



Appendix A10.6 – Otter

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1 Introduction

1.1 General Background

- 1.1.1 This Appendix reports the assessment of potential impacts on otters in the vicinity of the Northern Leg of the proposed scheme.
- 1.1.2 To aid the interpretation of the assessment, the five component route sections for the Northern Leg are as follows:
- Section NL1 ch314800 – 316000 (Derbeth to Tulloch Road);
 - Section NL2 ch316000 – 317400 (SAC Craibstone);
 - Section NL3 ch317400 – 322600 (A96 to Nether Kirkton);
 - Section NL4 ch322600 – 325370 (Nether Kirkton to Corsehill); and
 - Section NL5 ch325370 – 331000 (Corsehill to Blackdog).
- 1.1.3 Studies on otters were included as part of the Ecological Impact Assessment (EclA) and were undertaken in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 10 & 11 and the Environmental Impact Assessment (Scotland) Regulations 1999. In addition, the assessment was undertaken with cognisance of draft Institute of Ecology and Environmental Management (IEEM) guidelines.
- 1.1.4 These studies included desk-based consultation to collate existing information about otters in the area affected by the scheme and field surveys to provide current data about the status of otter populations.
- 1.1.5 Data from these studies were also collated to provide information to undertake an appropriate assessment of the proposed scheme on the River Dee Special Area of Conservation (SAC) (beyond Northern Leg study area) in relation to the requirements of Article 6.3 and 6.4 of the EU Habitats Directive. This information will be presented in a separate document, and is outside the scope of this report and the Environmental Statement.

Survey Aims

- 1.1.6 The purpose of the field survey was to determine the presence and status of otters in the study area so that an assessment could be made of the impacts of the proposed scheme on otters. Thus, the aims of the survey were to:
- assess the presence and status of otter populations in the study area,
 - assess the quality of riparian habitat present and evaluate the ecological importance of the area for otters;
 - assess any impacts the proposed scheme may have upon the local otter population; and
 - identify appropriate mitigation measures and determine any residual impacts.

1.2 Background

Biology

- 1.2.1 Otters are members of the *Mustelidae* family that also includes weasels, stoats, badgers, polecats and mink. There are 13 species of otter worldwide although only the European otter (*Lutra lutra* L.) (hereafter referred to as otter) is native to Britain (Mason & Macdonald, 1986). The diet of otters

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varies but fish generally comprise over 80% with other prey including birds, amphibians, molluscs, crustaceans and small mammals. In the Dee and Don catchments in Aberdeenshire, otter diet consists of over 90% fish, mostly salmonids (Kruuk et al., 1993). Otters generally favour riparian habitat although they may travel several miles over land to reach waterbodies or to cross between river catchments (Jefferies, 1988). In Britain otters tend to be largely nocturnal where they occur in fresh water habitats (Kruuk, 1995; Environment Agency 1999; Grogan et al., 2001) and diurnal in coastal areas (Kruuk, 1995).

- 1.2.2 Otters occupy a home range, which is a well-defined area where otters feed, rest and reproduce (Woodroffe, 2001). The size of an otter's range depends on the quality of the habitat and food supply (Kruuk, 1995). A typical home range may include a river, side streams, ponds and adjacent woodlands and wetlands. Radio-tracking studies have shown that in the Dee and Don catchments, male home range sizes average 32km but may be as long as 80km, with female ranges averaging 20km (Kruuk, 1995). In these studies, female and young otters foraged and spent most of their time in small streams and lochs while males were usually based on larger rivers such as the Dee and Don, with frequent forays into the female ranges (Kruuk, 1995). Otters mark their range by defecating (sprainting) in these areas. Otter spraint (faeces) is often found in conspicuous locations such as under bridges, on prominent rocks and overhanging tree roots or boughs (Mason & Macdonald, 1986; Environment Agency, 1999), and is generally located near important resources (Kruuk, 1995).
- 1.2.3 Home ranges may contain up to 30 resting sites and several sites may be used in an area with a plentiful food supply. These resting sites take a variety of forms including underground dens or 'holts', located in places such as cavities in the roots of bankside trees, piles of logs, flood debris, drains, caves and holes in rock-falls. Otter holts sometimes have one entrance underwater and at least one entrance above the high water mark, but may be located well away from the water's edge. The more secure sites used for breeding are usually safe from disturbance and frequent flooding, and may be some distance from water with females taking care not to leave any signs of their presence. Otters may also frequently use resting sites above ground in reed beds, tall herb vegetation and scrub. These above ground resting sites are often referred to as 'couches' (Environment Agency, 1999). Some individuals mainly use couches, even for breeding, and rarely use holts; on average along streams in Aberdeenshire, otters have been shown to spend 58% of day-time resting periods in couches (Kruuk et al., 1998).

Status and Legal Protection

- 1.2.4 The otter was once widespread throughout Britain. Between the 1950s and 1970s populations declined rapidly due to the pollution of watercourses, especially by organochlorines such as dieldrin (Jefferies, 1989). The decline now appears to have halted as a result of national and international legislation to protect otters as well as positive conservation management (Environment Agency, 1999). However, the otter is still classified by the International Union for the Conservation of Nature (IUCN) as a 'near threatened' species (IUCN, 2001), and numbers of otters killed on UK roads are of serious concern (Philcox et al., 1999).
- 1.2.5 Otters are protected under European legislation, being listed in Annexes IIa and IVa of EC Directive 92/43, 'The Conservation of Natural Habitats and of Wild Flora and Fauna' (the Habitats Directive). The above legislation is transposed into UK law by the Conservation (Natural Habitats, &c.) Regulations 1994 (Regulation 38), the otter being included in Schedule 2 of the Regulations. This legislation requires the UK to manage linear features that aid the migration and dispersal of species (e.g. rivers and banksides). It also enables the designation and conservation of Special Areas of Conservation (SACs), with otters sometimes being a reason for site designation. A further requirement of these statutes is that otter populations are maintained at a favourable conservation status (JNCC, 2006).
- 1.2.6 In the UK otters are fully protected under the Wildlife and Countryside Act 1981 (as amended) through inclusion in Schedule 5. The Nature Conservation (Scotland) Act (2004) extends the protection of birds, animals and plants by revising Part 1 of the Wildlife and Countryside Act 1981

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to include the term recklessly. Under the above legislation it is an offence to *inter alia*: intentionally and/or recklessly kill, injure or take otters; deliberately disturb otters (whether in a holt/couch or not); and/or intentionally or recklessly obstruct, damage or destroy otter holts or couches (JNCC, 2006).

- 1.2.7 The otter is also listed on Appendix 1 of the Convention on International Trade of Endangered Species (CITES) and Appendix II of the Bern Convention (Convention on the Conservation of European Wildlife and Natural Habitats, to which the UK is a signatory. The European sub-species is listed as 'globally threatened' on the IUCN/World Conservation Monitoring Centre Red Data List (JNCC, 2006).
- 1.2.8 The UK Biodiversity Steering Group identified the otter as a species of conservation concern resulting in a number of guidelines being drawn up to protect otters and their habitat. The targets of the ensuing UK Species Action Plan (UK SAP) for otters, are:
- to maintain and expand existing otter populations; and
 - by 2010 restore breeding otters to all catchments and coastal areas where they have been recorded since 1960.

2 Methods

2.1 Existing Data

- 2.1.1 Consultation was undertaken with a variety of statutory and non-governmental organisations including Scottish Natural Heritage (SNH), North East Scotland Biological Records Centre (NESBReC), Grampian Badger Survey and City of Aberdeen Council. The National Otter Survey of Scotland (Green & Green, 1997) was also consulted to gain information on otter distribution in the Aberdeen area.

2.2 Survey Methods

Field Survey

- 2.2.1 Because otters avoid disturbance and are largely nocturnal, surveys usually have to be carried out by searching for otter field signs. In the present study, all watercourses and waterbodies within a 1km wide corridor centred on the proposed route alignment (see Figures 10.6a - g) were surveyed for signs indicative of the presence of otters, including:
- otter spraint;
 - footprints;
 - actual, possible or potential resting sites. These include underground 'holts' e.g. beneath the roots of bankside trees; or above ground 'couches' e.g. in reedbeds;
 - slides or other well-used access points to watercourses (though additional evidence would be required to positively confirm such as indicative of otter presence);
 - feeding remains e.g. fish carcasses (though additional evidence would be required to positively confirm such as indicative of otter presence); and/or
 - sightings, including otter Road Traffic Accidents (RTAs).
- 2.2.2 Otter surveys were conducted over two to three-week periods in May 2004 and January/February 2005 to account for seasonal variations in otter activity. In general, these surveys only attempted to identify terrestrial habitats of otters lying within 10 metres of a waterbody, although in some areas where otter signs were abundant, the survey was extended to include adjacent habitats. Each watercourse was surveyed at least once and return visits were made to all major

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watercourses and waterbodies (those identified in Table 4), to confirm the status of otters using them.

2.2.3 In addition to the above standard survey methodology, a concerted effort was made to ascertain the terrestrial routes of otters. This involved searching for otter tracks in the snow during February and March 2005. Only large watercourses and waterbodies were targeted in this survey. The survey results were reviewed against the current design, and no further surveys were considered necessary to undertake this assessment.

Habitat Quality Assessment

2.2.4 In addition to the otter surveys, data relating to the water quality of water features was obtained so that a general assessment could be made as to the suitability of the habitat for otters. This involved a review of the Freshwater and Fish Reports (see Appendices A10.15 and A10.16) to obtain data on water quality classifications, riparian habitat and fish populations.

2.2.5 Factors that are likely to influence the survival of local otters are judged to be of the greatest importance when evaluating habitat value. As otter populations may be limited by prey abundance, areas possessing or allowing access to optimal foraging habitat are judged to be of key importance. Areas possessing sub-optimal foraging habitat but have other habitat qualities (e.g. low levels of disturbance and dense riparian cover) are of lesser importance, as they are less likely to be vital to local otter survival (Kruuk et al., 1993). Details of how values of importance to the local otter population were derived are given below:

- **Very High Value** - A locally unique key resource, vital for maintenance of existing otter population.
- **High Value** - Optimal foraging habitat owing to locally abundant prey items coupled with low disturbance and suitable riparian habitat for cover and lying-up sites i.e. holts and couches.
- **Medium Value** - Despite abundant prey items, location is considered sub-optimal due to either moderate disturbance levels or poor riparian habitat for cover and/or lying-up-sites.
- **Low Value** - Location offers marginal food resources and/or poor habitat/cover and/or suffers from substantial disturbance.

2.3 Survey Limitations

2.3.1 Otter field signs can be found at any time of the year. Surveys took place under ideal conditions during prolonged dry spells thus maximising the chances of finding otter field signs such as spraint, and allowing surveyors to generally survey from in the channel owing to low water levels. However due to the variable nature of wildlife and the limitations of survey methods it is possible that not all field signs present will have been recorded.

2.4 Evaluation of Ecological Importance

2.4.1 The ecological value of the local otter population was determined by reference to any designations and the results of the consultations, literature review and field surveys. The criteria used were based on the Ratcliffe Criteria (Ratcliffe, 1977) used in the selection of biological Sites of Special Scientific Interest (SSSI). Sites and features were classified according to the general criteria identified in Table 1.

Table 1 – Evaluation of Ecological Receptor

Value/Importance	Criteria
International (European)	Habitats An internationally designated site or candidate site (SPA, pSPA, SAC, cSAC, Ramsar site, Biogenetic/Biosphere Reserve, World Heritage Site) or an area which would meet the published

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Value/ Importance	Criteria
	<p>selection criteria for designation. A viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas of such habitat which are essential to maintain the viability of a larger whole. Any river classified as excellent A1 and likely to support a substantial salmonid population. Any river with a Habitat Modification Score indicating that it is Pristine or Semi-Natural or Obviously Modified.</p> <p><u>Species</u> Any regularly occurring population of internationally important species, threatened or rare in the UK. i.e. a UK Red Data Book species categories 1& 2 of UK BAP) or of uncertain conservation status or of global conservation concern in the UK BAP. A regularly occurring, nationally significant population/number of an internationally important species.</p>
<p>National (Scottish)</p>	<p><u>Habitats</u> A nationally designated site (SSSI, ASSI, NNR, Marine Nature Reserve) or a discrete area which would meet the published selection criteria for national designation (e.g. SSSI selection guidelines). A viable area of a priority habitat identified in the UK BAP, or of smaller areas of such habitat essential to maintain wider viability. Any river classified as excellent A1 and likely to support a substantial salmonid population. Any river with a Habitat Modification Score indicating that it is Pristine or Semi-Natural or Obviously Modified.</p> <p><u>Species</u> A regularly occurring, regionally or county significant population/number of an internationally/nationally important species. Any regularly occurring population of a nationally important species which is threatened or rare in the region or county (see local BAP). A feature identified as of critical importance in the UK BAP.</p>
<p>Regional (North East Scotland)</p>	<p><u>Habitats</u> Sites which exceed the County-level designations but fall short of SSSI selection criteria. Viable areas of key habitat identified in the Regional BAP or smaller areas of habitat essential to maintain wider viability. Viable areas of key habitat identified as of Regional value in the appropriate SNH Natural Heritage Future area profile. Any river classified as excellent A1 or good A2 and capable of supporting salmonid population. Any river with a Habitat Modification Score indicating that it is significantly modified or above.</p> <p><u>Species</u> Any regularly occurring, locally significant population of a species listed as being nationally scarce which occurs in 16-100 10 km squares in the UK or in a Regional BAP or relevant SNH Natural Heritage Future area on account of its regional rarity or localisation. A regularly occurring, locally significant population/number of a regionally important species. Sites maintaining populations of internationally/nationally important species that are not threatened or rare in the region or county.</p>
<p>Authority Area (e.g. County or District) Aberdeenshire/ City of Aberdeen</p>	<p><u>Habitats</u> Sites recognised by local authorities (e.g.) District Wildlife Sites (DWS) and Sites of Interest for Nature Conservation (SINS). County/District sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves (LNR). A viable area of habitat identified in County/District BAP or in the relevant SNH Natural Heritage Future area profile. A diverse and/or ecologically valuable hedgerow network. Semi-natural ancient woodland greater than 0.25 ha. Any river classified as good A2 or fair B and likely to support coarse fishery. Any river with a Habitat Modification Score indicating that it is significantly modified or above.</p> <p><u>Species</u> Any regularly occurring, locally significant population of a species listed in a County/District BAP due to regional rarity or localisation. A regularly occurring, locally significant population of a County/District important species. Sites supporting populations of internationally/nationally/regionally important species that are not threatened or rare in the region or county, and not integral to maintaining those populations. Sites/features scarce in the County/District or which appreciably enrich the County/District habitat resource</p>
<p>Local (immediate area or local village importance)</p>	<p><u>Habitats</u> Areas of habitat that appreciably enrich the local habitat resource (e.g. species-rich hedgerows, ponds etc). Sites that retain other elements of semi-natural vegetation that due to their size, quality or the wide distribution within the local area are not considered for the above classifications. Semi-natural ancient woodland smaller than 0.25 ha. Any river classified as fair B or poor C and unlikely to support coarse fishery. Rivers with a Habitat Modification Score indicating that it is severely modified or above.</p> <p><u>Species</u> Populations/assemblages of species that appreciable enrich the biodiversity resource within the local context. Sites supporting populations of county/district important species that are not threatened or rare in the region or county, and are not integral to maintaining those populations.</p>
<p>Less than Local (Limited ecological importance)</p>	<p>Sites that retain habitats and/or species of limited ecological importance due to their size, species composition or other factors. Any river classified as impoverished D and/or and with a Habitat Modification Score indicating that it is severely modified.</p>

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2.4.2 Within the context of the study area covered by this report, these criteria have been used to evaluate the otter population as follows:

- **International** – of European importance;
- **National** – of UK or Scottish importance;
- **Regional** – of North East Scotland importance;
- **County** – of importance in Aberdeenshire / City of Aberdeen;
- **Local** – of immediate local area or village importance; or
- **Less than local** – of limited ecological importance

2.5 Impact Assessment

2.5.1 In the assessment of significance of impact, consideration has been given both to the magnitude of impact and to the sensitivity of the receiving environment or species. The sensitivity of a feature was determined with reference to its level of importance although other elements have been taken into account where appropriate.

Impact Magnitude

2.5.2 Methods of impact prediction used included direct measurements, correlations, expert opinion and information from previous developments. Impacts include those that are predicted to be direct, indirect, temporary, permanent, cumulative, reversible or irreversible. The magnitude of each impact was assessed independently of its value or statutory status. Magnitude criteria are presented in Table 2, and include beneficial impact criteria in accordance with IEEM guidance (2002).

Table 2 - Impact Magnitude

Impact Magnitude	Criteria
High negative	The change is likely to permanently, adversely affect the integrity of an ecological receptor, in terms of the coherence of its ecological structure and function, across its whole area that enables it to sustain the habitat, complex of habitats and/or the population levels of species of interest.
Medium negative	The change is not likely to permanently adversely affect the ecological receptor's integrity but the effect on the receptor is likely to be substantial in terms of its ecological structure and function and may be significant in terms of its ecological objectives. Likely to result in changes in the localised or temporary distribution of a species but not affect its population status at a regional scale or permanently.
Low negative	The change may adversely affect the ecological receptor, but there will probably be no permanent effect on its integrity and/or key attributes and is unlikely to be significant in terms of its ecological objectives.
Negligible	The change may slightly adversely affect the receptor but will have no permanent effect on the integrity of the receptor or its key attributes. There are no predicted measurable changes to the species assemblage or population and the effect is unlikely to result in an increased vulnerability of the receptor to future impacts.
Positive	The change is likely to benefit the ecological receptor, and/or enhance the biodiversity resource of the receptor.
High positive	The change is likely to restore an ecological receptor to favourable conservation status, contribute to meeting BAP objectives (local and national) and/or create a feature that is of recognisable value for biodiversity.

Impact Significance

2.5.3 The significance of impact has been determined according to the matrix system illustrated in Table 3. Impacts can be beneficial or adverse, either improving or decreasing the ecological status health or viability of a species, population or habitat.

Table 3 - Impact Significance

Magnitude Importance	High negative	Medium negative	Low negative	Negligible	Positive	High positive
International	Major	Major	Moderate	Negligible	Moderate	Major
National	Major	Major	Moderate	Negligible	Moderate	Major
Regional	Major	Moderate	Minor	Negligible	Minor	Moderate
County	Moderate	Moderate	Minor	Negligible	Minor	Moderate
Local	Minor	Minor	Minor	Negligible	Minor	Minor
Less than Local	Minor	Negligible	Negligible	Negligible	Negligible	Negligible

2.5.4 The level of significance of impacts predicted on ecological receptors is an important factor in influencing the decision-making process and determining the necessity and/or extent of mitigation measures. In general, adverse impact significance greater than or equal to Moderate would require specific mitigation to be undertaken to ameliorate the impact significance to acceptable levels.

2.5.5 Where direct mortality during construction or due to a road traffic accident has been considered likely, the magnitude of impact is assessed as being high negative, regardless of the number of otters involved. This is due to the otter's status as a European protected species of international importance, although the significance of the impact has been assessed according to the importance of the Habitat Area. Therefore, such impacts will be assessed as having a Major or Moderate adverse level of significance on the integrity of the receptor and consequently any impact predicted to involve mortality will require specific mitigation measures to address these impacts.

3 Baseline

3.1 Data Search

3.1.1 In response to the decline of otter populations in the UK, a number of national population surveys were carried out in 1977-79, 1984-86 and 1991-94. In the final survey, 88% of sites surveyed in Scotland proved positive, representing a rise of 15% over the results from the first survey (Green & Green, 1997). Otters are now believed to be present in every river catchment in Scotland (Grogan et al., 2001).

3.1.2 The National Otter Survey of Scotland 1991-94 (Green & Green 1997) identified a rise of 2% in the number of positive sites in the Grampian region. The majority of negative sites were along isolated coastal fringes.

3.1.3 Most of the consultees possessed no records of otters in the survey corridor. Grampian Badger Survey, however, provided three records of otter RTAs in the survey area, dating from 1995 to 2001 (see Figures 10.6e - 10.6g):

- A947 road at NJ 891151;
- B977 road at NJ 892144; and
- B999 road at NJ 940154.

3.2 Survey Results

- 3.2.1 Although all water features were surveyed for otters only 25 have been included in the results section as the other features were covered culverts or field drains. Eight of these were watercourses considered as part of the Freshwater Ecology assessment (see Appendix A10.16) and the remaining 17 represent additional water features such as ponds and lochs that showed signs of otter use or were regarded as being potentially important to otters.
- 3.2.2 The main waterbodies within the study area include Gough Burn, Craibstone Burn, Green Burn (all Section NL2), Bogenjoss Burn (Section NL3), the River Don, Goval Burn, Parkhill Loch, Goval Mill Lade, Corsehill Burn (all Section NL4), Corby Loch, Lily Loch and Black Dog Burn (all Section NL5). Otter signs were abundant throughout the study area with the Goval Burn and River Don showing the greatest amount of activity. In total over two thirds of the water features surveyed (excluding field drains) showed signs of otters. All of these locations are shown in Figures 10.6a – g. Otter use of various features and a summary of habitat quality for otters are provided in Table 4. The table provides information on disturbance levels (based on a scale of very low to very high), the type and quality of the riparian habitat present and water quality/prey availability (see Freshwater and Fish reports in Appendices A10.15 and A10.16). Where signs of otters were recorded during the surveys, a description of the type of field signs encountered and the grid reference of lying-up sites are given. None of the field ditches surveyed showed signs of otter activity and these are therefore not included in the table.

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Table 4 - Habitat Features of Use to Otters

Water Feature	Grid Ref	Disturbance	Riparian Habitat	Water Quality/Prey availability	Otters	Holt/Couch	Observations
Section NL1							
Kepplehill Burn	NJ 865091 - 876093	Low: burn surrounded by farmland.	Dense gorse growth along stream edges offers good cover but surrounding area is fairly open.	Average Score Per Taxa (ASPT) score indicates water quality is good. However, the burn is likely to dry up during the summer, meaning that substantial fish populations are unlikely. Salmonids, brook lamprey and eel may possibly be present.	No signs evident	None evident	None.
Section NL2							
Gough Burn	NJ 863096 - 875104	Low-medium: upstream of existing road the burn flows through a golf course, but majority flows through woodland (Gough Burn DWS) occasionally used by walkers.	Upper reach of burn flows through golf course and is moderately open. Banks on lower reaches are covered with brushwood, ferns and rhododendron, all providing excellent lying-up habitat.	ASPT score suggests water quality is excellent. Pools and riffles provide good fish habitat. Don District Salmon Fisheries Board (DonDSFB) reports that the burn supports salmonids, eel, brook lamprey and minnow.	Present	None evident	Spraint was found at several locations along the burn.
Craibstone Burn	NJ 864106 - 876107	Low: relatively undisturbed woodland with occasional walkers.	Mixed woodland provides good cover and lying-up sites.	ASPT score suggests water quality is excellent. Pools and riffles provide good fish habitat. Burn likely to support salmonids, eel and brook lamprey.	Present	None evident	Several sprainting sites were recorded along this reach.
Craibstone Pond	NJ 868109	Low: occasional walker along adjacent track.	Dense emergent vegetation and woodland provide excellent cover and lying-up sites for otters.	No data available but habitat unlikely to support fish. Amphibians present.	No signs evident	None evident	No signs found but the pond is close to and linked to Craibstone Burn.
Green Burn	NJ 863111 - 877111	Low-medium: although section of the burn flows through undisturbed woodland, a 250m reach of the burn flows adjacent to A96 (T) and scrap yard.	Upper reach of the burn flows through mixed woodland, which provides excellent lying-up habitat. Piles of boulders and dead wood provide potential holt sites. Downstream of A96 (T), the banks are lined with grass, broom and bramble- provide excellent cover for otters and potential lying-up areas.	ASPT score suggests water quality is excellent. Pools and riffles provide good fish habitat. DonDSFB reports that the burn supports salmonids, eel, brook lamprey and minnow.	Present	None evident	Otter spraint was found at several locations along this reach of the burn.

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Water Feature	Grid Ref	Disturbance	Riparian Habitat	Water Quality/Prey availability	Otters	Holt/Couch	Observations
Section NL3							
Far Burn	NJ 861129 - 865126	Very low-high: in its upper reaches the burn flows through undisturbed farmland and woodland (Farburn wood DWS). Downstream however the burn flows through the centre of Kirkhill Industrial Estate.	Farburn Wood (DWS) provides good cover for otters and potential resting sites.	No data available but burn likely to support salmonids.	Present	None evident	Although no otter signs were recorded on the burn itself, otter footprints were recorded in the snow where the burn flows under a farm access track. The otter tracks led northeast overland, indicating that otters are taking terrestrial routes, possibly to/from Bogenjoss Burn.
Bogenjoss Burn	NJ 853133 - 863150	Very low-low: majority of burn flows through secluded woodland and wet grassland away from buildings and humans.	Abundant good cover in the form of mature broad leaved woodland and wet grassland dominated by gorse and <i>Juncus</i> spp.	ASPT score indicates water quality is good. Pools and riffles provide good fish habitat. Burn likely to support salmonids, eel and brook lamprey.	Present	None evident	Otter spraint and footprints were found at various points along this reach of burn although the majority of signs were located along the lower survey section. Otters have also regularly been seen crossing over land to the south of Monument Wood (Farmer, Pitmedden House, pers.comm).
Gravel Pits	NJ 873148	High: disturbance during the day as a result of quarry vehicles and people.	Patches of scattered scrub but mainly open.	No data available but habitat unlikely to support fish. Amphibians present.	No signs evident	None evident	None.
Section NL4							
River Don	NJ 877155 - 889141	Low-medium: west bank bordered by farmland with occasional walker and angler. Low: east bank fringed by farmland.	The west bank of the river is unfenced and subject to heavy grazing by sheep, resulting in poor cover for otters. Piles of rubble provide potential holt sites. The east bank of the river is also characterised by short grass but broom bushes with dense patches of emergent vegetation provide good cover in certain areas.	ASPT score suggests water quality is good. Pools and riffles provide good fish habitat. Don DSFB reports that the river supports salmonids, eel, brook lamprey, minnow and stickleback.	Present	Holt (Holt 1) recorded on west bank of river at: NJ8837014339	High densities of spraint and footprints were found along the entire survey reach, signifying constant use by otters. Prints belonging to a bitch otter and her cub were recorded in the snow adjacent to the River Don in February 2005. An active holt (holt 1) comprising a hole in the riverbank was located on the west bank of the river, the outside of the holt being marked with otter spraint, sign heaps and adult otter footprints. Directly opposite the holt on the east bank, a well-used otter pathway leads across the corner of a field to another holt (holt 2) on the Goval Burn. The pathway was marked with large quantities of spraint and sign heaps at each end.

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Water Feature	Grid Ref	Disturbance	Riparian Habitat	Water Quality/Prey availability	Otters	Holt/Couch	Observations
Goval Burn	NJ 885143 - 893159	Low: farmland and occasional wooded areas.	The lower reaches of this part of the burn have been fenced/walled resulting in a five metre wide riparian zone on each bank. Tall bankside vegetation dominates with occasional areas of wooded riparian habitat, both providing excellent cover for otters.	ASPT score suggests water quality is good. Pools and riffles provide good fish habitat. Don DSFB reports that the river supports salmonids, eel, brook lamprey and minnow.	Present	Holts (Holts 2-6) recorded at: NJ 8915714872 NJ 8915714872 NJ 8935015027 NJ 8943015195 Couches (Couches 1-3) recorded at: NJ 886147 NJ 888148 NJ 892149	Numerous sprainting sites were recorded along with footprints and a large salmon carcass that had been partially eaten by an otter. Adult otter footprints and sign heaps were recorded under Goval Bridge where the river is crossed by the A947 while footprints were also observed along the top of the riverbank leading over the B977 road. Otters are lying-up along the burn in dense riparian vegetation while four holts were recorded within the riverbank and one in a pipe (holt 5). An extensively excavated holt (holt 3) was located in the riverbank beneath a semi-mature sycamore tree, the entrance being marked with large quantities of spraint, adult otter footprints and bedding. Otter tracks were observed running south from this holt, across the Buchan Way. It is likely that otters are using this as a terrestrial short-cut route to Parkhill Loch. Two of the remaining holts (holts 4 and 6) were located in shallow cavities in the riverbank, these being marked with spraint and runs leading from them.
Goval Mill Lade	NJ 888148 - 894155	Low: mainly farmland although section of canal runs parallel to A947.	Relatively open stone and concrete banks representing poor cover upstream of A947 but below this point dense coverage of gorse, broom and emergent vegetation provide excellent cover.	ASPT score suggests water quality is good. Lade likely to support salmonids, eel, brook lamprey, minnow and stickleback.	Present	None evident	Numerous sprainting sites were recorded along the lade. An otter pathway was recorded where the A947 crosses the lade, with spraint on both sides of the road. An otter RTA was also recorded here on 23 February 2005 (pers.obs). Another well-used pathway was observed leading from the lade to Goval Burn, this also being marked with spraint at both ends of the path.
Corsehill Burn	NJ 893148 - 901161	Very low: mainly farmland.	Stone lined sparsely vegetated stream but upper reaches flow through wet woodland in Red Moss (on the SNH peatland inventory), this area providing excellent cover.	Salmonids and eel likely to be present.	Present	None evident	Numerous sprainting sites were recorded along the entire course of the burn, from its source in Red Moss to its confluence with Goval Burn.

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Water Feature	Grid Ref	Disturbance	Riparian Habitat	Water Quality/Prey availability	Otters	Holt/Couch	Observations
Corsehill Burn South	NJ 898150 - 911148	Low: mainly farmland and secluded woodland.	Good cover in the form of mature coniferous woodland along middle and upper reaches but open in lower reaches.	No data available but burn likely to support salmonids.	Present	None evident	Several spraints were recorded along a wooded section of burn.
Corsehill Pond	NJ899152	Very low: mainly farmland.	Moderate cover in the form of dense swards of <i>Juncus</i> spp.	No data available but habitat unlikely to support fish. Amphibians present.	No signs evident	None evident	None
Parkhill Loch	NJ 895141	Low: surrounded by woodland and scattered trees although potential disturbance from occasional recreational use of loch.	The loch is fringed by woodland with a dense understorey of bracken, willow and alder providing excellent cover where otters are likely to be lying-up. Reedbeds and an island within the loch provide additional cover and lying-up opportunities.	SEPA reports that the loch supports salmonids.	Present	None evident	Only the south-west shore of the loch was surveyed. Otter footprints and spraint were recorded on the loch and along the small burn that flows from the loch into the River Don. A pathway used by otters and badgers runs parallel to the burn between Parkhill Loch and the River Don.
Section NL5							
Red Moss Burn	NJ 914156 - 923147	Very low: mainly farmland and wet woodland.	Lower reaches of burn offer good cover in the form of broom and gorse while upper reaches flow through wet woodland composed of birch, goat willow and alder.	ASPT score suggests water quality is fair. Burn likely to support salmonids, eel, brook lamprey and stickleback.	Present	Potential Holt (Holt 7) recorded at: NJ 923148	The lower reaches of the burn were marked with copious quantities of spraint, a potential holt marked with spraint being recorded in a rabbit burrow in the bankside. A female otter was killed in 1998 at NJ 923152 where a minor road crosses the burn. It was also reported that an adult dog otter had a holt site along this reach of the burn (Ian Muir, Corby Loch Angling Syndicate, pers.comm).
Lily Loch	NJ 921145	Very low: loch surrounded by farmland.	Excellent cover with scrubby birch and willow surrounding entire loch plus emergent vegetation.	SEPA reports that loch supports salmonids. Eel also present (Ian Muir, Corby Loch Angling Syndicate, pers.comm).	Present	None evident	Otter spraint was found on a grass hummock immediately next to the loch.

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Water Feature	Grid Ref	Disturbance	Riparian Habitat	Water Quality/Prey availability	Otters	Holt/Couch	Observations
Corby Loch	NJ 924145	Low: loch surrounded by farmland and scrub but occasional angler.	Dense emergent vegetation and scattered scrub provide excellent couch habitat along western shore but sparse cover elsewhere around loch.	SEPA reports that loch supports salmonids.	Present	Couch (Couch 4) recorded at: NJ922145	Otter footprints were noted at the northern edge of loch where Red Moss Burn enters. Several sprainting sites were also noted on the western shore with otter runs leading through the vegetation. A couch site (couch 4) marked with spraint was recorded on the western shore amongst tall bankside vegetation. A bitch otter and her two cubs were observed hunting on the loch in summer 2003. Two adult otters were spotted together on the loch the following year (Ian Muir, Corby Loch Angling Association, pers.comm). Incidentally a dead mink was also found on the western shore, this possibly being killed by an otter.
Loch-Hills Farm pond	NJ 912149	Low-medium: surrounded by farmland but directly next to sand and gravel pit access road.	Dense scrub and emergent vegetation provides excellent opportunities for couch sites and general cover.	No data available but habitat unlikely to support fish. Amphibians present.	No signs evident	None evident	None
Loch Greens pond	NJ 914152	Very low: pond surrounded by farmland.	Peat stained pond surrounded by dense stands of <i>Juncus</i> spp. with little other vegetative cover.	No data available but habitat unlikely to support fish or amphibians.	No signs evident	None evident	None
Sand Pit pond	NJ 933143	Very low: pond surrounded by farmland.	Dense tall stands of <i>Juncus</i> spp. along with patches of gorse provide ample opportunities for couch sites and general cover.	SEPA reports that pond supports salmonids. Amphibians present.	Present	None evident	Otter spraint was found on two rocks in the pond.
Gourdieburn Ponds	NJ 938152	Very low: ponds surrounded by farmland.	Dense stands of <i>Juncus</i> spp. and patches of reedmace provide good cover and potential couch sites.	No data available but habitat unlikely to support fish. Amphibians present.	No signs evident	None evident	None
Harehill Burn	NJ 945135 - 948143	Very low: burn surrounded by farmland	Burn is flanked by tall herbaceous vegetation and areas of scrub.	No data available but small numbers of salmonids possibly present in lower reaches.	No signs evident	None evident	None

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Water Feature	Grid Ref	Disturbance	Riparian Habitat	Water Quality/Prey availability	Otters	Holt/Couch	Observations
Black Dog Burn	NJ 959138 - 941151	Low-medium: upper reaches surrounded by farmland but lower reaches flow past A90 and housing.	Upstream of A90 (T) the burn flows through dense patches of gorse, broom and rushes providing excellent cover. Downstream of A90 (T) the burn is bordered by tall grass with scattered patches of gorse providing good cover.	ASPT score suggests water quality is good. Pools and riffles provide good fish habitat. Burn likely to support salmonids, eel and brook lamprey.	Present	Holt (Holt 8) recorded at: NJ 953143	Otter spraint was found at various points along the entire survey reach. A potential holt was found in a badger sett 10m from the burn. The entrance to the hole was marked with spraint while a strong smell of spraint emanated from inside the tunnel.
Middlefield Burn	NJ 954149 - 965140	Low-medium: surrounded by farmland but burn flows past A90.	Burn is flanked by tall herbaceous vegetation and areas of scrub.	No data available but burn likely to support salmonids.	No signs evident	None evident	None

3.3 Survey Results Summary

- 3.3.1 Otters are present throughout the AWPR Northern Leg study area. The greatest amount of otter activity was however noted on the River Don, Goval Burn and Corby and Lily Lochs. While otter field signs were not detected on several watercourses and all field drains, it is considered likely that otters do use these features. As such, given that otters are present throughout the survey area it must be assumed that all watercourses (no matter how small) in the study area support otters. It is also of note that otters are using both holts and couches for lying-up although the latter appear to be subject to seasonal use, with only one couch (couch 4) being recorded during the winter surveys.
- 3.3.2 While signs of otters are abundant in all sections of the Northern Leg, it is not possible to determine the number of individual otters present in the study area as the abundance of field signs has been shown to be a poor predictor of otter population size (Chanin 2003). However, based on the sizes of otter prints found, it is possible to say that there are at least four different otters in the survey corridor. There appears to be one large dog otter, a smaller sub-adult male or adult female and a bitch with a cub although these conclusions are tentative. A number of areas in the route corridor do offer ideal conditions for breeding but the fact that otters breed in secure, well hidden sites means that confirming these areas are used for breeding is extremely difficult (Liles 2003). It is also important to note that otters are using terrestrial routes to move through their ranges with otter sightings and otter signs being found remote from watercourses in isolated areas (see Figures 10.6d and 10.6e).

3.4 Habitat Quality Assessment

Section NL1

- 3.4.1 Kepplehill Burn is assessed as being of **low value** to otters as it is unlikely to support large fish populations and despite being undisturbed it only offers limited cover. Furthermore, no otter signs were recorded on the burn, which holds little water during the summer months. The burn does however drain from the slopes of Brimmond Hill, which represents the watershed between the Dee and Don catchments. The source of Kepplehill Burn is close to that of Brodiach Burn (a tributary of the River Dee) while Kepplehill Burn flows into Bucks Burn, which is a tributary of the River Don. Kepplehill Burn may therefore represent an important commuting route between the two catchments and otters may be taking terrestrial routes over the hill to move between the two river systems, these terrestrial movements being facilitated by the good gorse cover present on Brimmond Hill.

Section NL2

- 3.4.2 Gough Burn is a tributary of the River Don and supports several species of fish including salmonids and eel (see Fish Report in Appendix A10.15). The burn also offers good undisturbed cover for lying-up in the form of mature woodland with dead wood and dense thickets of rhododendron; the occasional upturned tree root plate provides further potential holt sites. The burn is therefore considered to be of **high value**. Craibstone Burn possesses similar habitat to Gough Burn providing undisturbed cover and potential lying-up sites in the wooded sections. The burn also supports fish populations and as such is assessed as being of **high value** to otters. Craibstone Pond is situated 100m north of Craibstone Burn (see Figure 10.6b), and is linked to it via a small drainage ditch. The pond is surrounded by undisturbed woodland and scrub with emergent vegetation in the pond. Despite these favourable habitat characteristics, the pond does not support fish, only seasonally abundant amphibian prey (see Amphibian Report in Appendix A10.9) and is therefore assessed as being of **medium value** to otters. In addition to supporting several species of fish including salmonids and eel, Green Burn flows through 400m of undisturbed mature woodland in Chapel Croft Wood, offering lying-up sites in dead wood, tree roots and piles of boulders. A short reach of the burn does flow adjacent to the A96 and a car repair works (see

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Figure 10.6b) although the majority of the burn is subject to low disturbance levels. Green Burn is considered as being of **high value** to otters.

Section NL3

- 3.4.3 Walton and Howemoss field ditches are both surrounded by undisturbed farmland and possess areas of good, dense cover in the form of herbaceous vegetation and gorse. The ditches are, however, susceptible to drying up in the summer months and are unlikely to support fish populations. The ditches are assessed as being of **low** value. Far Burn flows through farmland and Farburn Wood DWS in its upper reaches before flowing through the centre of Kirkhill Industrial Estate, resulting in low to high disturbance levels. Cover is limited to the DWS reach and substantial fish populations are unlikely meaning that the watercourse is judged to be a feature of **low value** to otters. Bogenjoss Burn also represents a feature of **high value** to otters. This assessment is based on the burn's very low disturbance levels and the good lying-up and foraging habitat provided. The middle and lower reaches are flanked by mature broad-leaved woodland while the upper reaches flow through dense gorse and wet grassland both of which offer good lying-up habitat. Furthermore Bogenjoss Burn supports salmonids and eel, and is a tributary of the River Don (see Figure 10.6d). The gravel pit ponds are located only a few hundred metres from the River Don (see Figure 10.6d) but are features of **low value** to otters. The four ponds are situated in a working quarry site and are subject to high levels of disturbance from machinery and humans. Furthermore the ponds are unlikely to support fish, while the surrounding habitat is bare earth with no vegetative cover.

Section NL4

- 3.4.4 The reaches of River Don that were surveyed had numerous sprainting sites indicating that otters use the river regularly. The river possesses good water quality and this coupled with in-channel features such as pools and riffles results in ideal habitat for fish, notably salmonids. Indeed the lower reaches of the River Don support several species of fish, with particularly high numbers of salmon, trout and eels (important prey items for otters). This reach of the Don is also relatively undisturbed with only the occasional walker or angler. With the exception of occasional patches of emergent vegetation the riverbanks possess little suitable cover for otters and there is a lack of mature bankside trees for holt sites. However an active holt (holt 1) with otter spraint and footprints at its entrance was recorded in the riverbank (see Figure 10.6e). The status of the River Don as an exceptional fishery and its likely function as a commuting route to other tributary streams and catchments (facilitating immigration and dispersal of otters) means that it is of the highest level of importance and the river is therefore considered to be a feature of **very high value** to otters.
- 3.4.5 The Goval Burn constitutes a core area of otter activity in the Northern Leg with three couches (couches 1-3), five holts (holts 2-6) and numerous other field signs such as prints, sign heaps and spraint sites being observed (see Figure 10.6e). The burn has good water quality and as it is a tributary of the River Don it is likely to receive runs of salmonids. The burn is surrounded by farmland with low disturbance levels, while excellent riparian cover such as dense emergent vegetation provides optimal lying-up habitat. The Goval Burn is a habitat of **very high value** to otters.
- 3.4.6 Goval Mill Lade runs parallel to the Goval Burn and is judged to be of **high value** to otters. The lade supports several species of fish including eels and is likely to be an important resource when the surrounding burns and rivers are in spate. The lade is subject to low disturbance levels being surrounded by farmland although stone-lined banks east of the A947, provide poor cover for otters. West of this point however, Goval Mill Lade is bordered by broom and gorse scrub as well as in-channel emergent vegetation, all of which provide good lying-up habitat. An otter RTA was recorded where the A947 crosses the watercourse and an otter pathway can be found on the north bank of the lade (see Figure 10.6e) indicating that otters are crossing the road at this point.
- 3.4.7 Otter spraint was found at various points along Corsehill Burn from its source in Red Moss to its confluence with Goval Burn. The burn does however possess limited cover and is lined by

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stonewalls for much of its course. Otters are likely to forage for salmonids in the stream as well as using it as a commuting route to areas such as Red Moss and beyond to Corby Loch (see Figures 10.6e-f). It is also possible that otters are lying-up in wet woodland at Red Moss at the head of the burn, this area providing excellent undisturbed cover. Taking this information into account, Corsehill Burn should be considered a feature of **medium value** to otters.

- 3.4.8 Corsehill Burn South is a small stream that flows for several hundred metres through undisturbed coniferous woodland, offering good cover for otters along this reach. On leaving this area of woodland the burn flows underground for approximately 200m before resurfacing on the north side of the B977 road (see Figure 10.6e). It is possible that otters are following the stream eastwards and then travelling over land to Corby and Lily Lochs. The lower reaches of the burn suffer from heavy poaching by cattle, resulting in poor quality habitat for otters. The burn is unlikely to support large numbers of fish (the passage of migratory fish being obstructed) and is therefore assessed as being of **low value** to otters. Corsehill Pond is a small pond situated 150m from Corsehill Burn. It is surrounded by farmland, resulting in very low disturbance levels although swards of *Juncus* spp surrounding the pond provide limited cover. The habitat is unlikely to support fish although amphibians are present and provide a seasonal food resource. The pond is considered to be of **low value** to otters.
- 3.4.9 Parkhill Loch is a large waterbody connected to the River Don via a small burn, and is likely to be an important foraging resource for otters, especially when other principal foraging areas such as the River Don are in spate. Furthermore, undisturbed cover in the form of reedbeds, woodland and an island within the loch provide numerous lying-up opportunities, resulting in the loch being a feature of **high value** to otters.

Section NL5

- 3.4.10 Red Moss Burn has good undisturbed cover in the form of gorse, broom and emergent vegetation. The lower reaches of the burn near its confluence with Corby Loch are heavily marked with spraint and it is thought that a dog otter frequently lies-up along the burn (Ian Muir, Corby Loch Angling Syndicate, pers.comm). Otters are likely to forage in the lower reaches of the burn and it provides a potentially important commuting route between the River Don and Corby Loch (via Corsehill Burn and Goval Burn) (see Figures 10.6e-f). Indeed, a bitch otter was killed during high water levels in 1998 attempting to cross the road that passes over the burn at NJ 923152 (Ian Muir, Corby Loch Angling Syndicate, pers.comm) (see Figure 10.6d.6). Red Moss Burn is assessed as being of **high value** to otters.
- 3.4.11 Loch-Hills Farm pond represents a feature of **medium value** to otters. The pond is flanked by scrub and tall emergent vegetation that offers cover and lying-up sites for otters. However, a limiting factor is that there appears to be few or no fish present meaning that amphibians, small mammals and birds represent the only food resources. The pond also suffers minor disturbance from quarry vehicles, as it is located directly next to the sand and gravel pit access road. To the northeast lies Loch Greens pond, a feature of **low value** to otters. The pond is used regularly by cattle as a drinking point and therefore is subject to disturbance and trampling, with no surrounding vegetative cover. Furthermore, the pond does not appear to provide valuable prey items owing to the peaty (and therefore acidic) nature of the water. No fish or amphibians were observed in this pond (see Amphibian Report in Appendix A10.9).
- 3.4.12 Corby Loch is the largest area of open water in the route corridor and along with Lily Loch and Bishops Loch, represents a SSSI for birds (see Breeding Bird Survey Report in Appendix A10.4). Otter footprints were noted on the northern shore of the loch where Red Moss Burn enters (see Figure 10.6d.6). Several sprainting sites were recorded on the western shore with otter pathways through the vegetation and a couch (couch 4) marked with spraint being recorded (see Figure 10.6f). A bitch otter and her two cubs were observed hunting on the loch in summer 2003. Two adult otters were later spotted on the loch together the following year (Ian Muir, Corby Loch Angling Association, pers.comm). It would appear that otters are using the loch on a frequent basis as it provides excellent undisturbed cover in the form of rushes and scrubby wet woodland while being

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stocked with trout. It is also feasible that otters are breeding here owing to the seclusion of the surrounding habitat. Otter spraint was also found around Lily Loch that is situated immediately adjacent to Corby Loch and possesses similar habitat features. Lily Loch supports large populations of eel (Ian Muir, Corby Loch Angling Association, pers.comm) as well as providing excellent undisturbed cover for otters. As such, Corby and Lily Lochs are assessed as being of **very high value** to otters.

- 3.4.13 The Sand Pit pond showed evidence of use by otters yet it is located almost 500m away from the nearest waterbody (Corby Loch) (see Figure 10.6d.6). Otters are likely to be travelling over land from Corby Loch to feed on amphibians and fish in the pond. The pond also benefits from low disturbance levels being surrounded by farmland and possesses moderate cover from patches of gorse and wet grassland. The pond does not appear to support large numbers of fish and is considered to be of **medium value** to otters. Gourdieburn ponds are judged as being of **medium value** to otters. The ponds provide a seasonal source of food in the form of amphibians and provide good undisturbed cover.
- 3.4.14 Harehill Burn is flanked by dense herbaceous vegetation and is subject to very low disturbance levels. As a tributary of Blackdog Burn it is likely to support fish albeit small numbers owing to the fact that the burn dries up in certain places during the summer. The burn is assessed as being a feature of **low value** to otters. The lower reaches of Black Dog Burn downstream of the A90 are bordered by tall grass, herbaceous vegetation and patches of gorse, all providing good cover. The burn also supports several species of fish including eel but suffers from low to moderate levels of disturbance from nearby housing and an industrial estate. Upstream of the A90 the burn flows through farmland and is subject to very low disturbance levels. Furthermore the burn is bordered by dense gorse growth and swards of *Juncus* spp. that provide excellent lying-up habitat for otters. Otter spraint was recorded at the entrance to a badger tunnel 10m from the burn (holt 8) (see Figure 10.6d.7) with a strong smell of spraint emanating from within the hole. The burn also provides a commuting route to the coast and is considered as being a feature of **high value** to otters. Middlefield Burn also represents a potential commuting route to the coast and it is likely to support salmonid populations. The burn also possesses good undisturbed cover for otters and it is therefore judged to be a feature of **high value**.

3.5 Habitat Assessment Summary

- 3.5.1 The most important areas of habitat for otters in the Northern Leg corridor include the River Don, Goval Burn and Corby and Lily Lochs. All represent valuable feeding, resting and commuting resources. The value of some of the smaller watercourses (particularly those in Sections NL2 and NL3) should not however be overlooked as such watercourses have been shown to be important to otters in terms of foraging, as they may support a greater biomass of fish (Kruuk et al., 1993). The terrestrial habitat quality within the study area is generally poor with much of the land used for agriculture. This heightens the importance of the above water features as well as nearby areas of scrub and woodland in the context of the whole area. The study area also contains numerous field drains. While no otter signs were recorded on these ditches it is likely that otters are using them at certain times of the year for purposes such as travelling from one watercourse to another, lying-up and/or foraging. Despite being relatively undisturbed, the majority of these field ditches possess limited cover and do not support substantial fish populations meaning that they are only of **low value** to otters.

4 Evaluation

Section NL1

- 4.1.1 The only watercourse within this section is Kepplehill Burn, which is assessed as being of **county** importance to otters. The burn supports otter populations through functioning as a potentially important commuting route between the River Dee and River Don catchments although low fish populations mean that the burn is not vital to the maintenance of the population.

Section NL2

- 4.1.2 This section is of **regional** importance to otters with the Gough Burn, Craibstone Burn and Green Burn all maintaining the local otter population through their fish stocks and high value habitat. Locally important woodland including Gough Burn DWS, Craibstone, Parkhead and Chapel Croft Woods along the reaches of these burns is particularly valuable, adding to the importance of the area through providing undisturbed cover and potential lying-up sites.

Section NL3

- 4.1.3 Bogenjoss Burn represents the only major watercourse in this section, which is assessed as supporting regionally important otter populations. The burn is a tributary of the River Don and flows through marshy grassland, scrub and semi-natural riparian broad-leaved woodland that forms a viable area of priority LBAP habitat of county importance. The remaining watercourses are all minor features but the fact that they may be used as commuting routes means that they are of county importance. When combined, this section is assessed as being of **regional** importance.

Section NL4

- 4.1.4 When combined the freshwater habitat features in this Section are considered to maintain a **nationally** important population of otters. Otter signs are abundant and include many lying-up sites and potential breeding areas. Large fish populations in the River Don are vital to the maintenance of the species in this area.

Section NL5

- 4.1.5 This final section contains a number of important water features and areas of terrestrial habitat including Red Moss, Blackdog Burn and Corby and Lily lochs. The high value habitat and fish populations that these features possess maintain the local otter population. This section is therefore assessed as being of **national** importance.

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Table 5 – Evaluation of Otter Population

Water Feature	Habitat Value	Use by otters	Ecological Value	Reason for Valuation
Section NL1				
Kepplehill Burn	Low	Potential foraging and commuting.	County	Low value otter habitat and no otter signs recorded. However otters are likely to use the burn as a commuting route (between the Dee and Don catchments) and for foraging. Burn is considered to support populations of this regionally common but internationally important species although it is not integral to the maintenance of the population.
Section NL2				
Gough Burn	High	Foraging, commuting and lying-up.	Regional	High value otter habitat, otters are likely to lie-up in adjacent scrub and woodland. Fish populations and adjacent habitats likely to maintain populations of this regionally common but internationally important species.
Craibstone Burn	High	Foraging, commuting and lying-up.	Regional	High value otter habitat, otters are likely to lie-up in adjacent scrub and woodland. Burn likely to maintain populations of this regionally common but internationally important species.
Craibstone Pond	Medium	Potential foraging and lying-up.	County	Medium value otter habitat, otters may lie-up in bankside vegetation and surrounding scrub and woodland. The pond is considered to support otters but it is not fundamental to the maintenance of the species.
Green Burn	High	Foraging, commuting and lying-up.	Regional	High value otter habitat, otters are likely to lie-up in adjacent scrub and woodland. Burn likely to maintain populations of this regionally common but internationally important species.
Section NL3				
Walton Ditch	Low	Potential commuting	County	Low value otter habitat and no otter signs recorded. Otters are only likely to use ditch occasionally as a commuting route. Ditch is not important to the maintenance of the species.
Howemoss Ditch	Low	Potential commuting	County	Low value otter habitat and no otter signs recorded. Otters are only likely to use ditch occasionally as a commuting route. Ditch is not important to the maintenance of the species.
Far Burn	Low	Potential commuting	County	Low value otter habitat but otters may be using the burn occasionally as a commuting route and therefore it supports otter populations. Burn is not important to the maintenance of the species.
Bogenjoss Burn	High	Foraging, commuting and lying-up.	Regional	High value otter habitat, otters are likely to lie-up in adjacent woodland. Burn likely to maintain populations of this regionally common but internationally important species.
Gravel pit ponds	Low	Potential foraging	County	Low value otter habitat and no signs recorded. Proximity to River Don and amphibian populations mean that ponds are likely to support otters during the spring although feature is not integral to the maintenance of the species.
Section NL4				
River Don	Very High	Foraging, commuting, lying-up and breeding.	National	Very high value otter habitat supporting a regularly occurring, regionally significant population of an internationally important species. The river is vital to maintenance of the species.
Goval Burn	Very High	Foraging, commuting and lying-up. Potential Breeding.	National	Very high value otter habitat with numerous holt sites. Burn supports a regularly occurring, regionally significant population of this internationally important species.
Goval Mill Lade	High	Foraging, commuting and lying-up.	Regional	High value otter habitat. Significant fish numbers help maintain populations of this regionally common but internationally important species.
Corsehill Burn	Medium	Foraging, commuting and lying-up.	County	Medium value otter habitat including significant numbers of fish help support otter populations. The burn is however not vital to the maintenance of the species as there are other more important watercourses in the vicinity.

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Water Feature	Habitat Value	Use by otters	Ecological Value	Reason for Valuation
Corsehill Burn South	Medium	Foraging, commuting and lying-up.	County	Low value otter habitat likely to support limited fish populations. Burn likely to provide foraging and commuting resource to otters but it is not fundamental to the maintenance of the species.
Corsehill Pond	Low	Potential foraging.	County	Low value otter habitat. The pond is considered to support otters seasonally through its amphibian populations but it is not fundamental to the maintenance of the species.
Parkhill Loch	High	Foraging and lying up	Regional	High value otter habitat, significant fish numbers help support and maintain populations of this regionally common but internationally important species
Section NL5				
Loch-Hills Farm pond	Medium	Potential foraging and lying-up.	County	Medium value otter habitat, otters may lie-up in bankside vegetation and surrounding scrub. The pond is considered to support otters seasonally through its amphibian populations but it is not fundamental to the maintenance of the species.
Loch Greens Pond	Low	Potential foraging.	Less than local	Low value otter habitat with limited amphibian populations. Pond unlikely to support otters.
Lily Loch	Very High	Foraging and lying-up. Potential Breeding	National	Very high value otter habitat comprising large eel populations and potential breeding areas. Loch supports a regularly occurring, regionally significant population of this internationally important species.
Corby Loch	Very High	Foraging and lying-up. Potential breeding.	National	Very high value otter habitat comprising large salmonid populations and potential breeding areas. Loch supports a regularly occurring, regionally significant population of this internationally important species.
Red Moss Burn	High	Foraging, commuting and lying-up.	County	High value otter habitat, the burn is however not vital to the maintenance of the species as there are other more important water features in the vicinity.
Sand pit Pond	Medium	Foraging and lying-up.	County	Medium value otter habitat, otters may lie-up in bankside vegetation and surrounding scrub. The pond is considered to support otters through its small fish and amphibian populations but it is not intrinsic to the maintenance of the species.
Gourdieburn Ponds	Medium	Potential foraging and lying-up.	County	Medium value otter habitat, otters may lie-up in bankside vegetation. The pond is considered to support otters seasonally through its amphibian populations but it is not fundamental to the maintenance of the species.
Harehill Burn	Low	Potential foraging and lying-up.	County	Low value otter habitat and no otter signs recorded. Otters only likely to use burn occasionally as a commuting route and for foraging. Burn is unlikely to be important to the maintenance of the population.
Blackdog Burn	High	Foraging, commuting and lying-up.	Regional	High value otter habitat with holt, otters are likely to lie-up in adjacent gorse scrub. Burn likely to maintain populations of this regionally common but internationally important species.
Blackdog Ditch	Low	Potential lying-up	County	Low value otter habitat and no otter signs recorded. Otters are only likely to use ditch occasionally and the ditch is not important to the maintenance of the species.
Middlefield Burn	High	Potential foraging, commuting and lying-up.	County	Medium value otter habitat but no otter signs recorded. However otters are likely to use the burn as a commuting route (between the coast and land west of the A90) and for foraging and lying-up. Burn is considered to support populations of this regionally common but internationally important species although it is not integral to the maintenance of the population.

5 Potential Impacts

5.1 Introduction

- 5.1.1 The range of potential nature conservation impacts of road schemes, and their significance, depends on the individual circumstances of each scheme. However, it is possible to identify a number of main areas of concern, which have general applicability (Highways Agency, 1999). These are set out in this section in the following order: Direct Mortality, Habitat Loss, Habitat Fragmentation and Isolation, Disturbance, Pollution and Indirect Impacts.
- 5.1.2 It should be noted that the impacts associated with the operational phase of the scheme are considered to be permanent, whereas temporary impacts, which are only apparent while the road is being built, are discussed in association with the construction phase. The assessment of potential impacts assumes no mitigation measures are in place.

5.2 Generic Impacts

Direct Mortality

Construction

- 5.2.1 Otters are inquisitive animals and may be attracted onto work sites during the construction phase to investigate new machinery or spoil heaps (Highways Agency, 1999). Otters therefore risk becoming trapped in any pits, piping, chemical containers or wire mesh. As otters are largely nocturnal, any night works may also lead to otters being run-over by works vehicles. Such events are not common (Grogan et al., 2001) but the otter's status as an internationally protected species means that such an incident would constitute a serious impact.

Operation

- 5.2.2 The principle cause of direct mortality resulting from operation of the scheme is likely to be through otters being struck by vehicles as they attempt to cross the new road. Otters are highly susceptible to being killed on existing roads with 60% of all recorded violent deaths in the UK being attributed to road accidents (Woodroffe, 2001). Trunk and A-roads account for 57% of these RTAs (although they comprise only 13% of the road network), with the majority of road casualties (66%) occurring within 100m of a watercourse (Philcox et al., 1999). This frequently occurs during high water levels. In periods of flood otters are reluctant or unable to swim under a bridge or through a culvert due to strong currents and high flows, this being exacerbated where there is no ledge above the high water level for otters to walk along. Where otters do attempt to swim under the road during strong currents, they are liable to drown, especially in culverts that have become blocked at one end or where there is a lack of air space. Road Traffic Accidents (RTAs) may be increased where drainage ditches and streams run alongside the road, as otters can be attracted onto the carriageway (Grogan et al., 2001).
- 5.2.3 The proposed scheme could adversely affect otters where the route crosses and/or comes in close proximity to watercourses that are utilised by otters. It is possible that dispersing sub-adults and females could be killed either through being struck by vehicles or drowning as they attempt to swim under the road during high water levels. Females and juveniles in particular are vital in maintaining the population and their death could result in the loss of otters on some streams, which over time may lead to changes in the regional distribution of otters.

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Habitat Loss

Construction and Operation

5.2.4 The total amount of land-take required in order to construct the Northern Leg of the proposed scheme is estimated at approximately 3.16km² / 316ha. Table 6 shows the estimated total pre-construction and post-construction areas of Phase 1 Habitats present within the proposed land-take. The post-construction figures take account of both anticipated habitat loss to construction and habitat created or changed as a result of mitigation.

Table 6 – Summary of Areas of Land-take by Phase I Habitat Category

Phase 1 Habitat Description	Phase 1 Habitat Categories within proposed scheme land-take	
	Pre-construction (Ha)	Post-construction (Ha)
Woodland mixed plantation	6.57	25.53
Woodland broadleaved plantation (including standard trees)	3.57	4.22
Woodland broadleaved semi-natural	7.06	2.16
Woodland coniferous plantation	19.19	14.28
Scattered scrub	4.30	11.30
Dense continuous scrub	4.94	13.56
Acid grassland semi-improved	2.32	1.86
Acid grassland unimproved	0.47	0.43
Amenity grassland	0.83	0.63
Improved grassland	153.04	112.41
Marshy grassland	1.91	1.44
Neutral grassland semi-improved	0.41	0.36
Neutral grassland unimproved	0.16	0.16
Poor Semi-improved grassland	18.06	13.13
Arable	88.42	39.61*
Built up areas (buildings)	1.42	0.72
Herb & Fern bracken continuous	1.71	0.24
Open water	0.29	0.13
Parkland broadleaved	0.59	0.26
Parkland coniferous	0.22	0.07
Heathland wet heath acid	0.15	0
Total	315.63	242.50

**Figure assumes all potential return to agriculture is achieved*

5.2.5 Loss of habitat may occur from the siting of works compounds, and storage of materials. Such impacts are associated with the construction phase of the scheme due to their temporary nature. Further loss of habitat would occur during the excavation of cuttings, the construction of embankments and access roads, and the building of bridges and culverts where the road crosses watercourses. Construction is also likely to require the diversion and re-alignment of watercourses, as well as the destruction of features that may be in the vicinity of these wetland areas. However, although this habitat loss would occur during the construction phase of the scheme, it is regarded as an operational impact, since the habitat loss would be permanent. The otter is a secretive mammal and as such, holts and couches are very important. Each individual is familiar with its home range knowing each site where shelter is available. The loss of holts and other lying-up sites would therefore place more stress on the animal, requiring it to travel further in order to find suitable cover. This may create conflict between otters particularly where they exist at high (otter) population densities (e.g. in Aberdeen) or put them at risk to other hazards such as RTAs

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(Highways Agency 1999). Furthermore this would constitute an offence under UK and European legislation.

Habitat Fragmentation and Isolation

Construction

- 5.2.6 Construction of the road would necessitate the provision of construction compounds, storage facilities and access roads. These may prevent otters from moving freely within and between existing areas of habitat, particularly where they are situated in the vicinity of watercourses. The construction of culverts on some watercourses may act as a barrier to migratory fish movements, thus reducing salmonid populations (see Fish Report in Appendix A10.15) and rendering upper reaches of these streams of limited use to foraging otters.

Operation

- 5.2.7 The operational scheme would also result in habitat fragmentation and form a physical barrier to otters, preventing them from moving freely within and between available areas of habitat. The scheme would therefore divide otters' home ranges possibly causing them to abandon parts of their range, and making frequent road crossings, and hence RTAs, likely as otters attempt to reach foraging and lying-up areas. Otters are also capable of inflicting serious and potentially fatal injuries on each other during disputes over territory (Grogan et al 2001). Severance of an otter's home range may place it in direct competition with other otters, thus increasing stress within the metapopulation. The road may also restrict immigration and emigration thus decreasing genetic dispersal and increasing competition amongst currently stable populations. This is likely to be a particular problem where unsuitable watercourse crossings are provided, such as circular or long (>50 m) culverts as otters may be reluctant to use them. Indeed, there is a draft comment in the forthcoming DMRB advice note that culvert lengths in otter habitat should be minimised (Jim Green pers.comm.). The above impacts could be damaging to the otter population, removing animals that might have successfully colonised new areas in the catchment and adversely affecting breeding. Furthermore, this could result in contravention of Article 10 of the European Habitats Directive, which requires linear features such as rivers and streams to be managed and maintained.

Disturbance

Construction

- 5.2.8 Otters are likely to suffer increased disturbance during both construction and operation of the new road. Construction of the road is likely to create physical disturbance that could affect the activities of otters. Noise from machinery and vehicles, light for night working, the possible obstruction of holts and otter pathways and the presence of humans can all have adverse impacts. Consideration would need to be given so as to avoid the inappropriate siting of construction compounds and/or storage sites during the construction phase, which could exacerbate such impacts e.g. if they were placed close to a lying-up site. Under the relevant legislation it would be an offence if construction works were to obstruct access to a holt, disturb an otter in a holt or damage/destroy a holt or couch.
- 5.2.9 Otters may attempt to avoid any periodic disturbance, which would act as a barrier to their usual activities and deter them from using lying-up sites, resulting in the effective loss of these sites. This may cause otters to use different routes that may bring them into conflict with other otters or they may use a route that involves crossing other roads, and they may therefore risk being killed. Otters may also be prompted to forage further away if available foraging habitat is reduced. Moreover, as otters have no fixed breeding season, holts and couches may be occupied at any time of the year. Any disturbance could result in a female otter abandoning her cubs, which is likely to result in their death if they are still dependant on their mother i.e. during the first three months of their life (Highways Agency, 1999).

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Operation

- 5.2.10 During the operational phase otters are likely to suffer disturbance from traffic noise as well as from road lighting. Otters may become accustomed to these impacts over time (for instance, they commonly use the River Don in Aberdeen itself, e.g. at Bridge of Balgownie, Hans Kruuk, pers.comm), but otters could abandon any holts or couches in the immediate vicinity of the scheme.

Pollution and Other Indirect Impacts

Construction

- 5.2.11 Pollution of the watercourses and water features in the area could result in serious long-term damage to the productivity and diversity of nearby habitats, this having an adverse impact on both otters and their food supply. The construction of bridges and culverts as part of the road scheme may cause restrictions in river and stream channels, which can cause scouring and flooding, cumulating in sediment deposition downstream and a reduction in aquatic invertebrate numbers (Grogan et al., 2001). This would have an adverse impact on fish populations, which in turn could affect otter prey availability. The damage or destruction of salmonid redds is also possible during construction and this could have equally damaging repercussions on the otter population (see Fish report in Appendix A10.15).
- 5.2.12 There is also the potential for accidental spillages e.g. from oil and diesel drums. As well as reducing the amount of available prey, a particularly severe spillage may lead to a bio-accumulation of contaminants in prey species. High levels of pollutants may therefore accumulate in otters resulting in mortality. Being large carnivores, otters are particularly vulnerable to changes in food availability at all levels of the food chain. A pollution event would be particularly serious if it were to occur on one of the larger rivers such as the River Don since this river supports large fish populations, and otter use of land and streams in the vicinity of this river was high during the surveys. Pollutants such as oil and diesel can also affect thermo-regulation qualities of an otter's coat and cause mortality (Kruuk, 1995; Grogan et al., 2001).

Operation

- 5.2.13 Pollution from roads can be particularly significant during occurrences of storm water runoff or accidental spillage. Runoff from the operational road may contain compounds used in the manufacture of cars including zinc, cadmium and copper. Compounds such as PCBs may also be present and these have the potential to seriously affect reproduction of otters (Kruuk, 1995). There is also the possibility of spillages occurring during the operational phase and these would have impacts similar to those mentioned above.

5.3 Specific Impacts

- 5.3.1 Table 7 shows the specific impacts associated with the construction and operational phases of the AWPR Northern Leg scheme. Specific impacts have been assessed for the key watercourses identified. A precautionary approach has been adopted whereby the impact assessment is made on the presumption that no mitigation measures are to be put in place and that watercourse crossings would be designed to a minimal ecological standard. All habitat losses are approximations. Refer to Table 11 in the Terrestrial Habitats report (Appendix A10.1) for information regarding specific habitat loss.

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Table 7- Potential Impacts on Otter

Water feature	Crossing point(s)	Phase of scheme	Impacts	Impact magnitude/significance
Section NL1				
Kepplehill Burn	AWPR Mainline at ch315200	Construction	Minimal disturbance likely due to infrequent use of the burn by otters.	Negligible/Negligible
		Operation	Increased risk of direct mortality through RTAs where scheme crosses burn.	High negative/Moderate
			Loss of low value riparian habitat comprising scattered scrub and wet grassland. No significant impact predicted as habitat is of minimal value to otters.	Negligible/Negligible
			Scheme would sever otter movements between River Dee and River Don catchments although other commuting routes exist.	Medium negative/Moderate
		Risk of deterioration in water quality due to runoff from the scheme. Although otters are only likely to use Kepplehill Burn on an infrequent basis, the burn flows into Bucks Burn that is a tributary of the River Don, therefore increasing the significance of such an impact.	Medium negative/Moderate	
Section NL2				
Gough Burn	AWPR Mainline at ch316390	Construction	Otters are likely to forage along the burn and lie-up in woodland reaches, and therefore may suffer direct mortality or disturbance from construction activities.	High negative/Major
		Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn.	High negative/Major
			Loss high value mixed woodland and riparian habitat in Craibstone Wood comprising potential holt sites in bankside trees, dead wood and dense rhododendron thickets.	Medium negative/Moderate
			Scheme would sever otter movements between the River Don and land/watercourses to the west of the alignment e.g. the River Dee catchment, although other commuting routes exist.	High negative/Major
		Risk of deterioration in water quality due to runoff from the scheme. Burn is likely to be an important foraging resource and is a tributary of the River Don.	High negative/Major	
Craibstone Burn	AWPR Mainline at ch316990	Construction	Otters are likely to forage along the burn and lie-up in woodland reaches, and therefore may suffer direct mortality or disturbance from construction activities.	High negative/Major
		Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn.	High negative/Major
			Loss of value woodland habitat in Craibstone Wood comprising potential holt sites and dense scrub. Loss of 160m of medium value riparian habitat comprising tall herbs and occasional scrub.	Medium negative/Moderate

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Water feature	Crossing point(s)	Phase of scheme	Impacts	Impact magnitude/significance
			Scheme would sever otter movements between the River Don and land/watercourses to the west of the alignment e.g. the River Dee catchment although other commuting routes exist.	High negative/Major
			Risk of deterioration in water quality due to runoff from the scheme. Burn is likely to be an important foraging resource and is a tributary of the River Don.	High negative/Major
Craibstone Pond	None	Construction	Otters may suffer disturbance from construction of the scheme although they are only likely to use the pond during spring and summer when amphibians are present.	Low negative/Minor
		Operation	Increased risk of direct mortality through RTAs as otters attempt to reach pond.	High negative/Moderate
			Loss of high value woodland habitat in Craibstone Wood, comprising potential holt sites and dense scrub.	Medium negative/Moderate
			Scheme would sever otter movements to the pond, which is likely to provide a seasonally important source of food in the form of amphibians.	Medium negative/Moderate
			Risk of deterioration in water quality due to runoff from the scheme. Pond does not support fish but holds important populations of amphibians, which are likely to be a seasonally important prey resource to otters.	Medium negative/Moderate
Green Burn	AWPR Mainline at ch317330 A96 Kirkhill Industrial Estate Link Road	Construction	Otters are likely to forage along the burn and lie-up in woodland reaches, and therefore may suffer direct mortality or disturbance from construction activities.	High negative/Major
		Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn.	High negative/Major
			Loss of high value mixed woodland habitat in Chapel Croft Wood comprising scrub and boulder piles.	Medium negative/Moderate
			Loss of medium value riparian habitat comprising tall herbs and occasional scrub.	Low negative/Minor
			Realignment and straightening of burn likely to result in the loss of invertebrate/fish habitat, resulting in reduced prey availability.	Medium negative/Moderate
			Scheme would sever otter movements between the River Don and land/watercourses to the west of the alignment e.g. the River Dee catchment, although other commuting routes exist.	High negative/Major
			Lighting at A96 junction may initially cause disturbance to otters using the burn.	Low negative/Minor
			Risk of deterioration in water quality due to runoff from the scheme. Burn is likely to be an important foraging resource and is a tributary into River Don.	High negative/Major
Section NL3				
Walton Ditch	AWPR Mainline at ch317825	Construction	Minimal disturbance likely due to infrequent use of the ditch by otters.	Negligible/Negligible
		Operation	Increased risk of direct mortality through RTAs where scheme crosses ditch.	High negative/Moderate

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Water feature	Crossing point(s)	Phase of scheme	Impacts	Impact magnitude/significance
			Loss of low value riparian habitat comprising in-channel aquatic vegetation and dense thickets of gorse and broom. No significant impact predicted as habitat is of minimal value to otters.	Negligible/Negligible
			Scheme would sever otter movements although other more important commuting routes exist.	Low negative/Minor
			Risk of deterioration in water quality due to runoff from the scheme. No significant impact is predicted as otters are only likely to use the ditch on an infrequent basis while ditch is not connected to any flowing watercourses.	Negligible/Negligible
Howemoss Ditch	None	Construction	Minimal disturbance likely due to infrequent use of the ditch by otters.	Negligible/Negligible
		Operation	Increased risk of direct mortality through RTAs as the proposed scheme comes within 25m of the ditch.	High negative/Moderate
Far Burn	None	Construction and Operation	Burn is over 250m from the alignment and therefore no significant impacts are predicted.	Negligible/Negligible
Bogenjoss Burn	Kirkhill Access Track at ch319950 Kirkhill Access Track at ch320100 Kirkhill Access Track at ch320200 Kirkhill Access Track at ch320450 AWPR Mainline at ch320520 AWPR Mainline at ch320870	Construction	Otters are likely to forage along the burn and lie-up in woodland reaches, and therefore may suffer direct mortality or disturbance from construction activities.	High negative/Major
		Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn and in the vicinity of Monument Wood where otters are taking terrestrial routes to move through their ranges.	High negative/Major
			Loss of high value habitat comprising mixed woodland, dense gorse scrub and wet grassland.	Medium negative/Moderate
			Realignment and straightening of burn between ch.319950 - 320500 likely to result in the loss of invertebrate/fish habitat, resulting in reduced prey availability	Medium negative/Moderate
			Scheme would sever otter movements between the River Don and land/watercourses to the west of the alignment although other commuting routes exist.	High negative/Major
			Risk of deterioration in water quality due to runoff from the scheme. Burn is likely to be an important foraging resource and is a tributary of the River Don.	High negative/Major
Gravel Pit Ponds	None	Construction and Operation	Ponds are over 200m away from the scheme and therefore no significant impacts are predicted	Negligible/Negligible
Section NL4				
River Don	AWPR Mainline at ch323150	Construction	Disturbance from construction activities is likely since the River Don is used constantly by otters for foraging, commuting and lying-up.	High negative/Major
		Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses river.	High negative/Major
			Loss of approximately 40m of low value riparian habitat comprising pasture.	Negligible/Negligible

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Water feature	Crossing point(s)	Phase of scheme	Impacts	Impact magnitude/significance
			Scheme would sever otter movements to tributary streams and other catchments, the River Don being the largest watercourse in the study area and a key immigration and emigration route.	High negative/Major
			Risk of deterioration in water quality due to runoff from the scheme. Such events would have potentially serious indirect effects on local otter populations as the River Don represents a primary prey resource to otters in this area.	High negative/Major
Goval Burn	Re-aligned B977 at ch323610 Re-aligned A947 at ch324400 AWPR Mainline at ch324600	Construction	Construction of the scheme is likely to cause disturbance to otters using holts 3, 4 and 5 as well as to otters lying-up in dense riparian vegetation along the burn. Otters use the burn regularly for foraging, commuting and lying-up. In addition there is a risk of direct mortality to otters using holt 4 and riparian vegetation for lying-up.	High negative/Major
		Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn.	High negative/Major
			Scheme would result in the loss of holt 4 at ch324525, which constitutes an offence under current legislation. Holt 4 is thought to be used only occasionally during night time foraging. Similarly, two couches (couches 2 and 4) at ch323700 and ch324350 would also be lost, although these sites are subject to seasonal change.	High negative/Major
			Scheme would result in the loss of 650m of high value riparian habitat comprising tall herbaceous vegetation (including potential lying-up habitat) and scattered trees where the AWPR and associated side roads cross the burn.	Medium negative/Major
			Scheme would sever otter movements between Goval Burn and the River Don.	High negative/Major
			Risk of deterioration in water quality due to runoff from the scheme. Such events would have potentially serious effects as the burn constitutes a key foraging, commuting and lying-up resource, and flows into the River Don.	High negative/Major
Mill lade	Existing A947 at ch324240 Re-aligned A947 at ch324400	Construction	Otters would suffer disturbance from construction activities since watercourse is used regularly by otters for foraging, commuting and lying-up.	Medium negative/Moderate
		Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses lade and runs parallel to it.	High negative/Major
			Loss of low value riparian habitat comprising dry stone walls and strips of rank grassland. No significant impact predicted as habitat is of low value to otters.	Negligible/Negligible
			Scheme would sever otter movements between the Lade and Goval Burn.	High negative/Major
			Risk of deterioration in water quality due to runoff from the scheme. While the lade is not connected to any other watercourse, it is likely to be an important foraging and commuting feature.	High negative/Major

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Water feature	Crossing point(s)	Phase of scheme	Impacts	Impact magnitude/significance
Corsehill Burn	B977 link road 1 at Goval Junction B977 link road 2 at Goval Junction AWPR Mainline at ch325085	Construction	Burn is used by otters for foraging and commuting and they are therefore likely to suffer from disturbance.	Medium negative/Moderate
		Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn.	High negative/Moderate
			Loss of low value riparian habitat comprising dry stone walls and pasture. No significant impact predicted as habitat is of minimal value to otters.	Negligible/Negligible
			Realignment and straightening of burn between ch324750 and ch325080 likely to result in the loss of invertebrate/fish habitat, resulting in reduced prey availability.	Medium negative/Moderate
			Scheme would sever otter movements between Red Moss and the River Don.	Medium negative/Moderate
			Lighting at B977 junction may cause disturbance to otters using the burn.	Low negative/Minor
Risk of deterioration in water quality due to runoff from the scheme. Burn is likely to be a foraging and commuting resource and is a tributary of Goval Burn.	High negative/Moderate			
Corsehill Burn South	None	Construction	Otters are likely to use the burn as a commuting route, and therefore may suffer disturbance from construction activities.	Low negative/Minor
		Operation	Lighting at B977 junction may initially cause disturbance to otters using the burn.	Low negative/Minor
Corsehill Pond	AWPR Mainline at ch325125	Operation	Loss of low value pond habitat.	Negligible
Parkhill Loch	None	Construction and Operation	Loch is over 250m away from the scheme and therefore no significant impacts are predicted.	Negligible/Negligible
Section NL5				
Red Moss Burn	AWPR Mainline at ch327500	Construction	Otters are likely to use this reach of the burn for lying-up and therefore may suffer direct mortality or disturbance from construction activities.	High negative/Moderate
		Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn.	High negative/Moderate
			Loss of medium value riparian habitat comprising gorse and broom.	Low negative/Minor
			Scheme would sever otter movements between Red Moss and Corby and Lily Lochs.	High negative/Moderate
Risk of deterioration in water quality due to runoff from the scheme. Burn is used for foraging and commuting and flows into Corby Loch, which supports large fish populations.	High negative/Moderate			
Loch Hills Farm Pond	None	Construction	Disturbance to potential lying up and foraging at the pond.	Low negative/Minor

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Water feature	Crossing point(s)	Phase of scheme	Impacts	Impact magnitude/significance
Loch Greens Pond	AWPR Mainline at ch326525	Operation	Loss of low value pond habitat. No significant impact predicted as habitat is of minimal value to otters.	Negligible/Negligible
Corby and Lily Lochs	None	Construction and Operation	Lochs are over 200m and 400m away from the scheme respectively but as the scheme crosses Red Moss Burn, which flows into Corby Loch, there is a risk of deterioration in water quality. Both lochs are important foraging resources, thus increasing the magnitude of such an incident.	High negative/Major
Sand Pit Pond	None	Construction and Operation	Pond is over 300m away from the scheme and therefore no significant impacts are predicted.	Negligible/Negligible
Gourdieburn Ponds	None	Construction and Operation	Ponds are over 600m away from the scheme and therefore no significant impacts are predicted.	Negligible/Negligible
Harehill Burn	None	Construction and Operation	Burn is 150m away from the scheme and therefore no significant impacts are predicted.	Negligible/Negligible
Blackdog Burn	AWPR Mainline at ch329950 Blackdog Access Road (U240C)	Construction	Burn is used by otters for foraging, commuting and lying-up. Otters are therefore likely to suffer from disturbance.	Medium negative/Moderate
		Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn.	High negative/Major
			Loss of low value riparian habitat comprising wet grassland and occasional gorse. No significant impact predicted as habitat is of minimal value to otters.	Negligible/Negligible
			Scheme would sever otter movements to and from the coast.	High negative/Major
			Risk of deterioration in water quality due to runoff from the scheme. Burn is likely to be a foraging and commuting resource and flows into the North Sea.	High negative/Major
Blackdog Ditch	AWPR Mainline at ch330065	Construction	Minimal disturbance likely due to infrequent use of the ditch by otters.	Negligible/Negligible
		Operation	Increased risk of direct mortality through RTAs where the scheme crosses ditch.	High negative/Moderate
			Loss of approximately 100m of low value riparian habitat comprising in-channel aquatic vegetation and dense growths of gorse and broom. No significant impact predicted as habitat is of minimal value to otters.	Negligible/Negligible
			Risk of deterioration in water quality due to runoff from the scheme. Otters are only likely to use the ditch on an infrequent basis but the fact that it flows into Blackdog Burn, would increase the magnitude of a pollution incident	Medium negative/Moderate
Middlefield Burn	A90 Side road 1	Construction	Minimal disturbance likely due to infrequent use of the burn by otters.	Negligible/Negligible
		Operation	Increased risk of direct mortality through RTAs where scheme crosses burn.	High negative/Moderate

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Water feature	Crossing point(s)	Phase of scheme	Impacts	Impact magnitude/significance
	Side road 2		<p>Loss of low value riparian habitat comprising dry stone walls, patches of gorse and pasture. No significant impact predicted as this reach of the burn is of minimal value to otters.</p> <p>Realignment and straightening of 400m of burn likely to result in the loss of invertebrate/fish habitat, resulting in reduced prey availability.</p> <p>Scheme would sever otter movements between the coast and land to the west of the A90, although Blackdog Burn is a more likely commuting route.</p> <p>Lighting at A90 junction may initially cause disturbance to otters using the burn.</p> <p>Risk of deterioration in water quality due to runoff from the scheme. Otters are only likely to use the burn on an infrequent basis but the fact that it flows into the North Sea, would increase the magnitude of a pollution incident.</p>	<p>Negligible/Negligible</p> <p>Low negative/Minor</p> <p>Low negative/Minor</p> <p>Low negative/Minor</p> <p>Medium negative/Moderate</p>

5.4 Potential Impacts Summary

- 5.4.1 The greatest impacts of the scheme are associated with the operation of the road, particularly direct mortality caused by road accidents. This is the greatest cause of recorded otter mortality in the UK and without mitigation measures being put in place comparatively more otters may be killed on the new road than at present, constituting a serious impact.
- 5.4.2 Furthermore, the AWPR Northern Leg may form a barrier to otter movements, severing otter home ranges and severely limiting immigration and emigration, particularly where watercourses are culverted under the road through excessively long culverts. This would have a serious impact on the local otter population and may compromise the currently favourable conservation status of the species in the area.
- 5.4.3 Pollution incidents resulting from the new road scheme also have the potential to result in changes to the local otter population, particularly if a serious pollution incident occurred on the River Don as it supports the largest otter and fish populations in the area (see Fish Report in Appendix A10.15). However, while the scheme crosses numerous watercourses and passes through several high value terrestrial habitats, the majority of the land lost to the scheme would be agricultural land, which is of minimal value to otters. Construction of the scheme would however disrupt the routines of otters and result in the destruction of a holt and two couches as well as causing likely disturbance to holts 3 and 5, and to potential lying-up sites along the River Don, Goyal Mill Lade, Red Moss Burn and Blackdog Burn. Although couches were only found to be present during the summer months, they are an indication of habitat use by resident populations and are still protected by law as a 'resting place'.

6 Mitigation

6.1 Introduction

- 6.1.1 New road schemes and improvements to existing roads that do not take the requirements of otters into account in their design and construction may adversely affect existing populations. Although widely distributed and relatively common in Scotland, the otter's status is considered vulnerable and it was included in the *Biodiversity Steering Group Report* (1995) as a target species. This resulted in the Joint Nature Conservation Committee (JNCC) producing *A Framework for Otter Conservation in the UK: 1995-2000* (1996). These documents recognise road casualties as one of the main factors affecting otter populations and that work is required to reduce the impacts of road construction and operation (Grogan et al., 2001). There are several main targets in providing mitigation for otters on the UK road network, and they need to be considered in road design, construction and operation:
- minimise disturbance and adverse impacts on otters;
 - maintain access for otters to their present habitats;
 - to allow existing otter populations to expand and colonise new areas; and
 - to reduce the numbers of RTAs involving otters.
- 6.1.2 This requires careful planning by designers and constructors, so that important habitats and migration routes are not destroyed and the provision of more sensitive watercourse crossings where otters may be present. Moreover, there is a legal obligation for designers and constructors to provide mitigation measures that meet the demands of the legislation *in situ* to protect otters. The following section outlines mitigation measures that will be implemented in the current scheme. These are primarily based on advice given in the *Design Manual for Roads and Bridges: Nature Conservation Advice in Relation to Otters* (Highways Agency, 1999) and *Nature Conservation and Roads: Advice in Relation to Otters* (Grogan et al., 2001), and will help the above targets to be achieved in relation to the AWPR Northern Leg.

6.2 Generic Mitigation

Direct Mortality

Construction

- 6.2.1 Direct mortality of otters during the construction phase will be avoided through covering any work pits at night or positioning mammal ramps to allow any trapped animals to escape. Where otters are known to be active they will be excluded from the area by erecting temporary otter-proof fencing in such a way that commuting routes are not disrupted. Chestnut paling fence with stakes at 25mm gaps or stiff plastic mesh that otters cannot scale will be used as a temporary measure to keep otters out of dangerous areas. Where temporary fencing is erected it will be positioned to guide otters to safe crossing points. Alternative routes may include underpasses for site access roads, these having an internal diameter of at least 600mm. In order to prevent otters from being run over by construction vehicles, night time working (one hour after sunset to one hour before sunrise) must be suspended where the road comes within 30m of any watercourse or waterbody.

Operation

- 6.2.2 Direct mortality of otters from the operational scheme will be avoided by the erection of permanent otter-proof fencing along both sides of the carriageway (in conjunction with the provision of sufficient safe crossing points). The installation of badger fencing as specified by the DMRB (see Badger Report in Appendix A10.2) will be essential using a 50mm mesh to prevent otters being able to pass through the fence. Fencing must be 1500mm high (above ground) with a further 500mm buried into the ground and an additional 300mm angled in the direction a badger or otter will approach from. Where the fence abuts bridge rails, gate posts or a different type of fence, there must be no gaps larger than 50mm. If the fence crosses a drainage channel, a grille must be positioned under the fence to prevent otters passing through the gap. Regular maintenance will be required to ensure that no blockages occur at such points. Fencing must be installed wherever the scheme comes within 150m of a watercourse or where it severs or passes between areas of otter habitat. Where fencing extends for several hundred metres and there is no stream crossing, underpasses will need to be installed. The minimum internal diameter of the pipe must be 900mm and be as straight as possible. Fencing and underpasses installed as part of mitigation for badgers (see Badger Report in Appendix A10.2) will also provide mitigation for otters and vice versa.
- 6.2.3 Bridges and depressed invert culverts will be installed where the operational scheme crosses any flowing watercourse no matter how small. Where the road crosses wide rivers and streams (>3m) bridges will be constructed. Bridge design must allow space between the abutments of the bridge and the riverbank to enable otters to pass safely during high water levels. The abutments must be set back from the river to allow the natural riverbank and riverbed to remain intact. A distance of nine metres is recommended as a suitable corridor width (Grogan et al 2001). The bank should be softened by using log-piles, willow hurdles or hazel faggots but if hard protection is necessary, gabions and boulders should be used for easy access in and out of the river and for providing sprainting sites. Bridges must be designed so that the water flow rate is not increased as it passes under a bridge and the water level never rises to fill the tunnel. Where it is not feasible to allow a gap between the bridge abutments and the edge of the river then ledges must be incorporated in the design.
- 6.2.4 Where the operational scheme crosses smaller watercourses it may be more practicable to construct a culvert. Box culverts designed to a 1:200 flood return period will be used as opposed to cylindrical culverts which fill rapidly so reducing the air space available and making swimming more difficult. Culverts must be as wide as possible and be large enough to allow the incorporation of a dry ledge that is accessible during high water levels. Mammal ledges can be made of solid concrete integral with the culvert or steel that is bolted onto the culvert using metal brackets although the latter is preferable as it will not impact on fish and freshwater invertebrate populations. Ledges must be at least 500mm wide and be accessible both from the bank and the water by the provision of ramps or groups of large boulders. Ledges must be sited at least 150mm above the

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appropriate high flood level, allowing 600mm headroom. These can be installed on both sides of the culvert although on very small watercourses where it may be more practicable to install only one ledge, otters must be guided to the crossing by planting dense scrub on the opposite bank to the ledge. Where the route taken by an otter is known, this will be unnecessary as long as the ledge is on that side of the watercourse. If the design of the culvert means that there is not sufficient airspace then a dry mammal underpass will need to be installed within 50m of the riverbank and above possible flood levels. The dimensions of this underpass will depend on the length of the underpass, with recommended sizes being 600mm diameter for underpasses up to 20m long, 900mm diameter for underpasses between 20 and 50m long, and for underpasses over 50m, a box section of 1000mm x 2-5m wide (Highways Agency, 1999; Grogan et al., 2001). The length of all culverts in otter habitat should be kept to a minimum (Highways Agency, in prep.).

Habitat Loss

Construction and Operation

- 6.2.5 Habitat loss will be avoided through the construction of open span bridges where the scheme crosses large river valleys such as that of the Don, allowing the habitat below to remain relatively intact. To avoid temporary habitat loss associated with the construction phase of the scheme, works compounds and storage sites will be sited at least 30m away from any watercourse and avoid key areas of woodland, dense scrub and/or wetland. This will prevent valuable areas of otter habitat being degraded. Where the loss or degradation of valuable areas is unavoidable, they must be returned to their former quality or improved once construction is completed. Improvements may include the creation of waterbodies and reedbeds, the planting of trees such as willow, alder and ash along river banks, while emergent vegetation and dense scrub such as bramble should be encouraged. In addition to the above, habitat creation for other species groups such as bats, red squirrels, birds and amphibians will indirectly provide mitigation for otters, particularly where close to waterbodies. Further details regarding habitat creation/restoration can be found in the Terrestrial Habitats Report in Appendix A10.1. Where over-grazing is a current problem, opportunities exist for fencing-off areas of land adjacent to watercourses, thus encouraging vegetation growth. If old trees along riverbanks need to be removed as part of the scheme, the root systems should be retained to provide potential holt sites (where this is practical in terms of engineering works).
- 6.2.6 The destruction of holts and couches must be avoided wherever possible. However, where the loss of such sites is unavoidable exclusions will be required, while the provision of artificial holt sites and habitat creation will also be necessary. Exclusions will be carried out following described measures and in consultation with SNH. The destruction or disturbance of an otter holt/couch requires a special derogation under the European Habitats Directive. A licence to undertake such works will therefore need to be obtained from the Scottish Executive Environment and Rural Affairs Department (SEERAD) (the licensing authority for species protected under European legislation) thus permitting activities that would otherwise result in a contravention of the law. Regulation 44(3)(b) of the Conservation (Natural Habitats &c.) Regulations 1994, states that a licence cannot be issued unless the licensing authority (in this case the Scottish Executive) is satisfied that the action proposed 'will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range'. In this respect, the impact on the favourable conservation status of the otter population will need to be assessed. This assessment will inform the consideration of any requirements of the licence provision under Part III of the Habitats Regulations. The SEERAD licence will cover the entire scheme and will be procured at least 10 months prior to development commencing. The licence will include a method statement/otter management plan, identifying the following:
- where specific impacts upon otters and their habitat will occur;
 - the results of further otter surveys including the status of lying-up sites and evidence of breeding;
 - mitigation measures including detailed methodologies for holt exclusions and artificial holt design; and

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- details of a monitoring programme to ensure that the favourable conservation status of the otter population has not been compromised.

6.2.7 Pipe and chamber holts will be created although the installation of these will require land drainage consent from SEPA. Artificial holts will be situated in areas of low disturbance, located close to a river or waterbody (within 10m) and be below ground level. Where river and stream banks are to be protected close to the road scheme, large concrete blocks (1000mm diameter approx.) can also be used and piled together thus creating highly attractive cavities for otters (Hans Kruuk, pers.comm.). However, the above lying-up sites must only be created where the safety of otters can be assured by restricting access to the carriageway through the use of otter-proof fencing.

6.2.8 Where a watercourse has been re-aligned it must be returned to as near a natural state as possible. However, where this is not feasible there is an opportunity to create a new channel with meanders and planting-up the inside of bends with scrub. In addition to repairing the damage to the habitat, this will also encourage otters to pass the proposed scheme safely.

Habitat Fragmentation and Isolation

Construction

6.2.9 To reduce the effects of habitat fragmentation and isolation caused by the construction phase, works compounds, storage sites and access roads must not be located between important areas of otter habitat. Access roads will have otter underpasses installed, thus enabling otters to move freely throughout their home range. The construction of bridges and other structures may also cause obstructions that otters must negotiate. One side of the river or stream being bridged must therefore remain intact for as long as possible to provide safe access.

Operation

6.2.10 To reduce the effects of habitat fragmentation and isolation caused by the operational phase, bridges and culverts installed where the road bisects watercourses have been designed to allow the safe passage of otters during spate conditions. Field ditches, unless otherwise stated, will be incorporated into pre-earthworks drainage. Where extensive stretches of the road are fenced, dry underpasses must be installed under the road to enable otters to move between habitats. In this respect, underpasses installed as part of mitigation for badgers (see Badger Report in Appendix A10.2) will benefit otters. Such culverts and underpasses must be as short as possible to encourage their use by otters and badgers. Ideally culverts and underpasses should not be much in excess of 50m as over this length, the chances of otters and badgers readily using them significantly decreases.

Disturbance

Construction

6.2.11 During the construction phase, site compounds and storage or waste dumping facilities will be located at least 30m away from any holt/couch or watercourse, this distance being increased to 100m where breeding sites are concerned. If lying-up sites are likely to be disturbed by construction activities or if access routes are to be blocked, a SEERAD licence must be acquired prior to work commencing. The locations of all holts and couches must be identified to contractors in confidence to ensure that they are not accidentally disturbed during the construction process. Such areas will be fenced with signs to clearly mark that contractors must not enter. An ecological clerk of works must also be present during construction of the scheme while contractors will be provided with an overview of otter ecology prior to works commencing. Night time working (one hour after sunset to one hour before sunrise) must be suspended where the scheme comes within 30m of a holt/couch or watercourse to prevent disturbance to otters and their routines. Site clearance must be preceded by a thorough survey of the area for holts, couches and otters. Once this has been completed the working area must be fenced to prevent otters returning. If a holt or

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couch is discovered during construction, an exclusion zone of 30m must be established and all works suspended. If an occupied natal den is found, it may lead to the cessation of work for up to 10 weeks until cubs are mobile and able to leave the area. Local circumstances will dictate suitable protection zones and therefore ongoing liaison with SNH will be maintained.

Operation

- 6.2.12 Disturbance caused by the operational scheme will be mitigated for through measures described in ES Chapters 11 and 12 (Landscape and Visual). This will involve planting natural screens along the scheme and preventing noise and light disturbance to otters. Lighting levels will be reduced or non-existent where the operational scheme crosses or runs parallel to watercourses, while lay-bys will not be sited within 30m of these areas.

Pollution and Other Indirect Impacts

Construction and Operation

- 6.2.13 During the construction phase, contractors must adhere to SEPA best practice guidelines with regards to preventing pollution incidents. The relevant guidelines include:
- PPG1: General guide to the prevention of water pollution
 - PPG3: The use and design of oil separators
 - PPG5: Works in, near, or liable to affect watercourses
 - PPG6: Working at construction and demolition sites
- 6.2.14 Pollution control measures will necessitate the installation of drainage systems to divert runoff into drains, soak-aways and detention basins, thus avoiding contamination of watercourses. Detention basins will be fenced to prevent otters gaining access and drainage systems grilled to prevent otters entering and becoming trapped. Chemical and oil storage tanks must be set back at least 10m from any watercourse and secondary containment must be provided to prevent pollution incidents from occurring. Construction vehicles must be prohibited from crossing watercourses used as breeding grounds by salmonid fish and silt traps must be installed. Disturbance to streambeds must generally be kept to a minimum to prevent erosion and siltation. Where this is not feasible, the floor of the culvert will be set at least 150mm below the bottom substrate (see Fish Report in Appendix A10.15). The operational scheme will also require the installation of a safe drainage system (e.g. SUDS); further details regarding pollution control during construction and operation can be found in Chapter 9 (Water Environment) of the Environmental Statement.

Further Survey

- 6.2.15 Otters are highly active in the study area and key habitats and lying-up sites are subject to change. Taking into account that construction of the scheme is not likely to commence before 2009, further surveys will be required immediately prior to the start of the construction phase. This will involve re-surveying all watercourses and waterbodies within 100m of the alignment as well as checking on the status of existing holts and couches. Should any new otter lying-up sites be found, then mitigation must be adjusted as necessary. The discovery of any holts or couches that are being used for breeding will necessitate the suspension of all works in that area until the cubs have left the holt/couch.
- 6.2.16 Maintenance of mitigation will be essential, ensuring that all culverts, ledges and underpasses are checked to make sure that they are not blocked by flood debris that will obstruct the flow of water or prevent otters from using them. An inspection of all mitigation measures will be required after flooding. Fencing must also be examined at regular intervals of at least once a year to check for damage and corrosion. In this respect, it is important that maintenance of mitigation measures is stipulated in the Term Maintenance Contract. Post-construction monitoring will also be required on an annual basis over the first five years to check for signs of otters, assess the status of holts and

to record any RTAs. This will help gauge how otters are adapting to the new scheme and whether the mitigation measures have been effective in helping to maintain the otter population at a favourable conservation status and preventing RTAs. Based on the results of these surveys, alterations and/or enhancements to the mitigation may be necessary. A Species Management Plan will be prepared for otters or will be included in the EMP to be produced prior to construction.

6.3 Specific Mitigation

- 6.3.1 Table 8 Specific Mitigation Measures details the specific mitigation measures that will be put in place for otters to prevent, reduce and offset the adverse impacts associated with the construction and operational phases of the AWPR Northern Leg. It covers the five main impacts associated with road schemes and also includes generic mitigation measures primarily designed for other species (particularly in the case of habitat creation) but that will also benefit otters e.g. woodland planting for bats near a watercourse. Where generic mitigation is described for otters, details can be found in Section 6.2 of this report. Information relating to the types of watercourse crossings that will be installed as part of the scheme can be found in Table 8. All mitigation measures can be found on Figures 11.5a-p, Landscape and Ecological Mitigation. For details on specific habitat creation refer to the Terrestrial Habitats report in Appendix A10.1.

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Table 8 - Specific Mitigation Measures

Direct Mortality	Habitat Loss	Habitat Fragmentation & Isolation	Disturbance	Pollution and Other Indirect Impacts
Section NL1				
<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2</p> <p><u>Operational phase:</u> Otter-proof fencing to be fitted at ch315080-315620 (see Figures 11.5a-b). Installation of depressed invert box culvert with integral mammal ledge at crossing of Kepplehill Burn at ch315200 (see Table 9). Fencing and underpasses provided for badgers will also serve as mitigation for otters. The extent of badger fencing and locations of badger underpasses can be found in the Badger Report in Appendix A10.2 and on Figure 11.5a.</p>	<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2.</p>	<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2, including the incorporation of underpasses under certain site access roads.</p> <p><u>Operational phase:</u> Installation of depressed invert box culvert with integral mammal ledge at crossing of Kepplehill Burn at ch315200 (see Table 9).</p>	<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2</p> <p><u>Operational phase:</u> Generic mitigation as described in Section 6.2 including no lighting along carriageway.</p>	<p><u>Construction & Operational phases:</u> Generic mitigation as described in Section 6.2, and in the Fish and Freshwater Reports in Appendices A10.15 and A10.16.</p>
Section NL2				
<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2.</p> <p><u>Operational phase:</u> Otter-proof fencing to be fitted at ch316180-317500 and along a 300m stretch of the A96 west of the A96 Junction and a 600m stretch east of the Junction. Also, a 250m stretch of Dyce Drive north of the A96 roundabout, a 350m stretch east of the A96 roundabout, and a 600m stretch west of the A96 roundabout (see Figures 11.5b-e). Installation of depressed invert box culverts with integral mammal ledges at locations shown in Table 9. Fencing and underpasses provided for badgers will also serve as mitigation for otters. The extent of badger fencing and locations of badger underpasses can be found in the Badger Report in Appendix A10.2 and Figures 11.5b-e.</p>	<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2 including the exclusion of work compounds from Craibstone, Parkhead and Chapel Croft Woods between ch316725-317350.</p> <p><u>Operational phase:</u> For details on specific habitat creation refer to section 6 in the Terrestrial Habitat Report in Appendix A10.1. Planting of coniferous woodland to the west of the scheme in Habitat Area (HA) N28, between ch316990 – 317050 (see Figure 11.5c). Coniferous planting west of AWPR in HA N28, between ch317070-317150 (see Figure 11.5c). Block of coniferous planting east of AWPR in HA N28, between ch317000-317050 (see Figure 11.5c). Block of mixed woodland to the east of the road in HA N28 at ch317100-317310 (see Figure 11.5c).</p>	<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2, including the incorporation of underpasses under certain site access roads.</p> <p><u>Operational phase:</u> Installation of depressed invert box culverts with integral mammal ledges at locations shown in Table 9.</p>	<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2, including the exclusion of work compounds from Craibstone, Parkhead and Chapel Croft Woods between ch316725-317350.</p> <p><u>Operational phase:</u> Generic mitigation as described in Section 6.2 including restricting lighting to A96 Junction.</p>	<p><u>Construction & Operational phases:</u> Generic mitigation as described in Section 6.2 , and in the Fish and Freshwater Reports in Appendices A10.15 and A10.16.</p>

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Direct Mortality	Habitat Loss	Habitat Fragmentation & Isolation	Disturbance	Pollution and Other Indirect Impacts
Section NL3				
<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2.</p> <p><u>Operational phase:</u> Otter-proof fencing to be fitted at ch317670-318000, ch318420-319160, ch319800-321280 and along a 500m stretch of the U53C Kirkhill road east of South Kirkhill Junction (see Figures 11.5e-h).</p> <p>Installation of depressed invert box culverts with integral mammal ledges at locations shown in Table 9.</p> <p>Fencing and underpasses provided for badgers will also serve as mitigation for otters. The extent of badger fencing and locations of badger underpasses can be found in the Badger Report in Appendix A10.2 and on Figures 11.5e-h.</p>	<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2.including the exclusion of work compounds from Bogenjoss Burn, Pitmedden and Monument Woods between ch319950-321800.</p> <p><u>Operational phase:</u> For details on specific habitat creation refer to section 6 in the Terrestrial Habitat Report in Appendix A10.1.</p> <p>Where Bogenjoss Burn is to be re-aligned between ch319950-320500, the new channel will be restored to maximise its ecological value to otters as well as other species such as fish and aquatic invertebrates. This will include the incorporation of natural bank sides, meanders (where possible) and the creation of riparian habitat.</p> <p>A strip of scrub woodland will be created to the west of the scheme in HA N37 and N41 between ch319970-320410. A strip of riparian woodland will also be created along Bogenjoss Burn to the west of the scheme at HA N37/41, between ch322000-320510 (see Figure 11.5f-g).</p> <p>A strip of mixed woodland will be created west of the AWPR between ch320450-320690 (HA N41) while a mosaic of scrub woodland and grassland will be created to the east of the AWPR between ch320400-320880 (HA 37/41) (see Figures 11.5f-g).</p> <p>Generic mitigation as described in the Terrestrial Habitats, Badger, Bat, Red Squirrel, Bird and Amphibian Reports in Appendices A10.1-4 and A10.7).</p>	<p><u>Construction phase:</u> Generic mitigation as described in paragraph 0, including the incorporation of underpasses under certain site access roads.</p> <p><u>Operational phase:</u> Installation of depressed invert box culverts with integral mammal ledges at locations shown in Table 9.</p>	<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2., including the exclusion of work compounds from Bogenjoss Burn, Pitmedden and Monument Woods between ch319950-321800.</p> <p><u>Operational phase:</u> Generic mitigation as described in paragraph 0 including no lighting along carriageway.</p>	<p><u>Construction & Operational phases:</u> Generic mitigation as described in Section 6.2, and in the Fish and Freshwater Reports in Appendices A10.15 and A10.16.</p>
Section NL4				
<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2.</p> <p><u>Operational phase:</u> Otter-proof fencing to be fitted at ch322820 – 323020, ch323390-325220, and along a 350m stretch of the re-aligned B977 south and a 450m stretch north of the B977 overbridge. Also, a 600m stretch of the re-aligned A947 north of the A947</p>	<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2.including the exclusion of work compounds from terrestrial habitat surrounding Lily and Corby Lochs between ch327200-328000.</p> <p><u>Operational phase:</u></p>	<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2, including the incorporation of underpasses under certain site access roads.</p>	<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2., including the exclusion of work compounds from terrestrial habitat surrounding Lily and Corby Lochs between ch327200- 328000. A SEERAD otter development licence will be obtained while the</p>	<p><u>Construction & Operational phases:</u> Generic mitigation as described in Section 6.2, and in the Fish and Freshwater Reports in Appendices A10.15 and A10.16.</p>

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Direct Mortality	Habitat Loss	Habitat Fragmentation & Isolation	Disturbance	Pollution and Other Indirect Impacts
<p>overbridge, 450m of the re-aligned A947 south of the A947 overbridge, 450m stretch of the existing A947 north of its junction with the AWPR. A 300m stretch of Corsehill link road 1 (including B977), and 300m stretch of Corsehill link road 2 (including B977) will also be fenced (see Figures 11.5i-k).</p> <p>Installation of a high span bridge with set-back piers over the River Don at ch323050-323370. Provision of bridges, underpasses and depressed invert box culverts with integral mammal ledges at locations shown in Table 9.</p> <p>Fencing and underpasses provided for badgers will also serve as mitigation for otters. The extent of badger fencing and locations of badger underpasses can be found in the Badger Report in Appendix A10.2 and on Figures 11.5i-j.</p>	<p>For details on specific habitat creation refer to section 6 in the Terrestrial Habitat Report in Appendix A10.1.</p> <p>Creation of mixed woodland including a 100m long, 10m wide strip of riparian woodland along Goval Mill Lade (HA N61) at ch324400-324530 (see Figure 11.5j). Creation of mixed woodland including a strip of riparian woodland 150m long and 10m wide north of Goval Burn at ch324400-ch324530 (HA N61) (see Figure 11.5j).</p> <p>Creation of a small triangle of mixed woodland totalling , including a 50m long, 10m wide strip of riparian woodland south of Goval Burn at ch324400-324440 (HA N61) (see Figure 11.5j)</p> <p>A mosaic of scrub, mixed woodland and small ponds will be created on the Goval Burn floodplain at ch324530-324650 between the burn and Goval Mill Lade (HA N61). This area will provide otters with excellent cover and lying-up opportunities and encourage amphibians, thus presenting otters with an additional food source (see Figure 11.5j).</p> <p>Exclusion of holt 4 (under a SEERAD licence) and installation of two pipe and chamber holts on Goval Burn at ch324100 and ch324650 (see Figure 11.5j.).</p> <p>Creation of new pond to the south of the scheme at ch325450 in HA N71.</p>	<p><u>Operational phase:</u> Installation of, bridges, underpasses and depressed invert box culverts with integral mammal ledges at locations shown in Table 9.</p>	<p>installation of two pipe and chamber holts away from the road scheme will provide otters with alternative resting sites should disturbance levels be too high.</p> <p><u>Operational phase:</u> Generic mitigation as described in Section 6.2 including restricting lighting to B977 Junction.</p> <p>The creation of woodland and scrub habitat along the Goval Burn and Mill lade will also act as a buffer between the AWPR and these watercourses, reducing disturbance from the operational road and encouraging otters to continue to use the Goval Burn and Mill lade for lying-up, foraging and commuting. In addition, the creation of two pipe and chamber holts away from the road scheme will provide otters with alternative resting sites should disturbance levels be too high.</p>	
Section NL5				
<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2.</p> <p><u>Operational phase:</u> Otter-proof fencing to be fitted at ch326800-327710, ch328160 – 328790, ch329750-330350, along a 450m stretch of the A90 east of the A90 North Junction. Approximately 1400m of fencing east of A90 North Junction and along the edge of the riparian zone on Middlefield Burn. Also a 250m stretch of Blackdog Access Road east of the A90 (see Figures 11.5l – p).</p> <p>Installation of depressed invert box culverts with integral mammal ledges at locations shown in Table</p>	<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2.</p> <p><u>Operational phase:</u> For details on specific habitat creation refer to section 6 in the Terrestrial Habitat Report in Appendix A10.1.</p> <p>Scrub woodland and riparian woodland will be created north of the scheme along Blackdog Burn (HA N87) between ch329870-329970. Riparian woodland will also be planted south of the AWPR to the east of Blackdog Burn (HA N87) at ch329980-330090 (see Figure 11.5n).</p> <p>In addition, riparian woodland will be created at the A90 north junction inside the roundabout, east of the</p>	<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2, including the incorporation of underpasses under certain site access roads.</p> <p><u>Operational phase:</u> Installation of depressed invert box culverts with integral mammal ledges at locations shown in</p>	<p><u>Construction phase:</u> Generic mitigation as described in Section 6.2.</p> <p><u>Operational phase:</u> Generic mitigation as described in Section 6.2 including restricting lighting to A90 Junction.</p>	<p><u>Construction & Operational phases:</u> Generic mitigation as described in Section 6.2, and in the Fish and Freshwater Reports in Appendices A10.15 and A10.16.</p>

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<p>9. Fencing and underpasses provided for badgers will also serve as mitigation for otters. The extent of badger fencing and locations of badger underpasses can be found in the Badger Report in Appendix A10.2 and on Figures 11.5k-p.</p>	<p>roundabout and north of Middlefield Burn and east of the roundabout south of the burn (see Figure 11.5p)</p>	<p>Table 9.</p>		

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Table 9 - Watercourse Crossing Structures

Water feature	Chainage/location	Crossing type	Length (m)	Width (m)	Height (m)	Maximum flood level (m)	Additional Information
Section NL1							
Kepplehill Burn	AWPR Mainline at ch315200	Depressed invert culvert	154	1.8	1.5	0.606	Integral mammal ledge on north bank
Section NL2							
Gough Burn	AWPR Mainline at ch316390	Depressed invert culvert	66	2.4	1.5	0.678	Integral mammal ledge on north bank
Gough Burn Culvert 2	AWPR Mainline at ch316430	Depressed invert culvert	11	2.4	1.5		Integral mammal ledge on north bank
Craibstone Burn	AWPR Mainline at ch316990	Depressed invert culvert/bridge	106	2.7	1.5	0.453	Integral mammal ledge on north bank
Green Burn	AWPR Mainline (ch317330)	Depressed invert culvert	113	1.8	1.5	0.890	Integral mammal ledge and dry mammal underpass on north bank
	A96 (Mainline ch317330)	Depressed invert culvert	29	3	1.5	0.626	Integral mammal ledge on north bank
	Kirkhill Industrial Estate Link Road	Depressed invert culvert	23	3	1.5		Integral mammal ledge on north bank
Section NL3							
Bogenjoss Burn	Kirkhill Access Track at ch320100	Depressed invert culvert	9	2.7	1.5	0.349	Integral mammal ledge on north bank. Provision of wildlife overbridge at ch319960.
	Kirkhill Access Track at ch320215	Depressed invert culvert	8	2.7	1.5	0.531	Integral mammal ledge on north bank
	Kirkhill Access Track at ch320260	Depressed invert culvert	11	2.7	1.5	0.582	Integral mammal ledge on north bank
	Kirkhill Access Track at ch320475	Depressed invert culvert	10	2.7	1.5	0.584	Integral mammal ledge on north bank

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Water feature	Chainage/location	Crossing type	Length (m)	Width (m)	Height (m)	Maximum flood level (m)	Additional Information
	AWPR Mainline at ch320500	Depressed invert culvert	56	2.7	1.5	0.575	Integral mammal ledge on north bank
	AWPR Mainline at ch320870	Depressed invert culvert	160	2.7	1.8	-	
Section NL4							
River Don	AWPR Mainline at ch323050-323370	Buried structure	-	-	-	-	High span bridge with set-back piers
Goval Burn	Re-aligned B977 crossing at ch323610	Buried structure	92	5.4	2.4	NA	Integral mammal ledge on both banks
	Re-aligned A947 crossing at ch324400	Buried structure	49	5.4	2.4	NA	Integral mammal ledge on both banks
	AWPR Mainline at ch324600	Buried structure (bridge)	147.5	5.4	2.4	NA	Integral mammal ledge on both banks
Parkhill	Mainline at ch323950	Aqueduct	-	-	-	-	
Mill Lade	Existing A947 crossing at ch324230	Dry underpass	25	0.6	NA	NA	600mm diameter dry mammal underpass on south bank
	Re-aligned A947 crossing at ch324400	Buried structure	-	-	-	-	Integral mammal ledge on both banks
Corsehill Burn	AWPR Mainline at ch325085	Depressed invert culvert	77	2.7	1.5	0.621	Integral mammal ledge on north bank
	B977 link road 1 crossing, Goval Junction	Depressed invert culvert	32	2.7	1.5	0.660	Integral mammal ledge on north bank
	B977 link road 2 crossing, Goval Junction	Depressed invert culvert	55	2.7	1.5	0.660	Integral mammal ledge on north bank
Section NL5							
Red Moss Burn	AWPR Mainline at ch327500	Depressed invert culvert	58	2.7	1.5	0.701	Integral mammal ledge on north bank
Blackdog Burn	AWPR Mainline at ch329950	Depressed invert culvert	74	3	2.4	1.167	Integral mammal ledge on south bank

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Water feature	Chainage/location	Crossing type	Length (m)	Width (m)	Height (m)	Maximum flood level (m)	Additional Information
	Blackdog Access Road (U240C) crossing	Depressed invert culvert	39	3.6	2.4	1.167	Integral mammal ledge on north bank
Blackdog Ditch	Ch330065	Depressed invert culvert	47	2.4	1.2		Integral mammal ledge on west bank
Middlefield Burn	A90	Depressed invert culvert	93	2.4	1.2	0.370	Integral mammal ledge on north bank
	Side road crossing	Depressed invert culvert	54	2.4	1.2	0.227	Integral mammal ledge on north bank
	Side road crossing	Depressed invert culvert	47	2.4	1.2	0.204	Integral mammal ledge on north bank

6.4 Mitigation Summary

- 6.4.1 Evidence from radio-tracking and from studies of the distribution of road casualties shows that otters will use tiny streams and ditches including dry watercourses for feeding and as regular commuting routes (Kruuk et al., 1998; Chanin, 2003). In terms of mitigation, it is therefore most important to provide suitably designed culverts and bridges on every watercourse no matter how small so that otters may continue to commute within the confines of the river corridor. In this respect, fencing on both sides of the carriageway will be an equally vital component of mitigation, especially when it is considered that otters are frequently killed on trunk and A roads (Philcox et al., 1999). The prohibitive length of a number of the proposed culverts has been addressed in the residual impacts section of this report.
- 6.4.2 Generally, the most important areas of habitat will not be affected by the scheme although where valuable areas are to be lost, they will be compensated for through re-planting and the creation of additional habitat. Indeed, the provision of ponds and woodland as mitigation for other species such as bats and amphibians (see Bat and Amphibian Reports in Appendices A10.3 and A10.9) should also benefit otters. The loss of otter holts is however more difficult to mitigate for and therefore every effort must be made to avoid the destruction of these. One holt would need to be excluded as part of the scheme while several holts may be subject to disturbance from construction activities and the operational road. The procurement of a SEERAD licence will therefore be essential and this must be obtained at least 10 months in advance of development commencing. Any measures that are needed to protect otters should be in place prior to the construction phase starting. Similarly any mitigation required during the construction phase should be installed during the process. It is essential that all personnel working on site are aware of the mitigation in place and of the obligations. An ecological clerk of works will be appointed to oversee the implementation of mitigation measures and to ensure that mitigation procedures are adhered to. All the mitigation measures discussed in this section must be fully operational before the road scheme is opened to traffic.

7 Residual Impacts

7.1 Generic Residual Impacts

Direct Mortality

- 7.1.1 If the mitigation measures outlined are successfully implemented, the construction and operational phases of the road are not predicted to compromise the long-term viability of the otter population in the study area. For otters to adjust to the new scheme and use culverts and underpasses (especially those which are greater than 50m long as per paragraph 7.1.3 below) but ultimately they will be able to continue their nightly journeys within the confines of the river/waterway corridors therefore negating the need to enter the carriageway. In addition the provision of badger fencing in conjunction with otter fencing effectively means that the entire AWPR Northern Leg will be fenced, therefore preventing otters from finding their way onto the carriageway and averting potential RTAs. While individual RTAs may occasionally occur where otters are taking terrestrial routes and entering the carriageway via unfenced side roads, these are unlikely to affect the viability of the local population. Furthermore, such impacts are likely to be balanced by reduced traffic flows on existing roads (which lack appropriate bridges, culverts and fencing), which is predicted to result in a reduction in RTAs on these routes. Given that most RTAs are likely to go unrecorded this may represent a significant reduction in the impact of direct mortality on unmitigated roads.

Habitat Loss

- 7.1.2 The proposed scheme is unlikely to result in the significant loss of any highly valuable areas of otter habitat, the road passing mainly through agricultural land, which is of minimal value to otters. Several strips of high value riparian habitat within the SAC at Craibstone and along Goval Burn

would however be destroyed during construction while one otter holt and two couches would also be lost to the scheme. This may cause temporary stress to otters lying-up along the burn, although the provision of two pipe and chamber holts will ensure that minimal disruption is caused to the habits of otters in the long-term.

Habitat Fragmentation and Isolation

- 7.1.3 Despite the incorporation of bridges and culverts with integral mammal ledges, the completed road would, in the short term, sever home ranges especially when taking into account the large sizes of otter ranges. However, otters may soon become accustomed to using some of these structures and otters will be able to follow their natural behaviour patterns. In the long-term, the effects of fragmentation and isolation are likely to be exacerbated by culvert length, with longer and narrower culverts, such as those in excess of 100m long (e.g. Kepplehill Burn Culvert, Craibstone Burn Culvert and Green Burn Mainline Culvert) posing the greatest fragmentation impact to otter populations. Otters are known to use culverts longer than 100m in length although these are generally more than 5m wide resulting in slower flow rates (Jim Green pers.comm.). Research has shown that otters are less inclined to swim through structures with greater tunnel effects (calculated by height between span and water x width of span/length of span) or when flows are greater, thus highlighting the importance of large structures which present otters with the option of swimming or walking alongside the watercourse (Grogan et al., 2001). Taking into consideration that most culverts on the AWPR Northern Leg will be less than 3m wide (with the exception of A96 Mainline Culvert and culverts at Blackdog Junction) it is likely that some otters may be reluctant to use them, particularly where they are in excess of 50m long (Andy McKenzie, pers.comm.), and the road scheme is therefore likely to continue to sever otter home ranges and territories in the long term resulting in residual impacts (see Cumulative Impacts Assessment in Part E of the ES).

Disturbance

- 7.1.4 The completed road is likely to increase the overall level of disturbance to otters, as a consequence of the scheme crossing or running parallel to watercourses and passing through areas currently used for agriculture. The implementation of the suggested mitigation should ensure that disturbance is kept to a minimum during the construction phase, particularly in the vicinity of watercourses (where exclusion zones have been put in place) while lighting is only likely to be an issue close to three major junctions. The operational scheme also comes in close proximity (30m) to several lying-up sites although otters may become accustomed to increased noise levels over time. Furthermore, the provision of artificial holt sites away from the footprint of the scheme will present otters with alternative lying-up sites should disturbance levels prove to be too high. It should be noted that the waters and banks of the Rivers Don and Dee in the city of Aberdeen are frequently used by otters (e.g. near Bridge of Balgownie) (Hans Kruuk, pers.comm.), while otters are rapidly re-colonising rivers and streams in towns and cities across the UK (Chanin, 2003; Crawford, 2003). The main residual impacts resulting from disturbance are associated with the construction phase. These impacts are temporary and will be reduced to a minimal level by the mitigation measures proposed.

Pollution and Other Indirect Impacts

- 7.1.5 The implementation of the mitigation suggested should ensure that the risk of pollutants reaching any watercourse is negligible and therefore there should be no adverse impact on otters. The installation of culverts and diversion of watercourses is however, likely to destroy aquatic invertebrate habitat and result in scouring and sedimentation to some extent. This may have an adverse impact on fish populations, which will in turn have negative consequences for otters.

7.2 Specific Residual Impacts

7.2.1 Residual impacts during construction and operation are summarised in Table 10.

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Table 10 - Specific Residual Impacts

Water feature	Phase of scheme	Impacts	Impact magnitude/significance	Residual Impacts	Residual Impact magnitude/significance
Section NL1					
Kepplehill Burn	Construction	Minimal disturbance likely due to infrequent use of the burn by otters.	negligible/Negligible	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the burn.	negligible/Negligible
	Operation	Increased risk of direct mortality through RTAs where scheme crosses burn.	high negative/Moderate	A depressed invert box culvert with an integral mammal ledge will be constructed where the scheme crosses the burn, thus allowing otters to continue their nightly journeys within the confines of the burn corridor. The erection of otter/badger proof fencing along the entire scheme will prevent otters finding their way onto the carriageway.	negligible/Negligible
		Loss of 300m of low value riparian habitat comprising scattered scrub and wet grassland. No significant impact predicted as habitat is of minimal value to otters.	negligible/Negligible	No residual impact is predicted as existing habitat at the crossing point is of minimal value to otters.	negligible/Negligible
		Scheme would sever otter movements between River Dee and River Don catchments although other commuting routes exist.	medium negative/Moderate	At 154m long, some otters may be reluctant to use Kepplehill Burn culvert, although other routes exist.	low negative/Minor
		Risk of deterioration in water quality due to runoff from the scheme. Although otters are only likely to use Kepplehill Burn on an infrequent basis, the burn flows into Bucks Burn that is a tributary of the River Don, therefore increasing the significance of such an impact.	medium negative/Moderate	Road drainage system will ensure that road run-off entering the burn complies with Environmental Quality Standards.	negligible/Negligible
Section NL2					

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Water feature	Phase of scheme	Impacts	Impact magnitude/significance	Residual Impacts	Residual Impact magnitude/significance
Gough Burn	Construction	Direct Mortality risk	high negative/Major	Best practice guidelines and demarcation of the burn within 30m of active otter lying up sites to ensure that otters are not killed during construction.	negligible/Negligible
		Otters are likely to forage along the burn and lie-up in woodland reaches, and therefore may suffer disturbance from construction activities.	high negative/Major	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the burn. Otters lying-up in the surrounding woodland habitat may suffer some disturbance although this will be temporary.	low negative/Minor
	Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn.	high negative/Major	A depressed invert box culvert with an integral mammal ledge will be constructed where the scheme crosses the burn, thus allowing otters to continue their nightly journeys within the confines of the burn corridor. The erection of otter/badger proof fencing along the entire scheme will prevent otters finding their way onto the carriageway.	negligible/Negligible
		Loss of 0.5ha of high value mixed woodland and riparian habitat in Craibstone Wood comprising potential holt sites in bankside trees, dead wood and dense rhododendron thickets.	medium negative/Moderate	Re-planting in this area will partially offset loss of existing habitat, although this will take some time to mature.	low negative/Minor
		Scheme will sever otter movements between the River Don and land/watercourses to the west of the alignment e.g. the River Dee catchment although other commuting routes exist.	high negative/Major	The construction of a 66m long box culvert at this location will allow otters to move freely within and between available areas of habitat.	low negative/Minor
		Risk of deterioration in water quality due to run-off from the scheme. Burn is likely to be an important foraging resource and is a tributary of the River Don.	high negative/Major	Road drainage system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	negligible/Negligible

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Water feature	Phase of scheme	Impacts	Impact magnitude/significance	Residual Impacts	Residual Impact magnitude/significance
Craibstone Burn	Construction	Direct Mortality risk	high negative/Major	Best practice guidelines and demarcation of the burn within 30m of active otter lying up sites to ensure that otters are not killed during construction.	negligible/Negligible
		Otters are likely to forage along the burn and lie-up in woodland reaches, and therefore may suffer disturbance from construction activities.	high negative/Major	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the burn. Otters lying-up in the surrounding woodland habitat may suffer some disturbance, although this will be temporary.	low negative/Minor
	Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn.	high negative/Major	A depressed invert box culvert with an integral mammal ledge will be constructed where the scheme crosses the burn, thus allowing otters to continue their nightly journeys within the confines of the burn corridor. The erection of otter/badger proof fencing along the entire scheme will prevent otters finding their way onto the carriageway.	negligible/Negligible
		Loss of 1.5ha high value woodland habitat in Craibstone Wood, comprising potential holt sites and dense scrub. Loss of 160m of medium value riparian habitat comprising tall herbs and occasional scrub.	medium negative/Moderate	Re-planting in this area will offset loss of existing habitat, although this will take some time to mature.	low negative/Minor
		Scheme would sever otter movements between the River Don and land/watercourses to the west of the alignment e.g. the River Dee catchment although other commuting routes exist.	high negative/Major	At 106m long, some otters may be reluctant to use Craibstone Burn culvert, although other routes exist.	medium negative/Moderate
		Risk of deterioration in water quality due to run-off from the scheme. Burn is likely to be an important foraging resource and is a tributary of the River Don.	high negative/Major	Road drainage system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	negligible/Negligible

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Water feature	Phase of scheme	Impacts	Impact magnitude/significance	Residual Impacts	Residual Impact magnitude/significance
Craibstone Pond	Construction	Otters may suffer disturbance from construction of the scheme although they are only likely to use the pond during spring and summer when amphibians are present.	low negative/Minor	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the pond. Otters lying-up in the surrounding woodland habitat may suffer some disturbance, although this will be temporary.	negligible/Negligible
	Operation	Increased risk of direct mortality through RTAs as otters attempt to reach pond.	high negative/Moderate	The provision of box culverts on Craibstone Burn and Green Burn (see below) will allow otters to reach the pond while the erection of otter/badger proof fencing along the entire scheme will prevent otters finding their way onto the carriageway.	negligible/Negligible
		Loss of high value woodland habitat in Craibstone Wood, comprising potential holt sites and dense scrub (refer to Table 11 in the Terrestrial Habitats report (Appendix A10.1) for information regarding specific habitat loss).	medium negative/Moderate	Re-planting in this area will offset loss of existing habitat, although this will take some time to mature.	low negative/Minor
		Scheme would sever otter movements to the pond, which is likely to provide a seasonally important source of food in the form of amphibians.	medium negative/Moderate	The provision of box culverts on Craibstone Burn and Green Burn (see below) will allow otters to reach the pond, although at 106 and 113m long respectively, some otters may be reluctant to use these culverts.	low negative/Minor
		Risk of deterioration in water quality due to runoff from the scheme. Pond does not support fish but holds important populations of amphibians, which are likely to be a seasonally important prey resource to otters.	medium negative/Moderate	Road drainage system will ensure that road runoff entering the pond complies with Environmental Quality Standards.	negligible/Negligible
Green Burn	Construction	Direct Mortality risk	high negative/Major	Best practice guidelines and demarcation of the burn within 30m of active otter lying up sites to ensure that otters are not killed during construction.	negligible/Negligible

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Water feature	Phase of scheme	Impacts	Impact magnitude/significance	Residual Impacts	Residual Impact magnitude/significance
		Otters are likely to forage along the burn and lie-up in woodland reaches, and therefore may suffer disturbance from construction activities.	high negative/Major	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the pond. Otters lying-up in the surrounding woodland habitat may suffer some disturbance, although this will be temporary.	low negative/Minor
	Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn.	high negative/Major	Depressed invert box culverts with integral mammal ledges will be constructed where the scheme crosses the burn, thus allowing otters to continue their nightly journeys within the confines of the burn corridor. The erection of otter/badger proof fencing along the entire scheme will prevent otters finding their way onto the carriageway.	negligible/Negligible
		Loss of high value mixed woodland habitat in Chapel Croft Wood, comprising scrub and boulder piles.	medium negative/Moderate	Re-planting in this area including scrub planting along Green Burn will offset loss of existing habitat, although this will take some time to mature. Loss of invertebrate and fish habitat along re-aligned reach of the burn will be minimised through careful design of realignment, while best practice guidelines will be adhered to.	low negative/Minor
		Loss of 620m of medium value riparian habitat comprising tall herbs and occasional scrub.	low negative/Minor		
		Realignment and straightening of 750m of burn likely to result in the loss of invertebrate/fish habitat, resulting in reduced prey availability.	medium negative/Moderate		
		Scheme would sever otter movements between the River Don and land/watercourses to the west of the alignment e.g. the River Dee catchment although other commuting routes exist.	high negative/Major	The construction of box culverts at crossing points will allow otters to move freely within and between available areas of habitat. However, one of the culverts is 113m long, meaning that some otters may be reluctant to use it, although other routes exist.	medium negative/Moderate
		Lighting at A96 junction may initially cause disturbance to otters using the burn.	low negative/Minor	Otters may soon become accustomed to lighting and as such, disturbance is likely to be minimal in the long-term.	negligible/Negligible

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Water feature	Phase of scheme	Impacts	Impact magnitude/significance	Residual Impacts	Residual Impact magnitude/significance
		Risk of deterioration in water quality due to runoff from the scheme. Burn is likely to be an important foraging resource and is a tributary into River Don.	high negative/Major	Road drainage system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	negligible/Negligible
Section NL3					
Walton Ditch	Construction	Minimal disturbance likely due to infrequent use of the ditch by otters.	negligible/Negligible	Otters are only likely to use the ditch on an infrequent basis and therefore no residual impacts are predicted.	negligible/Negligible
	Operation	Increased risk of direct mortality through RTAs where scheme crosses ditch.	high negative/Moderate	Ditch will be incorporated into earthworks drainage but the construction of badger underpasses will allow otters to pass under the scheme safely. The erection of otter/badger proof fencing along the entire scheme will prevent otters finding their way onto the carriageway.	negligible/Negligible
		Loss of 240m of low value riparian habitat comprising in-channel aquatic vegetation and dense thickets of gorse and broom. No significant impact predicted as habitat is of minimal value to otters.	negligible/Negligible	As existing habitat is of low value and is unlikely to be frequently used by otters, no residual impacts are predicted.	negligible/Negligible
		Scheme would sever otter movements although other more important commuting routes exist.	low negative/Minor	Ditch will be incorporated into earthworks drainage but the construction of badger underpasses will allow otters to move freely within and between available areas of habitat.	negligible/Negligible
		Risk of deterioration in water quality due to runoff from the scheme. No significant impact is predicted as otters are only likely to use the ditch on an infrequent basis while ditch is not connected to any flowing watercourses.	negligible/Negligible	Road drainage system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	negligible/Negligible
Howemoss Ditch	Construction	Minimal disturbance likely due to infrequent use of the ditch by otters.	negligible/Negligible	Otters are only likely to use the ditch on an infrequent basis and therefore no residual impacts are predicted.	negligible/Negligible

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Water feature	Phase of scheme	Impacts	Impact magnitude/significance	Residual Impacts	Residual Impact magnitude/significance
	Operation	Increased risk of direct mortality through RTAs where scheme comes within close proximity to the ditch.	high negative/Moderate	The installation of otter/badger proof fencing along the entire scheme will prevent otters finding their way onto the carriageway.	negligible/Negligible
Far Burn	Construction and Operation	Burn is over 250m from the alignment and therefore no significant impacts are predicted.	negligible/Negligible	None predicted due to distance from scheme	negligible/Negligible
Bogenjoss Burn	Construction	Direct Mortality risk	high negative/Major	Best practice guidelines and demarcation of the burn within 30m of active otter lying up sites to ensure that otters are not killed during construction.	negligible/Negligible
		Otters are likely to forage along the burn and lie-up in woodland reaches, and therefore may suffer direct mortality or disturbance from construction activities.	high negative/Major	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the pond and reduce the risk of direct mortality. Otters lying-up in the surrounding woodland habitat may suffer some disturbance, although this will be temporary.	low negative/Minor
	Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn and in the vicinity of Monument Wood where otters are taking terrestrial routes to move through their range.	high negative/Major	Depressed invert box culverts with integral mammal ledges will be constructed where the scheme crosses the burn, thus allowing otters to continue their nightly journeys within the confines of the burn corridor. The erection of otter/badger proof fencing along the entire scheme will prevent otters finding their way onto the carriageway.	negligible/Negligible
		Loss of 580m of high value habitat comprising mixed woodland, dense gorse scrub and wet grassland. Realignment and straightening of burn between ch319950 and ch320500 likely to result in the loss of invertebrate/fish habitat, resulting in reduced prey availability	medium negative/Moderate	Re-planting in this area will offset loss of existing habitat. While this may take some time to mature, it will be of greater ecological value than at present. Loss of invertebrate and fish habitat along re-aligned reach of the burn will be minimised through careful design of realignment, while best practice guidelines will be adhered to.	negligible/Negligible

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Water feature	Phase of scheme	Impacts	Impact magnitude/significance	Residual Impacts	Residual Impact magnitude/significance
		Scheme would sever otter movements between the River Don and land/watercourses to the west of the alignment although other commuting routes exist.	high negative/Major	The construction of box culverts at crossing points will allow otters to move freely within and between available areas of habitat. However, one of the culverts is 160m long, meaning that some otters may be reluctant to use it, although other routes exist.	medium negative/Moderate
		Risk of deterioration in water quality due to runoff from the scheme. Burn is likely to be an important foraging resource and is a tributary of the River Don.	high negative/Major	Road drainage system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	negligible/Negligible
Gravel Pit Ponds	Construction and Operation	Ponds are over 200m away from the scheme and therefore no significant impacts are predicted	negligible/Negligible	None predicted due to distance from scheme	negligible/Negligible
Section NL4					
River Don	Construction	Direct Mortality risk	high negative/Major	Best practice guidelines and demarcation of the burn within 30m of active otter lying up sites to ensure that otters are not killed during construction.	negligible/Negligible
		Disturbance from construction activities is likely since the River Don is used constantly by otters for foraging, commuting and lying-up.	high negative/Major	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the river. Otters lying-up along the river may suffer some disturbance, although this will be temporary.	negligible/Negligible
	Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses river.	high negative/Major	Construction of a wide span bridge with set back piers will allow otters to pass safely between the abutments of the bridge and the riverbank during high water levels. The installation of otter/badger proof fencing along the entire scheme will prevent otters finding their way onto the carriageway.	negligible/Negligible
		Loss of 40m of low value riparian habitat comprising pasture.	negligible/Negligible	Bridge structure with set back piers will allow habitat underneath to remain relatively intact.	negligible/Negligible

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Water feature	Phase of scheme	Impacts	Impact magnitude/significance	Residual Impacts	Residual Impact magnitude/significance
		Scheme would sever otter movements to tributary streams and other catchments, the River Don being the largest watercourse in the study area and a key immigration and emigration route.	high negative/Major	The construction of a high span bridge with set back piers will allow otters to move freely within and between available areas of habitat.	negligible/Negligible
		Risk of deterioration in water quality due to runoff from the scheme. Such events would have potentially serious indirect effects on local otter populations as the River Don represents a primary prey resource to otters in this area.	high negative/Major	Road drainage system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	negligible/Negligible
Goval Burn	Construction	There is a risk of direct mortality to otters using holt 4 and riparian vegetation for lying-up.	high negative/Major	Best practice guidelines and demarcation of the burn within 30m of active otter lying up sites to ensure that otters are not killed during construction. Holt 4 will be excluded under a SEERAD licence thus reducing the risk of direct mortality to otters using the holt.	negligible/Negligible
		Construction of the scheme is likely to cause disturbance to otters using holts 3, 4 and 5 as well as to otters lying-up in dense riparian vegetation along the burn. Otters use the burn regularly for foraging, commuting and lying-up.	high negative/Major	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the burn. Otters lying-up along the burn may suffer some disturbance, although this will be temporary and two artificial holt sites will be created away from the scheme, thus providing otters with alternative lying-up sites.	negligible/Negligible
	Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn.	high negative/Major	Construction of bridge structures where the scheme crosses the burn will allow otters to continue their nightly journeys within the confines of the burn corridor. The erection of otter/badger proof fencing along the entire scheme will prevent otters finding their way onto the carriageway.	negligible/Negligible

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Water feature	Phase of scheme	Impacts	Impact magnitude/significance	Residual Impacts	Residual Impact magnitude/significance
		Scheme would result in the loss of holt 4 at ch324525, which constitutes an offence under current legislation. Holt 4 is thought to be used only occasionally during night time foraging. Similarly, two couches (couches 2 and 4) at ch323700 and ch324350 will also be lost although these sites are subject to seasonal change.	high negative/Major	Provision of two pipe and chamber holts will offset the loss of the natural holt (holt 4) and provide otters with long-term alternative holt sites.	low negative/Minor
		Scheme would result in the loss of 650m of high value riparian habitat comprising tall herbaceous vegetation (including potential lying-up habitat) and scattered trees where the AWPR and associated side roads cross the burn.	medium negative/Major	Habitat creation in this area will offset loss of existing habitat and enhance the quality of the habitat along the burn. Habitat areas will however take some time to mature.	negligible/Negligible
		Scheme would sever otter movements between Goyal Burn and the River Don.	high negative/Major	The construction of bridge structures will allow otters to move freely within and between available areas of habitat.	negligible/Negligible
		Risk of deterioration in water quality due to runoff from the scheme. Such events would have potentially serious effects as the burn constitutes a key foraging, commuting and lying-up resource, and flows into the River Don.	high negative/Major	Road drainage system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	negligible/Negligible
Mill Lade	Construction	Direct mortality risk.	high negative/Major	Best practice guidelines and demarcation of the burn within 30m of active otter lying up sites to ensure that otters are not killed during construction. Holt 4 will be excluded under a SEERAD licence thus reducing the risk of direct mortality to otters using the holt.	negligible/Negligible

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Water feature	Phase of scheme	Impacts	Impact magnitude/significance	Residual Impacts	Residual Impact magnitude/significance
		Otters would suffer disturbance from construction activities since watercourse is used regularly by otters for foraging, commuting and lying-up.	medium negative/Moderate	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the burn. Otters lying-up along the burn may suffer some disturbance, although this will be temporary.	low negative/Minor
	Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses lade and runs parallel to it.	high negative/Major	The construction of a bridge structure and dry underpass will allow otters to move freely within and between available areas of habitat.	negligible/Negligible
		Loss of 300m of low value riparian habitat comprising stone walls and strips of rank grassland. No significant impact predicted as habitat is of low value to otters.	negligible/Negligible	Habitat creation in this area will enhance the quality of habitat for otters along the lade.	negligible/Negligible
		Scheme would sever otter movements between the lade and Goval Burn.	high negative/Major	The construction of a bridge structure and dry underpass will allow otters to move freely within and between available areas of habitat.	negligible/Negligible
		Risk of deterioration in water quality due to runoff from the scheme. While the lade is not connected to any other watercourse, it is likely to be an important foraging and commuting feature.	high negative/Major	Road drainage system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	negligible/Negligible
Corsehill Burn	Construction	Burn is used by otters for foraging and commuting and they are therefore likely to suffer from disturbance.	medium negative/Moderate	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the burn.	negligible/Negligible

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Water feature	Phase of scheme	Impacts	Impact magnitude/significance	Residual Impacts	Residual Impact magnitude/significance
	Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn.	high negative/Moderate	Depressed invert box culverts with integral mammal ledges will be constructed where the scheme crosses the burn, thus allowing otters to continue their nightly journeys within the confines of the burn corridor. The erection of otter/badger proof fencing along the entire scheme will prevent otters finding their way onto the carriageway.	negligible/Negligible
		Loss of 700m of low value riparian habitat comprising stone walls and pasture. No significant impact predicted as habitat is of minimal value to otters.	negligible/Negligible	Loss of invertebrate and fish habitat along re-aligned reach of the burn will be minimised through careful design of realignment, while best practice guidelines will be adhered to. Burn will be restored to a more natural state than at present thus enhancing the quality of the habitat for otters along this stretch of the burn.	Negligible/Negligible
		Realignment and straightening of burn between ch324750 - 325080 is likely to result in the loss of invertebrate/fish habitat, resulting in reduced prey availability.	medium negative/Moderate		
		Scheme would sever otter movements between Red Moss and the River Don, although other commuting routes exist.	high negative/Moderate	The construction of box culverts at crossing points will allow otters to move freely within and between available areas of habitat. However, one of the culverts is 71m long, meaning that some otters may be reluctant to use it, although other routes exist	medium negative/Moderate
		Lighting at B977 junction may cause disturbance to otters using the burn.	low negative/Minor	Otters may soon become accustomed to lighting and as such, disturbance is likely to be minimal in the long-term.	negligible/Negligible
		Risk of deterioration in water quality due to runoff from the scheme. Burn is likely to be a foraging and commuting resource and is a tributary of Goyal Burn.	high negative/Moderate	Road drainage system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	negligible/Negligible
Corsehill Burn South	Construction	Otters are likely to use the burn as a commuting route, and therefore may suffer disturbance from construction activities.	low negative/Minor	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the burn.	negligible/Negligible

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Water feature	Phase of scheme	Impacts	Impact magnitude/significance	Residual Impacts	Residual Impact magnitude/significance
	Operation	Lighting at B977 junction may initially cause disturbance to otters using the burn.	low negative/Minor	Otters may soon become accustomed to lighting and as such, disturbance is likely to be minimal in the long-term.	negligible/Negligible
Corsehill Pond	Operation	Loss of low value pond habitat (refer to Table 11 in the Terrestrial Habitats report (Appendix A10.1) for information regarding specific habitat loss).	negligible/Negligible	A new pond will be created to offset the loss of Corsehill Pond. This is likely to result in a pond habitat that is of greater ecological value than the current pond.	negligible/Negligible
Parkhill Loch	Construction and Operation	Loch is over 250m away from the scheme and therefore no significant impacts are predicted.	negligible/Negligible	None predicted due to distance from scheme	negligible/Negligible
Section NL5					
Red Moss Burn	Construction	Direct Mortality risk	high negative/Major	Best practice guidelines and demarcation of the burn within 30m of active otter lying up sites to ensure that otters are not killed during construction.	negligible/Negligible
		Otters are likely to use this reach of the burn for lying-up and therefore may suffer disturbance from construction activities.	high negative/Major	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the burn.	low negative/Minor
	Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn.	high negative/Moderate	A depressed invert box culvert with an integral mammal ledge will be constructed where the scheme crosses the burn, thus allowing otters to continue their nightly journeys within the confines of the burn corridor. The erection of otter/badger proof fencing along the entire scheme will prevent otters finding their way onto the carriageway.	negligible/Negligible
		Loss of 200m of medium value riparian habitat comprising gorse and broom.	low negative/Minor	No re-planting will take place in this area and therefore habitat loss will be permanent.	low negative/Minor

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Water feature	Phase of scheme	Impacts	Impact magnitude/significance	Residual Impacts	Residual Impact magnitude/significance
		Scheme would sever otter movements between Red Moss and Corby and Lily Lochs.	high negative/Major	The construction of a box culvert where the scheme crosses the burn will allow otters to move freely within and between available areas of habitat.	negligible/Negligible
		Risk of deterioration in water quality due to runoff from the scheme. Burn is used for foraging and commuting and flows into Corby Loch, which supports large fish populations.	high negative/Moderate	Road drainage system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	negligible/Negligible
Loch Hills Farm Pond	Construction and Operation	Disturbance to potential foraging and lying up site.	low negative/Minor	Best practice guidelines will be followed as above.	negligible/Negligible
Loch Greens Pond	Operation	Loss of 0.05ha of low value pond habitat. No significant impact predicted as habitat is of minimal value to otters.	negligible/Negligible	None predicted due to distance from scheme	negligible/Negligible
Corby and Lily Lochs	Construction and Operation	Lochs are over 200m and 400m away from the scheme respectively but as the scheme crosses Red Moss Burn, which flows into Corby Loch, there is a risk of deterioration in water quality. Both lochs are important foraging resources, thus increasing the magnitude of such an incident.	high negative/Moderate	Road drainage system will ensure that road runoff entering the lochs complies with Environmental Quality Standards.	negligible/Negligible
Sand Pit Pond	Construction and Operation	Pond is over 300m away from the scheme and therefore no significant impacts are predicted.	negligible/Negligible	None predicted due to distance from scheme	negligible/Negligible
Gourdieburn Ponds	Construction and Operation	Ponds are over 600m away from the scheme and therefore no significant impacts are predicted.	negligible/Negligible	None predicted due to distance from scheme	negligible/Negligible
Harehill Burn	Construction and Operation	Burn is 150m away from the scheme and therefore no significant impacts are predicted.	negligible/Negligible	None predicted due to distance from scheme	negligible/Negligible

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Water feature	Phase of scheme	Impacts	Impact magnitude/significance	Residual Impacts	Residual Impact magnitude/significance
Blackdog Burn	Construction	Burn is used by otters for foraging, commuting and lying-up. Otters are therefore likely to suffer from disturbance.	medium negative/Moderate	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the burn.	negligible/Negligible
	Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn.	high negative/Major	Depressed invert box culverts with integral mammal ledges will be constructed where the scheme crosses the burn, thus allowing otters to continue their nightly journeys within the confines of the burn corridor. The installation of otter/badger proof fencing along the entire scheme will prevent otters finding their way onto the carriageway.	negligible/Negligible
		Loss of 400m of low value riparian habitat comprising wet grassland and occasional gorse. No significant impact predicted as habitat is of minimal value to otters.	negligible/Negligible	Habitat creation in this area will enhance the quality of the habitat along the burn. Habitat areas will however take some time to mature.	negligible/Negligible
		Scheme would sever otter movements to and from the coast.	high negative/Major	The construction of box culverts where the scheme crosses the burn will allow otters to move freely within and between available areas of habitat.	negligible/Negligible
		Risk of deterioration in water quality due to runoff from the scheme. Burn is likely to be a foraging and commuting resource and flows into the North Sea.	high negative/Major	Road drainage system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	negligible/Negligible
Blackdog Ditch	Construction	Minimal disturbance likely due to infrequent use of the ditch by otters.	negligible/Negligible	Otters are only likely to use the ditch on an infrequent basis and therefore no residual impacts are predicted.	negligible/Negligible
	Operation	Increased risk of direct mortality through RTAs where scheme crosses ditch.	high negative/Moderate	Depressed invert box culvert with integral mammal ledge will be constructed where the scheme crosses the ditch, thus allowing otters to continue their nightly journeys within the confines of the channel. The installation of otter/badger proof fencing along the entire scheme will prevent otters finding their way onto the carriageway	negligible/Negligible

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Water feature	Phase of scheme	Impacts	Impact magnitude/significance	Residual Impacts	Residual Impact magnitude/significance
		Loss of approximately 100m of low value riparian habitat comprising in-channel aquatic vegetation and dense gorse and broom. No significant impact predicted as habitat is of minimal value to otters.	negligible/Negligible	As existing habitat is of low value and is unlikely to be frequently used by otters, no residual impacts are predicted.	negligible/Negligible
		Scheme would sever otter movements although other more important commuting routes exist.	low negative/Minor	The construction of a box culvert where the scheme crosses the ditch will allow otters to move freely within and between available areas of habitat.	negligible/Negligible
		Risk of deterioration in water quality due to runoff from the scheme. Otters are only likely to use the ditch on an infrequent basis but the fact that it flows into Blackdog Burn, would increase the magnitude of a pollution incident	medium negative/Moderate	Road drainage system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	negligible/Negligible
Middlefield Burn	Construction	Minimal disturbance likely due to infrequent use of the burn by otters.	Negligible/negligible	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the burn.	negligible/Negligible
	Operation	Increased risk of direct mortality through RTAs where scheme crosses burn.	high negative/Moderate	Depressed invert box culverts with integral mammal ledges will be constructed where the scheme crosses the burn, thus allowing otters to continue their nightly journeys within the confines of the burn corridor. The erection of otter/badger proof fencing along the entire scheme will prevent otters finding their way onto the carriageway.	negligible/Negligible
		Loss of 300m of low value riparian habitat comprising stone walls, patches of gorse and pasture. No significant impact predicted as this stretch of the burn is of minimal value to otters.	negligible/Negligible	Landscape scrub planting south-east of Blackdog Junction and east of the A90 at Blackdog Croft,. Above Fife Hill (HA N97) east of the road and east of the A90 Junction there will be a strip of scrub woodland surrounding a detention basin. This planting would not appreciably enhance the value of the area for otters.	negligible/Negligible

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Water feature	Phase of scheme	Impacts	Impact magnitude/significance	Residual Impacts	Residual Impact magnitude/significance
		Realignment and straightening of 400m of burn likely to result in the loss of invertebrate/fish habitat, resulting in reduced prey availability.	low negative/Minor	Loss of invertebrate and fish habitat along re-aligned reach of the burn will be minimised through careful design of realignment, while best practice guidelines will be adhered to.	negligible/Negligible
		Scheme would sever otter movements between the coast and land to the west of the A90 although Blackdog Burn is a more likely commuting route.	medium negative/Moderate	The construction of box culverts at crossing points will allow otters to move freely within and between available areas of habitat. However, one of the culverts is 93m long, meaning that some otters may be reluctant to use it, although other commuting routes exist.	low negative/Minor
		Lighting at A90 junction may initially cause disturbance to otters using the burn.	low negative/Minor	Otters may soon become accustomed to lighting and as such, disturbance is likely to be minimal in the long-term.	negligible/Negligible
		Risk of deterioration in water quality due to runoff from the scheme. Otters are only likely to use the burn on an infrequent basis but the fact that it flows into the North Sea, would increase the magnitude of a pollution incident.	medium negative/Moderate	Road drainage system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	negligible/Negligible

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