensation areas have been more fully designed, and this has resulted in a slightly larger footprint than those shown in the FRA Report. This is principally because the engineering design has had to introduce slopes around the perimeter of each storage area that are acceptable to the landowner for use of farm machinery that weren't included in the concept design in the FRA Report. However, the basic location and the storage provided at each elevation slice, as set out in the FRA Report has been retained. Therefore, this change in the overall extents of the compensation areas has not affected this assessment. The extension to the culvert on Unnamed Watercourse 1 shall be designed in accordance with the guidance in CIRIA Report C689 in regard to hydraulic capacity. The FRA has stated that provisionally a 1200mm diameter culvert would be sufficient to pass the 1:200+CC design flow and would be an appropriate size to accommodate for potential future upsizing of the existing A96 culvert to pass the design flow. The FRA also states that an appropriate collection/drainage system will be required to manage flooding from Unnamed Watercourse 1. The drainage design for the Scheme should develop a solution along the above lines, and the designers should discuss and agree the final design solution with Transport Scotland, SEPA, and Aberdeenshire Council. The designers shall ensure that the rates of release of the surface water run off from the surface water drainage system are in accordance with the guidance provided in CIRIA Report C697 for acceptable rates of runoff and advice from SEPA and the Local Authority regarding acceptable Greenfield run off rates.
Alteration of water bodies	▪ The culvert extension on Unnamed Watercourse 1 shall be the minimum length required for the new road embankment, ▪ The culvert shall be detailed in accordance with the best practice guidance contained within CIRIA Report C689 "Culvert design and operation guide" to minimise effects on the watercourse channel at the culvert entrance and exit. In addition, the advice within CIRIA Report C551 Manual on Scour at Bridges and other Hydraulic Structures shall be taken into account in the design of the culvert, ▪ The design of the extended culvert on Unnamed Watercourse 1 shall ensure that, as a minimum, the existing hydraulic capacity is maintained, but also refer to flood risk mitigation requirements noted above, ▪ The design shall be undertaken with due consideration to the guidance contained in "River Crossing and Migratory Fish: Design Guidance", and where fish passage is considered possible then the new or extended culverts shall be designed in accordance with the above guidance, ▪ Reinstatement of the channel either side of the culvert shall include re-vegetation with local plant species to prevent introducing non native species, ▪ Where bank protection works are considered necessary these shall be "green" bank protection works (refer to "The Water Environment (Controlled Activities) (Scotland) Regulations 2005 - A Practical Guide" for details). Any bank protection works on Unnamed Watercourse 1 upstream and downstream of the realigned A96 shall be kept to the minimum length required.
Alteration to land drainage patterns	Where the new road embankment isolates an area of land that would naturally drain towards the River Urie (from chainage 300 – 1000), drainage provisions shall be put in place to prevent surface water run off in this area becoming trapped. This intercepted surface water shall be returned directly or indirectly (through road drainage provisions) to the reach of the River Urie within the study area.
Alteration of hydrology of water bodies	The surface water drainage proposals for the Scheme will include two levels of SUDS measures. These features can therefore be used to provide a level of attenuation of the road run off before discharge to the River Urie. The design shall ensure that the rate of release of the surface water run off from the road drainage system is in accordance with the guidance provided in CIRIA Report

Specific Issues	Mitigation Requirements
	C697 for allowable rates of run off. In addition, the extension to the culvert on Unnamed Watercourse 1 should be completed in accordance with the mitigation measures noted under "Alteration to channel of Unnamed Watercourse 1" & "Flood Risk to surrounding land from development" to ensure any effects on the passage of flows down this watercourse are minimised.
Disturbance of groundwater movement from the new road construction	None proposed at this stage.
Contamination of groundwater	The surface water drainage proposals for the Scheme will include two levels of SUDS design (as required by SEPA), and these measures can be detailed to assist in reducing the risk to the groundwater. Based on Method C putting the groundwater at medium risk of impact from a road drainage discharge to the groundwater, it is recommended that a direct discharge to the groundwater is avoided in this instance. It is also noted that an indirect discharge (e.g. seepage from a treatment pond or filter drain) can cause similar impacts to the groundwater. Therefore, it is recommended that any treatment pond or swale is fully lined with an impermeable liner to minimise any seepage into the relatively shallow groundwater at this location, and consideration should also be given to having a "sealed" drainage system leading up to a pond or lagoon (i.e. filter drains would also be lined).

The monitoring of the operational stage mitigation measures would principally be achieved via a review of the design just prior to finalisation to ensure that the recommended mitigation measures have been incorporated. This would ultimately be the responsibility of the promoter of the Scheme.

10.6 Disruption due to Construction

All construction disruption to water environment features has been identified and assessed in Section 10.4.1 "Construction Stage (impacts)".

10.7 Residual Impacts

This section describes the residual impacts subject to the adoption of the mitigation measures identified in Section 10.5. It is noted that where no effects were predicted in Section 10.4, these assessments have not been repeated in this section. Tables 10.24 and 10.25 show the construction and operation residual impacts respectively.

10.7.1 ***Construction Stage***

Table 10.24 – Construction Stage Residual Impacts

Potential Impact	Feature	Attribute	Quality	Importance	Magnitude (and Type) of Effect (Pre Mitigation)	Mitigation Require-ments	Magnitude (and Type) of Effect (Post Mitigation)	Residual Significance
Sediment mobilisation and spillage or discharge of other pollutants into watercourses	River Urie, Unnamed Watercourses & Quarry / Seasonal Pond	**River Urie** Water Supply / Quality Dilution & Removal of Waste Products Recreation Value to Economy Conveyance of Flow Biodiversity **Unnamed Watercourse 1 and 2** Water Supply / Quality Dilution & Removal of Waste Products Recreation Value to Economy Conveyance of Flow Biodiversity **Quarry / Seasonal Pond** Water Supply / Quality Dilution &	Good Good Good Moderate Good Good Good Poor Poor Moderate Poor Moderate	**Overall Importance High** (River Urie) **Medium** (Unnamed Watercourse 1 and 2) **Negligible** (Quarry / Seasonal pond) (see "Baseline" section) (for importance of each attribute refer to Section 10.3)	**Overall Magnitude** **Slight Adverse** (direct, localised to the reaches of the River Urie and Unnamed Watercourse 1 adjacent to and downstream of the site, and temporary) (for magnitude of each attribute refer to Section 10.4.1)	See Table 10.22	**Overall Magnitude** **Negligible Adverse** (direct, localised to reach of Unnamed Watercourse 1 and River Urie adjacent to and downstream of study area, and temporary) - based on the adoption of the mitigation measures noted, the risk of a significant discharge of polluting substances into the watercourses should be able to be reduced to a low level. The effects of any residual construction stage pollution should be temporary in nature, and therefore no long-term impact on the water quality classification should be experienced.	**Overall Residual SignificanceNegligible Adverse** for Unnamed Watercourse 1 and the River Urie

Potential Impact	Feature	Attribute	Quality	Importance	Magnitude (and Type) of Effect (Pre Mitigation)	Mitigation Require-ments	Magnitude (and Type) of Effect (Post Mitigation)	Residual Significance
		Removal of Waste Products Recreation Value to Economy Biodiversity	N/a Poor Poor Poor Poor					
Flood risk to surrounding land from development	Surrounding land (floodplain) and infrastructure located adjacent to the River Urie and Unnamed Watercourse 1, including areas upstream and downstream of the study area	Conveyance of Flow	Good	Rural land in an open flood plain is considered as having a **Low** sensitivity to increased flood risk, but residential and industrial properties within and adjacent to the flood plain are considered as having a **High** sensitivity to increased flood risk.	**Slight Adverse** (direct, local to and downstream of the Scheme, temporal i.e. during storm events only) for the River Urie and Unnamed Watercourse 1	See Table 10.22	**Negligible Adverse** (direct, local to and downstream of the Scheme, temporal i.e. during storm events only) for the River Urie and Unnamed Watercourse 1. It is considered that the major flood mitigation proposals (compensatory flood storage and flood relief drainage) would be adopted from the outset of the construction works to provide fill for the main proposed road embankment.	**Negligible Adverse** for land around the River Urie and Unnamed Watercourse 1

Potential Impact	Feature	Attribute	Quality	Importance	Magnitude (and Type) of Effect (Pre Mitigation)	Mitigation Require-ments	Magnitude (and Type) of Effect (Post Mitigation)	Residual Significance
Alteration of water bodies (Geomorph-ology & Hydrology)	River Urie, Unnamed Watercourses & Quarry / Seasonal Pond	**River Urie** Water Supply / Quality Dilution & Removal of Waste Products Recreation Value to Economy Conveyance of Flow Biodiversity **Unnamed Watercourse 1 and 2** Water Supply / Quality Dilution & Removal of Waste Products Recreation Value to Economy Conveyance of Flow Biodiversity **Quarry / Seasonal Pond** Water Supply / Quality Dilution & Removal of Waste Products Recreation Value to Economy	Good Good Good Moderate Good Good Good Poor Poor Moderate Poor Moderate N/a	**Overall Importance** **High** (River Urie)**, Medium** (Unnamed Watercourse 1 and 2) & **Negligible** (Quarry / Seasonal pond) (see "Baseline" section) (for importance of each attribute refer to Section 10.3)	**Overall Magnitude** Geomorphology **Moderate Adverse** (direct, localised, and temporary) for Unnamed Watercourse 1 Hydrology **Moderate Adverse** (direct, localised, and temporary) for Unnamed Watercourse 1 **Negligible Adverse** (indirect, highly localised, and temporary) for the River Urie (for magnitude of each attribute refer to Section 10.4.1)	See Table 10.22	**Overall Magnitude** Geomorphology **Moderate Adverse** (direct, localised, and temporary) for Unnamed Watercourse 1 Hydrology **Slight Adverse** (direct, localised, and temporary) for Unnamed Watercourse 1 **Negligible Adverse** (indirect, highly localised, and temporary) for the River Urie	**Overall Residual Significance** Geomorphology **Minor Adverse** for Unnamed Watercourse 1 Hydrology **Minor Adverse** for Unnamed Watercourse 1 **Negligible Adverse** for the River Urie

Potential Impact	Feature	Attribute	Quality	Importance	Magnitude (and Type) of Effect (Pre Mitigation)	Mitigation Require-ments	Magnitude (and Type) of Effect (Post Mitigation)	Residual Significance
		Biodiversity	Poor Poor Poor Poor					
Disturbance of groundwater movement	Groundwater	Water Supply / Quality Soak-away Vulnerability Economic value Conveyance of Flow Biodiversity	Moderate Poor Moderate Moderate Moderate Moderate	**Overall Importance** **Medium** (see "Baseline" section) (for importance of each attribute refer to Section 10.3)	**Overall Magnitude** **Slight Adverse** (direct, localised, and temporary) (for magnitude of each attribute refer to Section 10.4.1)	None proposed at this stage	**Overall Magnitude** **Slight Adverse** (direct, localised, and temporary) – as it is not anticipated that construction work will create any significant obstruction to the overall groundwater movement in the study area.	**Overall Magnitude** **Minor Adverse**
Contamination of groundwater	Groundwater	Water Supply / Quality Soak-away Vulnerability Economic value Conveyance of Flow Biodiversity	Moderate Poor Moderate Moderate Moderate Moderate	**Overall Importance** **Medium** (see "Baseline" section) (for importance of each attribute refer to Section 10.3)	**Overall Magnitude** **Slight Adverse** (indirect, localised to development site, temporary) (for magnitude of each attribute refer	See Table 10.22	**Overall Magnitude** **Negligible Adverse** (indirect, localised, temporary) – based on the adoption of the mitigation measures noted, the likelihood of significant quantities of contaminants being released into the shallow groundwater should be low. Therefore, it is considered that, although there may be a residual risk of some small spills of oil, fuel, or other chemicals, the effects of these will be highly localised.	**Overall Magnitude** **Negligible Adverse**

Potential Impact	Feature	Attribute	Quality	Importance	Magnitude (and Type) of Effect (Pre Mitigation)	Mitigation Require-ments	Magnitude (and Type) of Effect (Post Mitigation)	Residual Significance
					to Section 10.4.1)			

10.7.2 ***Operational Stage***

Table 10.25 – Operational Stage Residual Impacts

Potential Impact	Feature	Attribute	Quality	Importance	Magnitude (and Type) of Effect (Pre Mitigation)	Mitigation Require-ments	Magnitude (and Type) of Effect (Post Mitigation)	Residual Significance
Discharge of road run off to watercourses / drainage paths	River Urie	Water Supply / Quality Dilution & Removal of Waste Products Recreation Value to Economy Conveyance of Flow Biodiversity	Good Good Good Moderate Good Good	**Overall Importance** **High** (River Urie) (see "Baseline" section) (for importance of each attribute refer to Section 10.3)	**Overall Magnitude** **Slight Adverse** (direct, local to downstream reach of River Urie, permanent) (for magnitude of each attribute refer to Section 10.4.2)	See Table 10.23	**Overall Magnitude** **Negligible Adverse** (direct, localised to downstream reach of watercourse, permanent) see Table A4.4 of HA 45/09 – based on the adoption of the mitigation measures noted (i.e. two levels of SUDS which will remove a proportion of the sediment from the road run off), the HAWRAT (Method A) assessment still shows a pass for predicted copper and zinc levels, and the spillage risk remains significantly less than 0.5%. The HAWRAT method still highlights an alert under sediment impacts due to the presence of a protected area downstream, however the sediment is not judged to be accumulating and with the mitigation measures noted is not considered to be a significant concern. (Refer to Table 6.11 of the Chapter 6- Nature Conservation which does not report any post mitigation impacts on the water environment)	**Overall Residual Significance** **Negligible Adverse** for River Urie
Other road and infrastructure maintenance	River Urie, Unnamed Watercourses & Quarry / Seasonal	**River Urie** Water Supply / Quality Dilution & Removal of Waste Products	Good Good	**Overall Importance** **High** (River Urie), **Medium** (Unnamed	**Overall Magnitude** **Slight Adverse** (direct,	See Table 10.23	**Overall Magnitude** **Negligible Adverse** (direct, localised, temporal) – based on the adoption of the mitigation measures noted, the risk of a significant spillage of a potentially polluting	**Overall Significance** **Negligible Adverse** for the River Urie

Potential Impact	Feature	Attribute	Quality	Importance	Magnitude (and Type) of Effect (Pre Mitigation)	Mitigation Require-ments	Magnitude (and Type) of Effect (Post Mitigation)	Residual Significance
	Pond	Recreation Value to Economy Conveyance of Flow Biodiversity **Unnamed Watercourse 1 and 2** Water Supply / Quality Dilution & Removal of Waste Products Recreation Value to Economy Conveyance of Flow Biodiversity **Quarry / Seasonal Pond** Water Supply / Quality Dilution & Removal of Waste Products Recreation Value to Economy Biodiversity	 Good Moderate Good Good Good Poor Poor Moderate Poor Moderate N/a Poor Poor Poor	Watercourse 1 and 2) & **Negligible** (Quarry / Seasonal pond) (see "Baseline" section) (for importance of each attribute refer to Section 10.3)	localised, temporal) for the River Urie and Unnamed Watercourse 1 (for magnitude of each attribute refer to Section 10.4.2)		substance should be reduced to a low level. As noted previously, the clearing of debris from the culvert on Unnamed Watercourse 1 is likely to cause only minor disturbance at the entrance and exit of the culvert. As noted previously it is understood that the landscape design for the road verges is to replant with native grass and therefore there is not expected to be any significant ongoing requirement for the use of herbicides to maintain these areas.	and Unnamed Watercourse 1

Potential Impact	Feature	Attribute	Quality	Importance	Magnitude (and Type) of Effect (Pre Mitigation)	Mitigation Require-ments	Magnitude (and Type) of Effect (Post Mitigation)	Residual Significance
			Poor					
Flood risk to surrounding land from development	Surrounding land (floodplain) and infrastructure located adjacent to the River Urie and Unnamed Watercourse 1, including areas upstream and downstream of the study area	Conveyance of Flow	Good	Rural land in an open flood plain is considered as having a **Low** sensitivity to increased flood risk, but residential and industrial properties within and adjacent to the flood plain are considered as having a **High** sensitivity to increased flood risk.	**Slight Adverse** (direct, local to and downstream of the Scheme, temporal i.e. during storm events only) for the River Urie and Unnamed Watercourse 1	See Table 10.23	**Negligible Adverse** (direct, local to and downstream of the Scheme, temporal i.e. during storm events only) for the River Urie and Unnamed Watercourse 1. The compensatory flood storage areas will ensure that the Scheme will have a neutral impact on the River Urie flooding regime, and the flood relief works on Unnamed Watercourse 1 will ensure that the Scheme will have a neutral impact on the existing flooding regime of Unnamed Watercourse 1.	**Negligible Adverse** for the River Urie and Unnamed Watercourse 1
Alteration of water bodies	River Urie, Unnamed Watercourses & Quarry / Seasonal Pond	**River Urie** Water Supply / Quality Dilution & Removal of Waste Products Recreation Value to Economy Conveyance of Flow Biodiversity	Good Good Good Moderate Good	**Overall Importance** **High** (River Urie), **Medium** (Unnamed Watercourse 1 and 2) & **Negligible** (Quarry / Seasonal pond) (see	**Overall Magnitude** **Moderate Adverse** (direct, localised, permanent) for Unnamed Watercourse 1 & **Negligible Adverse** on	See Table 10.23	**Overall Magnitude** **Moderate Adverse** (direct, localised, and permanent) for Unnamed Watercourse 1 even with the adoption of the mitigation measures noted, as around 35m of the bed and banks of this feature will be lost due to the extension of the existing culvert. **Negligible Adverse** (temporal, i.e. during storm events only) on the River Urie floodplain.	**Overall Significance** **Minor Adverse** for Unnamed Watercourse 1 **Negligible Adverse** for River Urie

Potential Impact	Feature	Attribute	Quality	Importance	Magnitude (and Type) of Effect (Pre Mitigation)	Mitigation Require-ments	Magnitude (and Type) of Effect (Post Mitigation)	Residual Significance
		Unnamed Watercourse 1 and 2 Water Supply / Quality Dilution & Removal of Waste Products Recreation Value to Economy Conveyance of Flow Biodiversity **Quarry / Seasonal Pond** Water Supply / Quality Dilution & Removal of Waste Products Recreation Value to Economy Biodiversity	Good Good Poor Poor Moderate Poor Moderate N/a Poor Poor Poor Poor	"Baseline" section) (for importance of each attribute refer to Section 10.3)	the River Urie (for magnitude of each attribute refer to Section 10.4.2)			
Alteration to land drainage	River Urie, Unnamed Watercourses,	**River Urie** Water Supply / Quality	Good	**Overall Importance High** (River	**Overall Magnitude Negligible**	See Table 10.23	**Overall Magnitude Negligible Adverse** (indirect, highly localised, & permanent) for Unnamed	**Overall Residual Significance**

Potential Impact	Feature	Attribute	Quality	Importance	Magnitude (and Type) of Effect (Pre Mitigation)	Mitigation Require-ments	Magnitude (and Type) of Effect (Post Mitigation)	Residual Significance
patterns	& Quarry / Seasonal Pond	Dilution & Removal of Waste Products Recreation Value to Economy Conveyance of Flow Biodiversity **Unnamed Watercourse 1 and 2** Water Supply / Quality Dilution & Removal of Waste Products Recreation Value to Economy Conveyance of Flow Biodiversity **Quarry / Seasonal Pond** Water Supply / Quality Dilution & Removal of Waste Products Recreation Value to Economy	Good Good Moderate Good Good Good Poor Poor Moderate Poor Moderate N/a Poor Poor	Urie)**, Medium** (Unnamed Watercourse 1 and 2) & **Negligible** (Quarry / Seasonal pond) (see "Baseline" section) (for importance of each attribute refer to Section 10.3)	**Adverse** (direct, highly localised, permanent) for Unnamed Watercourse 1 **Negligible Adverse** (direct, localised, permanent) for the River Urie (for magnitude of each attribute refer to Section 10.4.2)		Watercourse 1 as the surface water run off to the watercourse from the adjacent ground will still be altered due to the new road embankment. However, this effect occurs over a short length at the downstream end of the watercourse so the overall flow in the watercourse is unlikely to be significantly altered. **Negligible Adverse** (indirect, localised, & permanent) for the River Urie as the surface water run off over a short reach will still be affected, even with the mitigation measures noted. However, the area of catchment affected is very small in comparison to the overall catchment and is therefore unlikely to have any significant effect on flows in the watercourse.	**Negligible Adverse** for both Unnamed Watercourse 1 and the River Urie

Potential Impact	Feature	Attribute	Quality	Importance	Magnitude (and Type) of Effect (Pre Mitigation)	Mitigation Require-ments	Magnitude (and Type) of Effect (Post Mitigation)	Residual Significance
		Biodiversity	Poor Poor					
Alteration to hydrology of water bodies	River Urie, Unnamed Watercourses, & Quarry / Seasonal Pond	**River Urie** Water Supply / Quality Dilution & Removal of Waste Products Recreation Value to Economy Conveyance of Flow Biodiversity **Unnamed Watercourse 1 and 2** Water Supply / Quality Dilution & Removal of Waste Products Recreation Value to Economy Conveyance of Flow Biodiversity **Quarry / Seasonal Pond** Water Supply / Quality Dilution &	Good Good Good Moderate Good Good Good Poor Poor Moderate Poor Moderate	**Overall Importance** **High** (River Urie), **Medium** (Unnamed Watercourse 1 and 2) & **Negligible** (Quarry / Seasonal pond) (see "Baseline" section) (for importance of each attribute refer to Section 10.3)	**Overall Magnitude** **Slight Adverse** (direct, highly localised, & temporal rainfall) for the River Urie **Slight Adverse** (direct, highly localised, & permanent) for Unnamed Watercourse 1 (for magnitude of each attribute refer to Section 10.4.2)	See Table 10.23	**Overall Magnitude** **Negligible Adverse** (direct, highly localised, temporal during / after rainfall) for the River Urie on the basis that the mitigation measures proposed (e.g. two levels of SUDS) will control the rate at which surface water runoff from the road will reach the receiving watercourse to an acceptable level. **Negligible Adverse** (direct, highly localised, and permanent) for Unnamed Watercourse 1 based on the extended culvert being designed in accordance with the mitigation measures noted and in particular that the capacity of the extended culvert should be no less than the capacity of the existing culvert upstream.	**Overall Residual Significance** **Negligible Adverse** for both Unnamed Watercourse 1 and the River Urie

Potential Impact	Feature	Attribute	Quality	Importance	Magnitude (and Type) of Effect (Pre Mitigation)	Mitigation Require-ments	Magnitude (and Type) of Effect (Post Mitigation)	Residual Significance
		Removal of Waste Products Recreation Value to Economy Biodiversity	N/a Poor Poor Poor Poor					
Disturbance of groundwater movement from the new road	Groundwater	Water Supply / Quality Soak-away Vulnerability Economic value Conveyance of Flow Biodiversity	Moderate Poor Moderate Moderate Moderate Moderate	**Overall Importance** **Medium** (see "Baseline" section) (for importance of each attribute refer to Section 10.3)	**Overall Magnitude** **Slight Adverse** (direct, localised, permanent) (for magnitude of each attribute refer to Section 10.4.2)	See Table 10.23	**Overall Magnitude** **Slight Adverse** (direct, localised, and permanent) – as the depth of groundwater below the study area is relatively shallow and it is anticipated that the permanent works, in particular the presence of the new road embankment on the underlying drift deposits, could cause some localised effects on groundwater movement. However, it is noted that there are already two existing railway embankments immediately upslope of the proposed road embankment and these are likely to influence the existing groundwater regime in the superficial deposits, and may already restrict the "natural" movement of groundwater towards the River Urie over the length of the study area. It is therefore considered that the addition of the new road embankment will not introduce a significant new obstruction to groundwater movement. In addition, it is noted that the location of these effects are well away	**Overall Residual Significance** **Minor Adverse** for the groundwater

Potential Impact	Feature	Attribute	Quality	Importance	Magnitude (and Type) of Effect (Pre Mitigation)	Mitigation Require-ments	Magnitude (and Type) of Effect (Post Mitigation)	Residual Significance
							from the limited areas of groundwater dependant ecosystem identified, and these features are not anticipated to be affected by the proposed Scheme.	
Contamination of groundwater	Groundwater	Water Supply / Quality Soak-away Vulnerability Economic value Conveyance of Flow Biodiversity	Moderate Poor Moderate Moderate Moderate Moderate	**Overall Importance** **Medium** (see "Baseline" section) (for importance of each attribute refer to Section 10.3)	**Overall Magnitude** **Moderate Adverse** (indirect, localised to length of Scheme, permanent) (for magnitude of each attribute refer to Section 10.4.2)	See Table 10.23	**Overall Magnitude** **Slight Adverse** (indirect, localised to length of Scheme, and permanent) based on the adoption of the mitigation measures noted (i.e. no direct discharge to groundwater and lining the drainage infrastructure with an impermeable liner to minimise seepage into the groundwater) this would assist in minimising the potential effects on groundwater quality by removing the pathway for road run off to reach the groundwater. The Method C assessment would remain as Medium risk, as it does not allow for the application of mitigation measures and the calculated risk of pollution from accidental spillages would remain as significantly less than 0.5%. These two assessments taken in conjunction with the mitigation measures proposed have led to the overall magnitude of effect, which probably retains an element of conservatism.	**Overall Residual Significance** **Minor Adverse**

10.8 Compliance with Plans & Policies

This Section provides an assessment of the degree to which the Scheme complies with the relevant plans and policies relating to the water environment. The Scheme with its mitigation measures is assessed as such in relation to the following legislation: -

- **EU Directive 2000/60/EC (Water Framework Directive (WFD)), transposed into the Water Environment and Water Services Act (Scotland) 2003 (the "WEWS" Act).** The compensatory flood storage areas for the River Urie, flood relief drainage for Unnamed Watercourse 1 and SUDS drainage proposals will manage potential fluvial and surface water flooding effects arising from the Scheme during construction and operation and the SUDS drainage proposals will manage the potential water quality impact upon water features, groundwater and their attributes in the vicinity of the Scheme. The Scheme with its mitigation measures will comply with the objectives of the WFD in ensuring that the status of the water bodies in the vicinity of the Scheme will not deteriorate.
- **SPP (Scottish Planning Policy).** With no mitigation in place, the Scheme would not comply with SPP since the Scheme's land-raising proposals would remove a significant volume of flood storage from the River Urie's functional floodplain and would lead to a slight adverse effect to others who live in close proximity to the River upstream and downstream of the Scheme. With no mitigation measures, the Scheme would also be at risk of flooding from Unnamed Watercourse 1. However, with the mitigation measures identified (compensatory flood storage, flood relief drainage, and SUDS drainage), it is assessed that flooding can be managed at the study area, and would not increase the probability of flooding elsewhere, and therefore the Scheme will comply with SPP.
- **Aberdeen City and Shire Structure Plan (2009).** The Scheme is proposed on an area of land which is at risk of fluvial flooding and therefore would not comply with this Plan. However the Plan allows for development in 'exceptional circumstances' (i.e. essential road infrastructure), and with a detailed FRA having been undertaken to supplement this EIA to identify and assess mitigation measures, it is considered that this development would abide by the policies set out in the Plan relating to the flooding and climate change allowance. The Scheme will also comply with the Plan by producing negligible impacts upon the aquatic ecological environment and is not considered to affect the water bodies potential to achieve 'good ecological status' under the Water Framework Directive.
- **Proposed Aberdeen City and Shire Strategic Development Plan (2013).** The Proposed SDP notes that "*Areas of Aberdeen and Aberdeenshire are already at risk from flooding, but increased risk comes about through changing and more unpredictable weather patterns and rising sea levels. Avoiding flood risk is an important measure to adapt to climate change*". Similar to the 2009 Structure Plan, the Proposed SDP states that development on land that is at an unacceptable risk of flooding should be avoided, however in exceptional circumstances and with suitable mitigation measures (e.g. detailed FRA) this stance may change. As the Scheme is identified within the development plan in this instance it is considered compliant with planning policy.
- **The Aberdeenshire Local Development Plan (2012).** In addition to compliance with the Structure Plan, the Scheme will also comply with the more specific water environment related policies contained within this Plan in relation to having no effects on existing flood risk, is not itself at risk of flooding, and is not considered to affect the water bodies potential to achieve "good ecological status" under the Water Framework Directive.

10.9 Summary

This chapter addresses the potential effects on the water environment as a result of the proposed Scheme. In the context of these proposals the significant water resources are the River Urie, Unnamed Watercourses 1 & 2, the Quarry / Seasonal Pond, and the Groundwater. The assessment of effects was divided into four main areas, and these were: Surface Water Quality; Flooding; Geomorphology and Hydrology; and Groundwater. The predicted residual impacts ranged from Negligible to Minor Adverse, subject to the adoption of a range of mitigation measures identified in Section 10.5.

Based on the assessment tools provided in DMRB HD 45/09 and the additional assessments undertaken as part of this Chapter it is considered unlikely that the Scheme would lead to any significant residual impacts on water resources features. On this basis it is considered that the Scheme complies with most of the relevant policies noted in Section 10.3.7, in that it is not predicted to have a significant adverse effect on the water environment.

References

- Aberdeen City and Shire Structure Plan (2009)
- The Aberdeenshire Local Plan (2012)
- EU Directive 2000/60/EC (Water Framework Directive (WFD)), transposed into the Water Environment and Water Services Act (Scotland) 2003 (the "WEWS" Act)
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 in respect of discharges to surface or groundwater
- SPP (Scottish Planning Policy), Flood and drainage sections
- Flood Risk Management (Scotland) Act 2009
- SEPA Policy No. 41 (SEPA – Planning Authority Protocol, Development at Risk of Flooding: Advice and Consultation)
- SEPA Policy No. 19 (Groundwater Protection Policy for Scotland)
- British Geological Survey , Geological Assessment – Detailed GR202943/1 (Desktop Study)
- CIRIA, Report C697 – SUDS Manual (2007)
- CIRIA, Report C551 Manual on Scour at Bridges and other Hydraulic Structures (2002)
- CIRIA, Report C532 "Control of water pollution from construction sites" (2001)
- CIRIA, Report C648 "Control of water pollution from linear construction projects" (2006)
- Design Manual for Roads and Bridges, Volume 11, Section 3, Part 10, HD 45/09, Highways Agency / Scottish Executive Development Department (2009)
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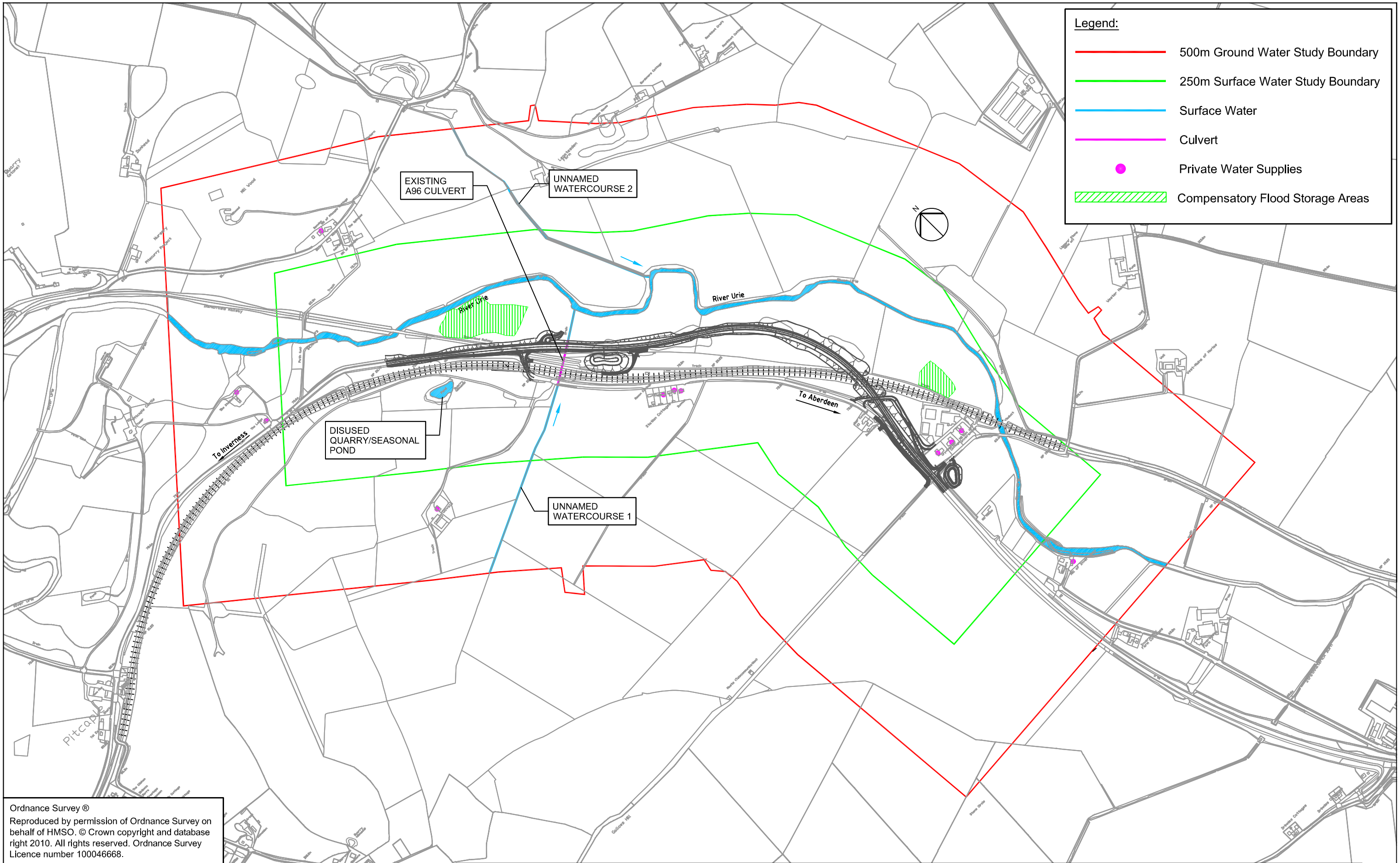

A96 Inveramsay Bridge Improvement

Environmental Impact Assessment
Water Resources Study Area

TRANSPORT SCOTLAND
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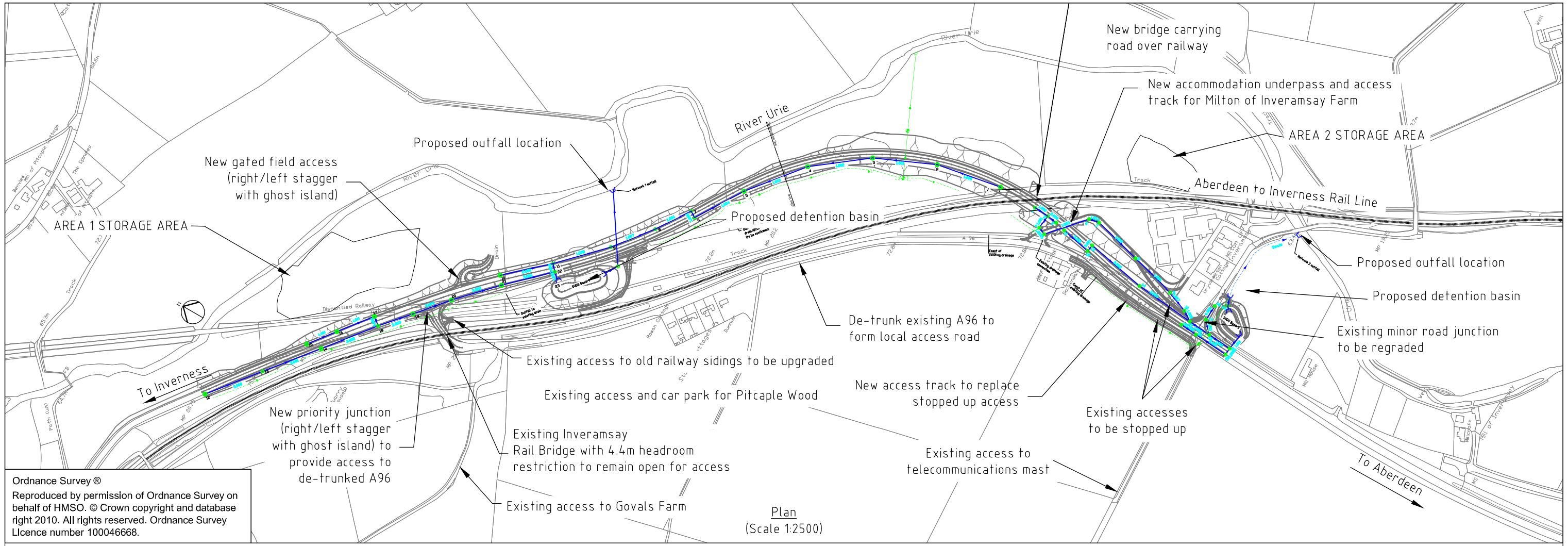
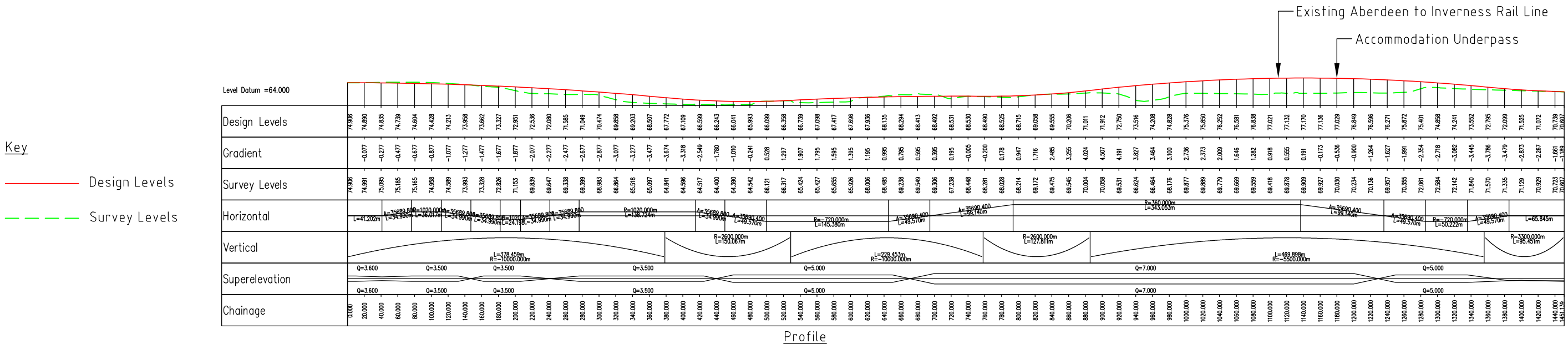
Figure 10.1



Plan
(Scale 1:2500)



Profile
(Scale H1:2500; V1:1000)

A96 Inveramsay Bridge Improvement

Drainage Proposals and Flood Storage Compensation

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Figure 10.2