Appendix A40.7 - Water Vole Survey

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Introduction

1. General Background

1.1 This report is one of the appendices supporting Chapter 40 (Ecology and Nature Conservation) of the AWPR Environmental Statement. It considers the potential impacts on water vole populations associated with the Fastlink of the proposed scheme. The results of the surveys carried out for the purpose of this assessment are also presented and area shown on Figures A40.9a-f.

1.2 The three component route sections in this report for the Fastlink of the proposed scheme are as follows:

- Section FL1: Stonehaven to Howieshill (ch0 – ch3200);
- Section FL2: Howieshill to Cookney (ch3200 – ch6300); and
- Section FL3: Cookney to Cleanhill Junction (ch6300 – ch10200).

1.3 All tables and figures are structured in this manner.

1.4 The Ecological Impact Assessment (EcIA) was undertaken in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 10 and 11 (Highways Agency 2001) and the Environment Assessment (Scotland) Regulations 1999, along with cognisance of draft Institute of Ecology and Environmental Management (IEEM) guidelines.

1.5 These studies included desk-based consultation to collate existing information about water vole populations in the study area for the proposed scheme and field surveys to provide current data about the status of water vole populations and the habitats that support them.

1.6 Cumulative impacts are assessed in a separate report combining the predicted impacts for all habitats and species over the proposed route (refer to Part E of the Environmental Statement ES).

Aims

1.7 The purpose of the assessment was to:

- assess the presence and status of water vole populations and their habitats in the study area;
- assess the quality of riparian habitat present and evaluate the importance of the area for water vole;
- assess any potential impacts that the proposed scheme may have upon the local water vole population; and
- identify appropriate generic mitigation measures.

1.2 Background to Assessment

Biology

1.2.1 Water voles *Arvicola terrestris* are the largest of the British voles. Most water vole populations are associated with water features, including rivers, ponds, land drains and marshland. They show a preference for permanent slow-flowing water features with densely vegetated banks. They feed upon the aerial stems and leaves of waterside plants. During winter, roots, bark and rhizomes represent an important part of the water voles diet. Water voles are usually found within 2m of the water's edge where they dig burrows into soft banks.
1.2.2 Female water voles are territorial and defend their resources from other females. In contrast, male water voles do not defend territories. Territorial ownership is marked by discrete latrine sites consisting of flattened piles of droppings topped with fresh ones. The length of home ranges can vary from 30m to 150m for females and 60m to 300m for males (Strachan, 1998). A series of abutting water vole territories is called a colony.

1.2.3 Water voles are patchily distributed across the UK. They are found throughout England, Wales and Scotland, including Northeast Scotland (Jefferies, 2003; Telfer, 2001), but are absent from Ireland (Harris et al., 1995). Most UK populations are found below an altitude of 50m (Harris et al. 1995). However, in some river catchments water voles are restricted to tributaries in the upper reaches of the river system where mink are relatively scarce. Such populations of voles have been recorded in the Scottish Highlands at altitudes above 900m (Raynor, 2002).

1.2.4 Studies have shown that water vole populations in North Scotland survive as ‘metapopulations’ (Stewart et al., 1999; Aars et al., 2001; 2006; Telfer et al., 2001). A metapopulation comprises a network of colonies, often with low numbers of individuals, with a fragmented distribution. Water vole metapopulations exist as the result of a balance between colony extinctions and dispersal. (Stewart et al., 1999). Water vole populations are able to retain high levels of genetic variability through dispersal and interaction between these fragmented colonies and an ability to found new colonies in areas of suitable habitat (Aars et al., 2006).

1.2.5 The British water vole population suffered a steady decline throughout the 20th century owing to habitat destruction and agricultural intensification. This decline has been rapidly accelerated in recent years, through predation by feral American mink (Mustela vison). Abundant mink can wipe out a water vole colony; therefore mink presence will render areas of potentially suitable water vole habitat unsuitable.

1.2.6 Two national surveys by the Vincent Wildlife Trust in 1989-1990 and 1996-1998 have highlighted a serious population crash with the loss of 88% of the remaining water vole population in only seven years. The 1990 population of Scottish water voles was estimated at 2,374,000 whilst the 1998 population was estimated at only 354,000 water voles (Jefferies, 2003).

**Legal Status**

1.2.7 The water vole was afforded partial protection under the Wildlife and Countryside Act (WCA) (1981) (as amended) when, in 1998, it was added to Schedule 5 in respect of Section 9 (4) only. Further protection was afforded when the Nature Conservation (Scotland) Act 2004 revised Part 1 of the WCA (1981). These acts make it an offence to intentionally or recklessly damage, destroy or obstruct access to any structure or place that water voles use for shelter or protection, or to disturb water voles while they are using such a place.

1.2.8 In January 2005 the Department for Environment, Food and Rural Affairs (DEFRA) released a consultation paper that recommended the water vole should have its protection status increased to full protection under Schedule 5 of the Wildlife and Countryside Act (1981) (as amended). However, as yet there has been no date set for these changes. The changes will mean that, as for red squirrel (see Appendix A40.6: Red Squirrel), it will be illegal to intentionally or recklessly kill, injure or capture water voles or to possess or transport water voles or any part of a water vole unless acquired legally, or to kill or capture water voles by indiscriminate methods such as snaring or poisoning.

1.2.9 National Planning Policy Guidance 14 (NPPG 14) refers to natural heritage and how this should relate to Scotland’s land use planning process. NPPG 14 makes the presence of a protected species (e.g. water vole) a material consideration in the assessment of development proposals.

1.2.10 The water vole is identified for priority action by the Biodiversity Steering Group (United Kingdom Biodiversity Partnership 2005) and has a national Species Action Plan. In addition it is a Northeast Scotland Local Biodiversity Action Plan species.
2 Methods

2.1 Consultation

2.1.1 Sections of the River Dee and River Don catchments were surveyed in 1990 and 1996 as part of the National Water Vole Survey (Jefferies, 2003). In addition this survey looked at the River Ythan catchment (approximately 15km north of the study corridor) and coastal burns in the Buchan area (approximately 15km north of the study corridor).

2.1.2 A water vole survey was carried out by Jacobs in 2004 and 2005 (as part of a previous AWPR route alignment investigation). This survey looked at a survey corridor that overlapped with the Southern Leg and Northern Leg survey corridor in places (see Appendices A10.8 and A25.7). This survey found no evidence of water voles.

2.2 Survey Methods

2.2.1 The DMRB does not give specific guidance on water vole survey techniques, therefore the survey methodology followed that described in the Water Vole Conservation Handbook (Strachan, 1998). This involved searching for evidence of water voles and making an assessment of the habitat present.

2.2.2 All riparian zones, watercourses and wetlands within 250m of the alignment were surveyed for water voles. The survey was extended beyond 250m where appropriate. All water features were identified from Ordnance Survey maps, aerial photographs and through a preliminary walkover survey. Survey locations are detailed in Table 1 and presented in Figures 40.9a–f.

2.2.3 All watercourses and ponds were surveyed from the channel/pond, where possible, to give the best view of bank habitat.

2.2.4 The survey was undertaken during May, July and August 2006. This is an optimal time to carry out water vole surveys as it is during the breeding season and latrine marking is at its peak (Woodroffe, 2000). The survey was conducted following periods of dry weather meaning that neither precipitation nor high water levels would have washed any such latrines away. However due to the variable nature of wildlife and the limitations of survey methods it is possible that not all field signs will have been recorded.

Water Vole Presence

2.2.5 The survey consisted of searching for field signs as described in Strachan (1998), including burrows, nests, runs, latrines, foot prints and feeding stations.

2.2.6 Morris et al. (1998) produced an equation for estimating water vole population numbers using the number of latrines discovered to predict the number of voles present. The equation has been tested using mark-recapture studies. Morris’ equation has been used in this study were water vole latrines have been found. Morris’ equation is \( y = 1.48 + (0.683x) \) where \( x \) = latrines counted per 100m and \( y \) = water voles per 100m. However, when water vole populations are fragmented or small, water voles are likely to maintain fewer latrines as conflicts with neighbouring water voles are likely to be rare. For this study Morris’ equation is unlikely to produce reliable population estimates due to the sparsity of latrines identified (see Table 5). However it may provide a useful index of water vole activity thereby allowing comparison between occupied sites (WildCRU, Oxford University 2004).
Habitat Suitability

2.2.7 The habitat suitability of water features for water voles was assessed using landscape factors known to be conducive to supporting water vole colonies (Woodroffe, 2000; Strachan, 1998). This assessment was based upon:

- flow rate of water features - water voles prefer static to moderate flowing water features;
- water depth - water voles prefer water features to have a depth of at least 0.3m;
- suitability of vegetation - water voles require stands of emergent vegetation or tall grasses on which to feed; areas of heavily shaded, wooded bank provide little suitable feeding habitat; and
- bank suitability - water voles require areas of soft bank in which to excavate their burrows, overly rocky bank habitat is unsuitable.

2.2.8 For each factor, each water feature was assessed using a High, Medium or Low scale, to determine the habitat suitability for water voles. Suitability of vegetation and bank were given greater weight than flow rate and flow depth. Therefore water features were assessed for water voles as follows:

- High suitability: water feature offers all four landscape factors in a favourable state, i.e. slow flowing/static water of a depth of at least 0.3m with moderate/high suitable vegetation and moderate/high bank suitability.
- Moderate suitability: water feature offers moderate/high vegetation and bank suitability with either suitable water depth or suitable flow rate the location.
- Low/moderate suitability: water feature offers moderate/high vegetation and bank suitability, but neither suitable water depth nor suitable flow rate.
- Low suitability: water feature offers either poor vegetation or low bank suitability, regardless of other landscape factors.

2.2.9 In addition, the overall area of suitable habitat on each water feature was taken into account. Where areas of good quality water vole habitat were either small or fragmented, the water feature was awarded a lower value for its suitability.

Mink Presence

2.2.10 Signs of mink were noted, including footprints, scats (faeces) and actual sightings. Each water feature was assessed for mink populations and classed as being present, likely to be present or unlikely to be present.

Water Vole Survey Locations

2.2.11 Water vole survey locations in sections FL1-FL3 are presented in Table 1.

Table 1 – Water Vole Survey Locations

<table>
<thead>
<tr>
<th>Site Number</th>
<th>Grid Reference</th>
<th>Habitat Area</th>
<th>Name</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section FL 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>NO 873 874 – NO 873 886</td>
<td>F3, F4 and F6</td>
<td>Megrays Burn</td>
<td>40.9a</td>
</tr>
<tr>
<td>2</td>
<td>NO 873 878 – 878 888</td>
<td>F7</td>
<td>Limpet Burn</td>
<td>40.9b</td>
</tr>
<tr>
<td>3</td>
<td>NO 872 887 – NO 869 892</td>
<td>F6 and F7</td>
<td>Limpet Burn</td>
<td>40.9b</td>
</tr>
</tbody>
</table>
Aberdeen Western Peripheral Route
Environmental Statement Appendices
Part D: Fastlink
Appendix A40.7 - Water Vole Survey

<table>
<thead>
<tr>
<th>Site Number</th>
<th>Grid Reference</th>
<th>Habitat Area</th>
<th>Name</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>NO 872 887 – NO 867 900</td>
<td>F8 and F10</td>
<td>Coneyhatch Burn and Drains at Coneyhatch Farm and Fishermyle Farm</td>
<td>40.9b</td>
</tr>
<tr>
<td>5</td>
<td>NO 874 901 - NO 869 903</td>
<td>F8 and F10</td>
<td>Green Burn and Green ditch</td>
<td>40.9b</td>
</tr>
<tr>
<td>6</td>
<td>NO 869 904</td>
<td>F12</td>
<td>Drain at Fishermyle Moss</td>
<td>40.9b</td>
</tr>
<tr>
<td>7</td>
<td>NO 866 904</td>
<td>F12</td>
<td>Fishermyle Moss</td>
<td>40.9b</td>
</tr>
<tr>
<td>8</td>
<td>NO 861 903</td>
<td>n/a</td>
<td>Fishermyle Pond</td>
<td>40.9b</td>
</tr>
</tbody>
</table>

Section FL 2

<table>
<thead>
<tr>
<th>Site Number</th>
<th>Grid Reference</th>
<th>Habitat Area</th>
<th>Name</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>NO 861 909 – NO 869 911</td>
<td>F12 and F13</td>
<td>Allochie Burn and Drains at Allochie</td>
<td>40.9c</td>
</tr>
<tr>
<td>10</td>
<td>NO 862 911- 871 919</td>
<td>F13</td>
<td>Back Burn</td>
<td>40.9c</td>
</tr>
<tr>
<td>11</td>
<td>NO 874 917 – 869 920</td>
<td>F15</td>
<td>Burn of Muchalls and Muchall Ditches</td>
<td>40.9c</td>
</tr>
<tr>
<td>12</td>
<td>NO 877 925</td>
<td>F16</td>
<td>Burn of Blackbutts</td>
<td>40.9c</td>
</tr>
</tbody>
</table>

Section FL 3

<table>
<thead>
<tr>
<th>Site Number</th>
<th>Grid Reference</th>
<th>Habitat Area</th>
<th>Name</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>NO 876 935</td>
<td>F18 and F19</td>
<td>Cookney Ditch</td>
<td>40.9d</td>
</tr>
<tr>
<td>14</td>
<td>NO 874 940</td>
<td>F18 and F19</td>
<td>Stoneyhill Burn</td>
<td>40.9d</td>
</tr>
<tr>
<td>15</td>
<td>NO 877 948</td>
<td>F20</td>
<td>Balnagubs Burn</td>
<td>40.9d</td>
</tr>
<tr>
<td>16</td>
<td>NO 877 950</td>
<td>F18</td>
<td>East Rothnick Burn, North Rothnick Burn and Tributary Burn of Elsick</td>
<td>40.9d</td>
</tr>
<tr>
<td>17</td>
<td>NO 875 962</td>
<td>F20</td>
<td>Whiteside Burn</td>
<td>40.9e</td>
</tr>
<tr>
<td>18</td>
<td>NO 875 962</td>
<td>F22</td>
<td>Crossley Burn, East Crossley Burn, Cairns Burn and Cairnfield Burn</td>
<td>40.9e</td>
</tr>
<tr>
<td>19</td>
<td>NO 867 968</td>
<td>F22 – F26</td>
<td>Stranog Burn</td>
<td>40.9e</td>
</tr>
<tr>
<td>20</td>
<td>NO 870 975</td>
<td>F26</td>
<td>Greens of Crynoch Burn, Wedderhill Burn, Polton Burn and Craigentath Burn</td>
<td>40.9f</td>
</tr>
<tr>
<td>21</td>
<td>NO 875 975 – NO 875 978</td>
<td>F27</td>
<td>Crynoch Burn</td>
<td>40.9f</td>
</tr>
</tbody>
</table>

2.3 Evaluation of Nature Conservation Value

2.3.1 The ecological value of the local water vole population and the habitats that support it was determined by reference to any designations, 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 2.

Table 2 – Evaluation of Ecological Receptor

<table>
<thead>
<tr>
<th>Ecological Importance</th>
<th>Attributes of Ecological Receptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>International (European)</td>
<td>Habitats</td>
</tr>
<tr>
<td></td>
<td>An internationally designated site or candidate site i.e. Special Protection Area (SPA), provisional SPA (pSPA), Special Areas of Conservation (SAC), candidate SAC (cSAC), Ramsar site, Biogenetic/Biosphere Reserve, World Heritage Site or an area which meets the published selection criteria for such designation. A viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas of such habitat that 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.</td>
</tr>
<tr>
<td></td>
<td>Species</td>
</tr>
<tr>
<td></td>
<td>Any regularly occurring population of an internationally important species, which is threatened or rare in the UK, i.e. a UK Red Data Book species or listed as occurring in 15 or fewer 10km squares in the UK (categories 1 and 2 in the UK BAP) or of uncertain conservation status or of global conservation concern in the UK BAP. A regularly occurring, nationally significant population/number</td>
</tr>
</tbody>
</table>
## Ecological Attributes of Ecological Receptor

<table>
<thead>
<tr>
<th>Ecological Importance</th>
<th>Attributes of Ecological Receptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>of any internationally important species.</td>
<td></td>
</tr>
<tr>
<td>National (Scottish)</td>
<td>Habits</td>
</tr>
<tr>
<td></td>
<td>A nationally designated site i.e. Site of Special Scientific Interest (SSSI), Areas of Special Scientific Interest (ASSI), National Nature Reserve (NNR), Marine Nature Reserve, or a discrete area, which meets the published selection criteria for national designation (e.g. SSSI selection guidelines) A viable area of a priority habitat identified in the UK Biodiversity Action Plan (UK BAP), or of smaller areas of such habitat that 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.</td>
</tr>
<tr>
<td></td>
<td>Species</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>Regional (Northeast Scotland)</td>
<td>Habits</td>
</tr>
<tr>
<td></td>
<td>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 such habitat that are essential to maintain the viability of a larger whole. Viable areas of key habitat identified as being 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.</td>
</tr>
<tr>
<td></td>
<td>Species</td>
</tr>
<tr>
<td></td>
<td>Any regularly occurring, locally significant population of a species listed as being nationally scarce which occurs in 16-100 10km 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.</td>
</tr>
<tr>
<td>Authority Area (e.g. County or District) Aberdeen/ City of Aberdeen</td>
<td>Habits</td>
</tr>
<tr>
<td></td>
<td>Sites that are recognised by local authorities e.g. Sites of Interest for Nature Conservation (SINS) and District Wildlife Sites (DWS). 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.</td>
</tr>
<tr>
<td></td>
<td>Species</td>
</tr>
<tr>
<td></td>
<td>Any regularly occurring, locally significant population of a species that is listed in a County/District BAP on account of its regional rarity or localisation. A regularly occurring, locally significant population of a county/district important species (particularly during a critical phase of its life cycle). Sites supporting populations of internationally/nationally/regionally important species that are not threatened or rare in the region or county, and are not integral to maintaining those populations. Sites/features that are scarce within the county/district or which appreciably enrich the county/district habitat resource.</td>
</tr>
<tr>
<td>Local (Immediate local area or village importance)</td>
<td>Habits</td>
</tr>
<tr>
<td></td>
<td>Areas of habitat considered to appreciably enrich the 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 of such habitats within the local area are not considered for the above classifications. Semi-natural ancient woodland smaller than 0.25ha. 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.</td>
</tr>
<tr>
<td></td>
<td>Species</td>
</tr>
<tr>
<td></td>
<td>Populations/assemblages of species that appreciably 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.</td>
</tr>
<tr>
<td>Less than Local (Limited ecological value)</td>
<td>Sites that retain habitats and/or species that are 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.</td>
</tr>
</tbody>
</table>
2.4 Qualitative Impact Assessment

2.4.1 The assessment of impacts and mitigation development for the Fastlink of the proposed scheme was undertaken in accordance with project programme constraints, which afforded limited time for survey and assessment. The assessment of potential impacts has therefore been undertaken in a qualitative manner only. No quantification of impact magnitude or significance has been undertaken as part of this assessment.

2.4.2 However, the general impacts on ecology and nature conservation as a result of new trunk roads are well documented. Therefore in this report, the potential impacts of the proposed scheme are discussed in generic and qualitative terms. This provides an indication of the types of impacts that are likely to result prior to mitigation. An indication of where significant impacts are anticipated is also provided.

2.4.3 Similarly, mitigation is proposed in general terms only. Site specific mitigation has not been formulated for this assessment. The mitigation section describes a general approach and guiding principles, which are established methods used on UK road schemes.

2.4.4 The risk of residual impacts remaining following mitigation is discussed in the main chapter, Chapter 40 (Ecology and Nature Conservation).

2.5 Limitations to Ecological Impact Assessment

2.5.1 The survey was carried out during May, July and August 2006; the optimum time of year for conducting a water vole survey as latrine marking is at its peak (Woodroffe, 2000). The survey was conducted following periods of dry weather meaning that neither precipitation nor high water levels would have washed any such latrines away. However, due to the variable nature of wildlife and the limitations of survey methods it is possible that not all field signs will have been recorded. The greatest potential for field signs to have gone unrecorded occurred where surveys took place in areas of bog and marshy grassland. In such areas, water voles are unlikely to use burrow systems and may not latrine mark. This means that evidence of water voles can be much more difficult to find.

3 Baseline

3.1 Consultation Information

3.1.1 No previous water vole surveys have been carried out within the Fastlink study corridor. However otter surveys commenced in February 2006. These surveys covered a wider corridor than that featured within this report as the preferred route alignment had not been selected at that stage. During the otter surveys, water vole signs were identified at a fishing pond (Fishermyre pond) at Grid Reference NO 861904. No other water vole signs were recorded during these surveys, which extended as far south as Stonehaven. However the otter surveys were undertaken at a sub-optimal time of year to survey for water voles and not all water features were surveyed – therefore other water vole colonies may not have been identified.

3.1.2 SNH reported that water voles have been sighted north of Stonehaven (personal communication to SNH via Mr David MacDonald from the Stonehaven and District Angling Association).

3.1.3 The 1996 National Water Vole Survey (Jefferies, 2003) found remnant water vole populations to be present at a few isolated locations on the Upper Dee catchment. These populations were recorded on the Muir of Dess (approximately 40km from the study corridor), the Upper Derry (approximately 65km from the study corridor) and the Water of Feugh (approximately 20km from the study corridor). Sites on the Lower Don that were found to be positive for water voles during the 1990 survey were found to be negative in 1996 with no new sites identified. Mink were recorded throughout both catchments during the 1996 survey. Other notable water vole colonies in other...
river catchments identified in the National Water Vole Survey in proximity to the study sites include scattered, declining colonies around the lowland farmland of Buchan (approximately 25km north of the study corridor); several populations in narrow burns flowing directly to the sea along the Buchan coastline (approximately 25km north of the study corridor) and clusters of water voles surviving in the headwaters of tributaries of the River Ythan (approximately 35km north of the study corridor) (NES LBAP 2005, Telfer et al., 2001).

3.2 Survey Results

Water Vole Presence

3.2.1 Evidence of water voles was identified on Green Ditch (water feature 5), within a dry ditch in Fishermyre Moss (water feature 6), on a drain at Fishermyre Moss (water feature number 7) and at Fishermyre Pond (water feature number 8), approximately 3km north of Stonehaven (locations shown on Figure 40.9b). These locations all lie within section FL1. No water voles were identified anywhere else. Descriptions of locations exhibiting evidence of water voles and the field signs identified are described in Table 5.

3.2.2 Latrine sites were identified at Green Ditch (water feature 5), within a dry ditch in Fishermyre Moss (water feature 6), on a drain at Fishermyre Moss (water feature 7) and at Fishermyre Pond (water feature 8). Only footprints were recorded within the Moss itself despite a thorough search. These were found running along a 30m length of dry ditch. The identified footprints could be evidence of dispersing water voles as opposed to evidence of a colony as no feeding stations, latrines or burrows were found along the dry ditch. However, it is likely that water voles colonies exist within Fishermyre Moss itself, as it provides good nesting habitat and good foraging habitat.

3.2.3 Using Morris et al.’s (1998) water vole population equation, an index of activity was produced for three of the four sites (no latrines were found at Fishermyre Moss and an index of activity could not be determined). The equation produced values of between 3.6 and 4.2 water voles per colony. This suggests that activity is similar between the three colonies and is comparable with fragmented water vole populations elsewhere in Scotland (WildCRU, Oxford University, 2004). It is assumed that the water vole population at each of the colonies is small (perhaps as small as 1-2 breeding females per colony) given the low levels of activity and the short length of habitat exhibiting field signs (no greater than 100m for each of the three sites). As stated previously it is difficult to make an estimation of population size from latrines as water voles may not be maintaining latrines and may be defecating within their burrow systems.

3.2.4 The three identified colonies and assumed colonies at Fishermyre Moss, although fragmented, lie within 1km of one another. This is well within the likely dispersal distance of water voles (mean of 2km in uplands, mean of 1km in lowlands (Aars et al., 2006); maximum of 3.6km (Stoddart, 1970), suggesting that the three identified colonies represent parts of an overall water vole metapopulation. The survival of each of the individual water vole colonies identified is likely to increase the probable survival of the other water vole colonies and the population in this area as a whole, particularly given the low numbers of water voles assumed to be present.

3.2.5 Fragmented, spatially isolated habitats supporting small populations can suffer the effects of inbreeding depression (Madsen et al., 1995) which can lead to a loss of fitness and increased probability of extinction. Aars et al., (2006) have shown that small water vole populations in patchy habitat can retain high levels of genetic variability through frequent dispersal over broad geographical ranges. The habitat between the four positive sites comprises of peat bog at Fishermyre Moss and wet grassland at Fishermyre Farm (see Appendix A40.1: Terrestrial Habitats). These habitats allow maintenance of genetic variability as they link the various identified colonies together and allow juvenile voles to safely disperse and set up new colonies. Dispersing water voles will travel over land as well as along water features (Telfer et al., 2001). Dispersal is of particular importance given the assumed small colony size.
3.2.6 A feature of water vole metapopulations is the impermanence of the colonies that it comprises. It is likely that the identified colonies go through cycles of extinction followed by recolonisation from neighbouring colonies. Extinction could be on account of predation or fluctuations in habitat suitability. It is therefore also likely that areas of unoccupied suitable habitat identified close to the existing colonies have supported water voles in the recent past and will be recolonised in the near future.

3.2.7 The three identified colonies and assumed colonies at Fishermyre Moss suffer some severance due to two roads. A C-road separates the colony at Green Burn and Green Ditch from the colony at Fishermyre Moss, whilst the B979 separates Fishermyre Pond from Fishermyre Moss. However it is likely that water voles will attempt to cross these roads when dispersing given the narrow width of the road. These roads are shown on Figure 40.9b.

Habitat Suitability

3.2.8 Of the 21 sites surveyed, only five water features exhibiting ‘high’ suitability for water voles were identified. These were recorded at:-

- Coneyhatch Burn;
- Green Burn and Green Ditch;
- Drainage ditch at Fishermyre Moss;
- Fishermyre Moss; and
- Fishermyre Pond;

3.2.9 All five areas identified as being of high value habitat for water voles are located within 1km of each other. These locations are linked to one another by Fishermyre Moss and wet grassland around Fishermyre Farm.

3.2.10 Six sites were identified as offering either ‘low’ or ‘low/moderate’ habitat suitability for water voles, and ten were identified as being of moderate suitability.

3.2.11 These locations are described in Table 5 and shown on Figures 40.9a–f.

Mink Presence

3.2.12 The gamekeeper at Fishermyre Pond reports occasionally seeing mink at the pond. Evidence of mink was also found at Back Burn (water feature 10); Burn of Muchalls and Muchalls ditches (water feature 11); along the length of the Crynoch Burn (water feature 20) and the associated ditches (Greens of Crynoch Burn, Wedderhill Burn, Polton Burn and Craigentath Burn (water feature 20).
### Table 3 – Table of Sites Exhibiting Positive Signs of Water Voles

<table>
<thead>
<tr>
<th>Watercourse, number and Habitat Area</th>
<th>Evidence identified</th>
<th>Habitat Description</th>
<th>Adjacent Land-use</th>
<th>Activity Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Burn and Green Ditch (5) F8 and F10</td>
<td>Four latrines were identified in a 100m section of the drainage ditch near the water edge. Nine burrows were identified. More burrows and latrines may have been present concealed within the vegetation higher up the bank. Eight feeding stations were identified adjacent to the drainage channel. Runs through the vegetation were identified throughout the 100 metre stretch.</td>
<td>Drainage ditch with steep sloping banks (approximately 45°). Banks approximately 1.2m tall. Water depth fluctuates between 20cm at shallowest up to 40cm at deepest. Channel is approximately 2 metres wide. Bank with lush vegetation comprising grasses, rushes and tall herbs. Some emergent vegetation in channel.</td>
<td>Adjacent land-use comprises species rich wet grassland/marsh habitat with pockets of wet woodland and gorse scrub. The habitat is not grazed probably on account of its dampness. This provides potential nesting habitat in the tall grasses and rushes present and provides cover for dispersing voles. Green Ditch flows under a C-road into a drainage ditch at Fishermyre Moss. A fuller description of the surrounding habitat can be found in Appendix A40.1 (Terrestrial Habitats).</td>
<td>4.2</td>
</tr>
<tr>
<td>Fishermyre Moss Drain (6) F12</td>
<td>Four latrines were identified along an approximately 60m of drainage ditch. No burrows were identified. Three feeding stations were found. Runs led away from the drainage ditch into the surrounding vegetation.</td>
<td>Drainage ditch approximately 50cm wide, with short banks (approximately 20cm). Banks well vegetated with <em>Juncus</em> and some emergent <em>Juncus</em> within the channel itself. Drainage ditch varies between 10 and 40cm in depth. Ditch is shaded for a 20m section where it passes through willow scrub.</td>
<td>The surrounding land use comprises Fishermyre Moss, which consists of areas of grasses and rushes, heather, occasional pockets of gorse and willow scrub and occasional pools of standing water. The drainage ditch at Fishermyre Moss is linked to Green Ditch by a culvert underneath a C-road that lies to the south. A fuller description of the surrounding habitat can be found in Appendix A40.1 (Terrestrial Habitats).</td>
<td>4.2</td>
</tr>
<tr>
<td>Fishermyre Moss (7) F12</td>
<td>A series of water vole footprints were identified along a 30m length of muddy ditch within the moss itself. Runs were identified throughout <em>Juncus</em> and grass vegetation however these could not be conclusively attributed to water voles as bank/field vole droppings and feeding stations were also found throughout the wetter parts of the moss. No water vole latrines, burrows or feeding stations were found despite a thorough search. Water vole field signs are difficult to find here as linear watercourses are limited and shallow and do not offer burrowing habitat. Water voles are likely to be using nests in collapsed vegetation and foraging throughout the moss.</td>
<td>Fishermyre Moss is approximately 55ha in size, it comprises an extensive area of marshy grassland (approximately 35ha) dominated by grasses and rushes with occasional patches of willow scrub and occasional pools of standing water. North of this area approximately 20ha of the moss is dominated by heather and is much drier.</td>
<td>Fishermyre Moss is bordered by agricultural land to the north and east; to the south is another area of marshy grassland; to the west an extensive area is separated from the moss by the B979. Fishermyre pond is contained within heather moorland. A fuller description of the surrounding habitat can be found in Appendix A40.1 (Terrestrial Habitats).</td>
<td>n/a</td>
</tr>
</tbody>
</table>
### Fishermere Pond (8)

Habitat Area – Not Applicable

Evidence identified:
Three latrines were identified around the western edge of the pond (100m stretch), two burrows were found on the banks of the pond, seven feeding stations were identified and runs were found throughout the surrounding vegetation.

Habitat Description:
The pond is approximately 1ha in size. Depth is approximately 20-30cm near the edges and over 50cm near the centre. The pond fringes mainly consist of shallow sloping banks (approximately 20° and 30cm in height) with *Juncus*.

Adjacent Land-use:
The pond is bounded to the north and south by heather moorland whilst to the east there is a small wet flush between the pond and the B979. Beyond the B979 lies Fishermere Moss. There is another wet flush between the western end of the pond and the Burn of Monboys which lies approximately 500m west of the pond.

<table>
<thead>
<tr>
<th>Watercourse, number and Habitat Area</th>
<th>Evidence identified</th>
<th>Habitat Description</th>
<th>Adjacent Land-use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishermere Pond (8)</td>
<td>Three latrines were identified around the western edge of the pond (100m stretch), two burrows were found on the banks of the pond, seven feeding stations were identified and runs were found throughout the surrounding vegetation.</td>
<td>The pond is approximately 1ha in size. Depth is approximately 20-30cm near the edges and over 50cm near the centre. The pond fringes mainly consist of shallow sloping banks (approximately 20° and 30cm in height) with <em>Juncus</em>.</td>
<td>The pond is bounded to the north and south by heather moorland whilst to the east there is a small wet flush between the pond and the B979. Beyond the B979 lies Fishermere Moss. There is another wet flush between the western end of the pond and the Burn of Monboys which lies approximately 500m west of the pond.</td>
</tr>
</tbody>
</table>

**Table 4 – Water Vole Habitat Assessment**

<table>
<thead>
<tr>
<th>Watercourse Number and Name</th>
<th>Habitat Area</th>
<th>Water Depth (m)</th>
<th>Flow</th>
<th>Vegetation Suitability for Water Voles</th>
<th>Suitability of Banks for Water Voles</th>
<th>Mink Present</th>
<th>Additional Notes</th>
<th>Suitability for Water Voles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section FL 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 - Megray Burn</td>
<td>F3, F4 and F6</td>
<td>0.15</td>
<td>Slow</td>
<td>High</td>
<td>Moderate</td>
<td>Unknown</td>
<td>Banks shallow.</td>
<td>Moderate</td>
</tr>
<tr>
<td>2 - Limpet Burn</td>
<td>F7</td>
<td>0.15</td>
<td>Slow</td>
<td>High</td>
<td>Moderate</td>
<td>Unknown</td>
<td>Banks shallow. Burn flows through an area of marshy grassland potentially providing additional foraging and nesting habitat.</td>
<td>Moderate</td>
</tr>
<tr>
<td>3 - Limpet Burn (northern stretch)</td>
<td>F6 and F7</td>
<td>0.3</td>
<td>Moderate</td>
<td>Moderate</td>
<td>High</td>
<td>Unknown</td>
<td></td>
<td>Moderate</td>
</tr>
<tr>
<td>4 - Coneyhatch Burn</td>
<td>F8 and F10</td>
<td>0.2 – 0.5 around Coneyhatch Farm, largely dry elsewhere</td>
<td>Static</td>
<td>High around Coneyhatch Farm, moderate elsewhere.</td>
<td>High</td>
<td>Unknown</td>
<td>Sections around Coneyhatch Farm may occasionally support water vole colonies given suitable habitat and connectivity to nearby colonies, however no evidence of water voles was found at the time. Drier sections provide wildlife corridor linking extent populations with good habitat.</td>
<td>High</td>
</tr>
<tr>
<td>5 - Green Burn and Green Ditch</td>
<td>F8 and F10</td>
<td>0.2 – 0.4</td>
<td>Slow</td>
<td>High</td>
<td>High</td>
<td>Unknown</td>
<td>Water voles present. Surrounding habitat comprises marshy grassland providing additional foraging and nesting habitat.</td>
<td>High</td>
</tr>
<tr>
<td>6 - Drain at Fishermere Moss</td>
<td>F12</td>
<td>0.1 - 0.4</td>
<td>Slow</td>
<td>High</td>
<td>Moderate</td>
<td>Unknown</td>
<td>Water voles present. Approx 60m of suitable habitat; drain is dry in upper reaches. Surrounding habitat comprises marshy grassland providing additional foraging and nesting habitat</td>
<td>High</td>
</tr>
<tr>
<td>7 - Fishermere Moss</td>
<td>F12</td>
<td>0-0.5</td>
<td>Static</td>
<td>High</td>
<td>n/a</td>
<td>Unknown</td>
<td>Water voles present. Moss with occasional pools and extensive grasses, <em>Juncus</em>, <em>Sphagnum</em> and heather cover.</td>
<td>High</td>
</tr>
<tr>
<td>Watercourse Number and Name</td>
<td>Habitat Area</td>
<td>Water Depth (m)</td>
<td>Flow</td>
<td>Vegetation Suitability for Water Voles</td>
<td>Suitability of Banks for Water Voles</td>
<td>Mink Present</td>
<td>Additional Notes</td>
<td>Suitability for Water Voles</td>
</tr>
<tr>
<td>-----------------------------</td>
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</tr>
<tr>
<td>8 - Fishermyre Pond</td>
<td>n/a</td>
<td>0.5+</td>
<td>Static</td>
<td>High</td>
<td>High</td>
<td>Unknown</td>
<td>Water voles present.</td>
<td>High</td>
</tr>
<tr>
<td><strong>Section FL 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 - Allochie Burn</td>
<td>F12 and F13</td>
<td>0.2</td>
<td>Slow</td>
<td>Low-High</td>
<td>Moderate</td>
<td>Unknown</td>
<td>Occasional poached sections, Mainly low habitat with occasional small (&lt; 15m) patches of high habitat.</td>
<td>Low- Moderate</td>
</tr>
<tr>
<td>10 - Back Burn</td>
<td>HF13</td>
<td>0.05-0.1</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Yes</td>
<td>Right bank heavily poached</td>
<td>Low – Moderate</td>
</tr>
<tr>
<td>11 - Burn of Muchalls and Muchall Ditches</td>
<td>F15</td>
<td>0.1-0.5</td>
<td>Fast</td>
<td>High</td>
<td>Low</td>
<td>Yes</td>
<td></td>
<td>Moderate</td>
</tr>
<tr>
<td>12 - Burn of Blackbutts</td>
<td>F16</td>
<td>0 – 0.01</td>
<td>Static</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Unknown</td>
<td>Mainly dry</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Section FL 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 - Cookney Ditch</td>
<td>F18 and F19</td>
<td>0.1-0.3</td>
<td>Slow</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Unknown</td>
<td>Heavily shaded by gorse in parts</td>
<td>Moderate</td>
</tr>
<tr>
<td>14 - Stoneyhill Burn</td>
<td>F18 and F19</td>
<td>0.01 – 0.2</td>
<td>Static – slow</td>
<td>Low</td>
<td>Moderate</td>
<td>Unknown</td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>15 - Balnagubs Burn</td>
<td>F20</td>
<td>0.1-0.3</td>
<td>Slow</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Unknown</td>
<td>Heavily shaded by gorse in parts while some banks are exposed clay. One small section of high habitat (approx 100m).</td>
<td>Moderate</td>
</tr>
<tr>
<td>16 - East Rothnick Burn, North Rothnick Burn and Tributary Burn of Elsick</td>
<td>F18</td>
<td>0 – 0.5</td>
<td>Static</td>
<td>High</td>
<td>High</td>
<td>Unknown</td>
<td>Dense vegetation, steep banks, some gorse cover, evidence of bank voles. Main artery provided high habitat; much of rest dry.</td>
<td>Moderate</td>
</tr>
<tr>
<td>17 - Whiteside Burn</td>
<td>F20</td>
<td>0.1-0.3</td>
<td>Slow</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Unknown</td>
<td>Heavily shaded by gorse in parts.</td>
<td>Moderate</td>
</tr>
<tr>
<td>18 - Crossley Burn, East Crossley Burn, Cairns Burn and Cairmfeld Burn</td>
<td>F22</td>
<td>0.05 - 0.1</td>
<td>Slow</td>
<td>Moderate</td>
<td>High</td>
<td>Unknown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 - Stranog Burn</td>
<td>F22 – F26</td>
<td>0</td>
<td>N/a</td>
<td>Moderate</td>
<td>Low</td>
<td>Unknown</td>
<td>Heavily shaded by gorse in parts.</td>
<td>Low</td>
</tr>
<tr>
<td>20 - Greens of Crynoch Burn, Wedderhill Burn, Polton Burn and Craigentath Burn</td>
<td>F26</td>
<td>0.05 - 1</td>
<td>Slow</td>
<td>High</td>
<td>High</td>
<td>Yes</td>
<td></td>
<td>Moderate</td>
</tr>
<tr>
<td>21 - Crynoch Burn</td>
<td>F27</td>
<td>0.1 – 0.3</td>
<td>Fast</td>
<td>Low</td>
<td>Low</td>
<td>Yes</td>
<td></td>
<td>Low</td>
</tr>
</tbody>
</table>
3.3 Survey Results Summary

3.3.1 Evidence of water voles was found at four locations around Fishermyre Moss. These four locations may represent colonies of a water vole metapopulation centred around Fishermyre Moss. The colonies are likely to be small and reliant on the connectivity provided by the moss. The moss provides potential nesting habitat within the tall vegetation, an abundant food supply and refuge from predation. The land around Fishermyre Moss also offered the best habitat in the study corridor through the provision of burrowing habitat along drainage ditches associated with the moss and within Fishermyre Pond. No evidence of water voles was found elsewhere.

4 Evaluation of Habitat Areas

4.1 Evaluation – Overview

4.1.1 The water vole population identified within the study corridor has been evaluated as a whole. In addition, each water feature has been evaluated in terms of its importance to water voles on the basis of presence of water voles, habitat quality (according to Table 5) and distance from known water vole populations.

Section FL1

4.1.2 The water vole population at Fishermyre Moss is identified as being of national importance. This is on account of the site supporting a regularly occurring population of a nationally important species which is threatened or rare in the region or county (see Table 2).

4.1.3 Individual water features are evaluated in Table 5.

4.1.4 Water features 5-8 are all evaluated as being of national importance to water voles. Water vole colonies have been identified on water features 5, 6, 7 and 8. In addition, each of these water features offers habitat of high suitability for water voles. Each of these water features is likely to be essential to the viability of the Fishermyre water vole population as a whole. Further to potentially supporting several water vole colonies, Fishermyre moss (water feature 7) provides alternative foraging habitat and nesting habitat to that offered by the drainage ditches. In addition, it provides a linkage between the water vole colonies identified throughout the area, which allows water voles to disperse and colonise new areas and allows genetic exchange making the moss fundamental to the survival of this fragmented, small population.

4.1.5 Coneyhatch Burn and associated ditches (watercourse 4) have been awarded county importance. No evidence of water vole was found on the drainage ditches at the time of survey, however large sections of the associated drainage ditches offer habitat of high quality. These are less than 500m from an existing water vole colony and are linked via a (dry) drainage ditch and the wet grassland at Coneyhatch Farm which both provide dispersal routes for water voles. Given that there are frequent fluctuations in suitable site occupancy associated with the natural dynamics of water vole metapopulations, there is a significant probability that this site has previously supported water voles and will do so again in the near future. It may therefore offer an important habitat resource to the wider Fishermyre water vole metapopulation.

4.1.6 Water features 1-3 are evaluated as being of local importance to water voles. Whilst no water voles have been identified on these water bodies, they offer some suitable habitat and are well linked and close to the population at Fishermyre. Therefore there is the possibility that these water bodies could become colonised in the future.
Section FL2

4.1.7 Water features 9-10 are evaluated as being of local importance to water voles. Whilst no water voles have been identified on these water features, they offer some suitable habitat and are well linked and close to the population at Fishermyre. Therefore there is the possibility that these water features could become colonised in the future.

4.1.8 Water features 11 and 12 are evaluated as being of less than local importance for water voles. Although offering some suitable habitat and being moderately close to the Fishermyre population (approximately 2km away), these water features are isolated from the Fishermyre population by intensive farmland and roads. It is therefore considered unlikely that these water features will be colonised by water voles in the future.

Section FL3

4.1.9 Water features 13-18 are evaluated as being of less than local importance for water voles. Although offering some suitable habitat and being moderately close to the Fishermyre population (between 2 and 6km away), these water features are isolated from the Fishermyre population by intensive farmland and roads. It is therefore considered unlikely that these water features will be colonised by water voles in the future.

4.1.10 Water features 19 – 21 are not included in Table 5 as they are evaluated as being of no ecological value to water voles. This is on account of the distance from the nearest known water vole population (all greater than 7km). These sites are all severed from the water vole population by intensive agricultural land. Water voles would be unable to colonise these areas using the main arterial watercourses as these are all well used by mink. Any water voles attempting to colonise any of the suitable stretches of these main watercourses would be likely to suffer from mink predation.

4.1.11 If mink were not present throughout the study area then it would be expected to support a moderate /good water vole population given the suite of localised water bodies, many of which offer suitable habitat for water voles. Despite possessing some areas of suitable habitat it is highly unlikely that water voles will recolonise and gain a foothold elsewhere in the study corridor whilst mink are still present.

4.1.12 SNH is currently piloting a mink eradication program in the Western Isles with a view to protecting breeding birds on the islands (SNH, 2003). Although the trapping scheme is progressing well, it is expensive and labour intensive. Whilst mink eradication on an island system is viable, it is likely to be much more difficult to achieve on the mainland as mink would be able to recruit from the wider population unless trapping was undertaken on a massive scale. Given the logistical problems, mink eradication on the mainland is unlikely to happen in the near future.
Table 5 – Habitat Evaluation

<table>
<thead>
<tr>
<th>Watercourse Name and Number</th>
<th>Habitat Area</th>
<th>Suitability of Habitat for Water Voles</th>
<th>Proximity to nearest water vole colony</th>
<th>Evaluation</th>
<th>Reason for Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Section FL 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 - Megrav Burn</td>
<td>F3, F4 and F6</td>
<td>Moderate</td>
<td>1.5km</td>
<td>Local</td>
<td>Offers suitable water vole habitat and is in close proximity and well linked to an existing water vole population. Could therefore become colonised in near future.</td>
</tr>
<tr>
<td>2 - Limpet Burn</td>
<td>F7</td>
<td>Moderate</td>
<td>1.5km</td>
<td>Local</td>
<td>Offers suitable water vole habitat and is in close proximity and well linked to an existing water vole population. Could therefore become colonised in near future.</td>
</tr>
<tr>
<td>3 - Limpet Burn (northern stretch)</td>
<td>F6 and F7</td>
<td>Moderate</td>
<td>1km</td>
<td>Local</td>
<td>Offers suitable water vole habitat and is in close proximity and is well linked to an existing water vole population. Could therefore become colonised in near future.</td>
</tr>
<tr>
<td>4 - Coneyhatch Burn</td>
<td>F8 and F10</td>
<td>High</td>
<td>&lt;0.5km</td>
<td>County</td>
<td>Offers high quality water vole habitat and is in close proximity to an existing water vole population and is well connected by drainage ditches and wet grassland. Could therefore be occasionally populated by water voles. Away from main watercourse and so unlikely to be used by mink.</td>
</tr>
<tr>
<td>5 - Green Burn and Green Ditch</td>
<td>F8 and F10</td>
<td>High</td>
<td>Water voles present</td>
<td>National</td>
<td>Supports water vole colony, offers good habitat and is of importance to survival of the Fishermere water vole population as a whole. Away from main watercourse and so unlikely to be used by mink.</td>
</tr>
<tr>
<td>6 - Drain at Fishermere Moss</td>
<td>F12</td>
<td>High</td>
<td>Water voles present</td>
<td>National</td>
<td>Supports water vole colony, offers good habitat and is of importance to survival of the Fishermere water vole population as a whole. Away from main watercourse and so unlikely to be used by mink.</td>
</tr>
<tr>
<td>7 - Fishermere Moss</td>
<td>F12</td>
<td>High</td>
<td>Adjacent to water vole colony</td>
<td>National</td>
<td>Provides linkage between the three existing identified colonies. Offers suitable habitat and is likely to be used by water voles. Is of importance to survival of the Fishermere water vole population as a whole. Away from main watercourse and so unlikely to be used by mink.</td>
</tr>
<tr>
<td>8 - Fishermere Pond</td>
<td>n/a</td>
<td>High</td>
<td>Water voles present</td>
<td>National</td>
<td>Supports water vole colony, offers good habitat and is of importance to survival of the Fishermere water vole population as a whole. Infrequently visited by mink.</td>
</tr>
<tr>
<td><strong>Section FL 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 - Allochie Burn</td>
<td>F12 and F13</td>
<td>Low-Moderate</td>
<td>&lt;1km</td>
<td>Local</td>
<td>Offers some suitable water vole habitat and is in close proximity to an existing water vole population. Could therefore become colonised in near future.</td>
</tr>
<tr>
<td>10 - Back Burn</td>
<td>F13</td>
<td>Low – Moderate</td>
<td>1km</td>
<td>Local</td>
<td>Offers some suitable water vole habitat and is in close proximity to an existing water vole population. Could therefore become colonised in near future; particularly if management practices changed (i.e. fencing of banks to prevent poaching and control of mink).</td>
</tr>
<tr>
<td>11 - Burn of Muchalls and Muchall Ditches</td>
<td>F15</td>
<td>Moderate</td>
<td>2km</td>
<td>Less than local</td>
<td>Offers some suitable habitat, is moderately close to but isolated from known water vole populations by intensive farm land and roads. Is unlikely to be colonised by water voles in the future.</td>
</tr>
</tbody>
</table>
### Aberdeen Western Peripheral Route
**Environmental Statement Appendices**

**Part D: Fastlink**

**Appendix A40.7 - Water Vole Survey**

<table>
<thead>
<tr>
<th>Watercourse Number and Name</th>
<th>Habitat Area</th>
<th>Suitability of Habitat for Water Voles</th>
<th>Proximity to nearest water vole colony</th>
<th>Evaluation</th>
<th>Reason for Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 - Burn of Blackbutts</td>
<td>FR16</td>
<td>Low</td>
<td>2.5km</td>
<td>Less than local</td>
<td>Offers little suitable habitat, is moderately close to but isolated from known water vole populations by intensive farm land and roads. Is unlikely to be colonised by water voles in the future.</td>
</tr>
<tr>
<td>Section FL 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 - Cookney Ditch</td>
<td>F18 and F19</td>
<td>Moderate</td>
<td>3.5km</td>
<td>Less than local</td>
<td>Offers some suitable habitat, is moderately close to but isolated from known water vole populations by intensive farm land and roads. Is unlikely to be colonised by water voles in the future.</td>
</tr>
<tr>
<td>14 - Stoneyhill Burn</td>
<td>F18 and F19</td>
<td>Low</td>
<td>4km</td>
<td>Less than local</td>
<td>Offers little suitable habitat, is moderately close to but isolated from known water vole populations by intensive farm land and roads. Is unlikely to be colonised by water voles in the future.</td>
</tr>
<tr>
<td>15 - Balnagubs Burn</td>
<td>F20</td>
<td>Moderate</td>
<td>5km</td>
<td>Less than local</td>
<td>Offers some suitable habitat, is moderately close to but isolated from known water vole populations by intensive farm land and roads. Is unlikely to be colonised by water voles in the future.</td>
</tr>
<tr>
<td>16 - East Rothnick Burn, North Rothnick Burn and Tributary Burn of Elsick</td>
<td>F18</td>
<td>Moderate</td>
<td>5.5km</td>
<td>Less than local</td>
<td>Offers some suitable habitat, is moderately close to but isolated from known water vole populations by intensive farm land and roads. Is unlikely to be colonised by water voles in the future.</td>
</tr>
<tr>
<td>17 - Whiteside Burn</td>
<td>F20</td>
<td>Moderate</td>
<td>6km</td>
<td>Less than local</td>
<td>Offers some suitable habitat, is moderately close to but isolated from known water vole populations by intensive farm land and roads. Is unlikely to be colonised by water voles in the future.</td>
</tr>
<tr>
<td>18 - Crossley Burn, East Crossley Burn, Cairns Burn and Cairnfield Burn</td>
<td>F22</td>
<td>Moderate</td>
<td>6km</td>
<td>Less than local</td>
<td>Offers some suitable habitat, is moderately close to but isolated from known water vole populations by intensive farm land and roads. Is unlikely to be colonised by water voles in the future.</td>
</tr>
<tr>
<td>19 - Stranog Burn</td>
<td>F22 – F26</td>
<td>Low</td>
<td>7km</td>
<td>No ecological value to water voles</td>
<td>Is not close to any known water vole populations and offers little suitable habitat. Is very unlikely to be colonised by water voles in the future.</td>
</tr>
<tr>
<td>20 - Greens of Crynoch Burn, Wedderhill Burn, Polton Burn and Craigentath Burn</td>
<td>F26</td>
<td>Moderate</td>
<td>7.5km</td>
<td>No ecological value to water voles</td>
<td>Is not close to any known water vole populations and offers some suitable habitat. Is very unlikely to be colonised by water voles in the future.</td>
</tr>
<tr>
<td>21 - Crynoch</td>
<td>F27</td>
<td>Low</td>
<td>7.5km</td>
<td>No</td>
<td>Is not close to any known water vole populations and offers little suitable habitat. Is very unlikely to be colonised</td>
</tr>
<tr>
<td>Watercourse Number and Name</td>
<td>Habitat Area</td>
<td>Suitability of Habitat for Water Voles</td>
<td>Proximity to nearest water vole colony</td>
<td>Evaluation</td>
<td>Reason for Evaluation</td>
</tr>
<tr>
<td>-----------------------------</td>
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<td>-------------------------------</td>
</tr>
<tr>
<td>Burn</td>
<td></td>
<td></td>
<td></td>
<td>ecological value to water voles</td>
<td>by water voles in the future.</td>
</tr>
</tbody>
</table>
4.2 Evaluation Summary

4.2.1 Water voles are sparsely distributed in the northeast of Scotland, particularly in lowland areas with only a few known populations (Jefferies, 2003). This makes the population found around Fishermyre Moss of particular importance. No water voles were found elsewhere within the Fastlink study area or during surveys for the AWPR Southern Leg and AWPR Northern Leg, highlighting the local scarcity of this species.

4.2.2 The most important water bodies identified in the area are water features 5-8 (Green Ditch, Drain at Fishermyre Moss, Fishermyre Moss and Fishermyre Pond); these are all evaluated as being of national importance. These water features are of greatest importance as they offer the best habitat within the study corridor and support a water vole population.

4.2.3 The survival of the population identified is attributable to the suite of suitable habitats found at water features 5-8 and because these habitats are sited in a matrix of semi-natural habitat, allowing dispersal to new sites and enabling genetic mixing between these small fragmented colonies.

5 Potential impacts

5.1 Generic Impacts

5.1.1 The impact assessment addresses impacts associated with both the construction phase and the operational phase of the road. Following guidance from the DMRB, impacts assessed include direct mortality, habitat loss, habitat fragmentation, disturbance and pollution.

5.1.2 Specific impacts have not been provided at this stage (refer to section 2.4). Impacts of the proposed road are addressed only in a generic sense, looking at general impacts that may affect all water vole populations in the vicinity of the scheme. It is thought that the water vole population at Fishermyre Moss has the potential to expand as far north as Back Burn (water feature 10) and as far south as Megray Burn (water feature 1). Beyond these limits it is assumed to be highly unlikely that any water features will be colonised by water voles and therefore that there will be no impact on water voles any farther north than Back Burn. Impact assessment will therefore only examine impacts that could potentially affect water features 1-10.

5.1.3 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.

Direct Mortality – Construction

5.1.4 Water voles are strongly associated with their burrow systems and nests. In the presence of any disturbance, water voles will seek refuge within their burrow systems. This will leave them liable to direct mortality during the construction of the proposed scheme, when works to clear any ditch systems or re-profile any water features might result in the destruction of burrow systems. Likewise any works to clear or drain any areas of wetland might result in water voles being crushed by works vehicles. Any works which could cause vibrations in the vicinity of water vole burrows (e.g. bore hole operations or the movement of heavy vehicles) could cause burrow systems to collapse leading to further direct mortality. The current alignment might result in the direct mortality of water voles using water features 4, 5, 6 and 7 (Coneyhatch Burn and drains at Coneyhatch Farm and Fishermyre Farm, Green Burn and Green Ditch, drains at Fishermyre Moss and Fishermyre Moss).

5.1.5 Water voles might become trapped within any lengths of narrow pipe, containers or wire mesh associated with the construction of the proposed scheme. There will be a greater risk of this occurring where such items have been discarded in areas of tall vegetation, marshland or in drainage ditches.
Direct Mortality – Operation

5.1.6 Where the proposed scheme crosses drainage ditches and burns, it might be necessary to culvert these water features. Inappropriate design of culvert might result in fast flows of water or a lack of air space, particularly during flood events. Any water voles attempting to swim under the road in such conditions could drown or be swept away.

5.1.7 Water voles normally avoid areas of open ground as they perceive a greater risk of predation in such areas (Carter and Bright; 2003, Dean, 2003), therefore it is unlikely that water voles would attempt to cross the carriageway and suffer any mortality through being run over.

Habitat Loss – Construction

5.1.8 Loss of habitat during construction could occur from the siting of temporary works compounds, balancing ponds, storage of materials and temporary site access roads.

5.1.9 The proposed scheme could result in a loss of both existing and potential water vole habitat where the road crosses and/or runs close to water features. Loss of habitat has been one of the main factors that have contributed to the water vole’s decline over the last century (Strachan and Jefferies, 1993). The reckless destruction of water vole burrows is an offence under the Wildlife and Countryside Act (1981) (as amended).

5.1.10 Where the proposed scheme crosses water features, these would be culverted, re-aligned or stopped (in the case of some drainage ditches). All three of these processes would result in a loss and degradation of habitat. Culverted water features would lack vegetation and soft banks and might not be used due to water voles’ increased perception of predation risk (Carter and Bright, 2003). Insensitively designed water body re-alignments, where water features are either canalised, too steep or constructed of manmade materials, could be unsuitable for water voles due to lack of suitable vegetation, high flow rates or unsuitable burrowing habitat.

5.1.11 The proposed scheme might result in further habitat loss through its impacts upon the local hydrology of an area. Impacts to ground water flow or disturbance to surface run-off might result in some areas of wetland or drainage ditches drying out or flooding. Fluctuations to water levels can reduce the availability of cover, burrowing habitat and food resources to water voles (WildCRU, Oxford University, 2004; Strachan, 1998). Inappropriate design of bridges and culverts could cause restrictions in the watercourse channels, which can cause scouring and flooding, leading to sediment deposition and the siting up of water features (Grogan et al., 2001).

5.1.12 The current alignment might result in water vole habitat loss at water features 4, 6, and 7 (Coneyhatch Burn and drains at Coneyhatch Farm and Fishermyre Farm, drains at Fishermyre Moss and Fishermyre Moss).

Habitat Loss – Operation

5.1.13 The edge effects of the road might increase the overall habitat loss associated with the road; spray and road runoff could have impacts upon soils in adjacent habitat, making them unsuitable for wetland plant species. Additional habitat loss might occur where drainage ditches or areas of wetland lie beneath the footprint of the proposed scheme.

Severance and Habitat Fragmentation – Construction and Operation

5.1.14 The proposed scheme would sever several water bodies. Severed water features would either be stopped (in the case of some drainage ditches) or culverted. Culverted sections of water feature are unlikely to be frequently used by water voles as they would offer long sections (20-50m) of bare habitat where water voles would perceive a high risk of predation (Carter and Bright, 2003). Water voles would not attempt to cross the carriageway for the same reasons. The proposed scheme would provide an effective barrier to movements of water voles from one side of the road to the
other and would fragment the water vole population where it separates colonies from one another. This would have two effects on the local water vole population. The first would be to prevent water voles dispersing and colonising new or previously occupied areas; the second would be to prevent water voles from interacting with neighbouring water vole colonies separated from one another by the proposed scheme. Both of these effects would increase the potential for the local water vole population as a whole to become extinct.

5.1.15 It is important for the viability of small, fragmented populations of water voles, such as the one present within the AWPR route, to be able to maintain genetic variance through interactions between local colonies and to be able to colonise unoccupied suitable areas of habitat as and when they become available. If a large proportion of the overall population is limited to a single colony, in a small patch of suitable habitat, the likelihood of the entire population being wiped out through a single stochastic event is increased.

5.1.16 As well as fragmenting water vole populations, the proposed scheme might lead to the fragmentation of water vole habitat. Fragmented lengths of ditch or wetland might be unsuitable habitat for water voles, offering insufficient food or burrowing habitat. The effects of fragmented habitat would add to the overall effects of habitat loss.

5.1.17 The current alignment would result in the severance of colonies at water features 5 and 6 (Green Burn and Green Ditch) from colonies at water features 7 and 8 (Fishermyre Moss and Fishermyre Pond). The alignment would provide a barrier to the future colonisation of water features 1-4 (Megrgray Burn, Limpet Burn and Coneyhatch Burn and drains at Coneyhatch Farm and Fishermyre Farm), and would fragment water features 4, 6 and 7 (Coneyhatch Burn and drains at Coneyhatch Farm and Fishermyre Farm, drains at Fishermyre Moss and Fishermyre Moss).

Disturbance – Construction

5.1.18 Any works taking place within 20m of a water vole colony might disturb water voles. Levels of disturbance will depend upon what works are taking place, e.g., the use of loud machinery 20m from the channel or works within the affected water feature are likely to cause a greater disturbance than hand digging 10m from the channel. Disturbed voles could forage less, seeking refuge in burrow systems.

Disturbance – Operation

5.1.19 Operational disturbance is unlikely to have an impact upon water voles.

Pollution – Construction

5.1.20 Any spillages into water features or wetlands of cement, petrochemicals, lubricants, solvents, etc, used for plant and general works during the construction of the proposed scheme might harm water voles, vegetation and water quality of their habitat.

5.1.21 Where road construction takes place close to a water feature, excessive dust or earth is released into the water feature. This might add to the degradation of water vole habitat.

Pollution – Operation

5.1.22 Run-off from the road might contain toxic chemicals such as zinc, cadmium and copper. Compounds such as Polychlorinated Biphenyls (PCBs) could also be present, which have the potential to affect mammalian reproductive rates (Grogan et al., 2001). Further details regarding generic impacts of pollution can be found in Chapter 39 (Water Environment) of the Environmental Statement and in the Freshwater Ecology Report in Appendix A40.9.
5.2 Summary of Potential Impacts

5.2.1 It is assumed to be highly unlikely that water voles will colonise any water features further north than Back Burn. Therefore the impact of the road on water voles and their habitats is restricted to water features 1-10 (Megray Burn – Black Burn). The described impacts can affect the water vole population in two ways. The first is through placing limits upon the ability of existing water vole populations to expand their range in the future. The second is through impacting upon the existing water vole population identified at Fishermyre Moss (water features 4-8). Impacts of the proposed scheme that would affect the likely survival of the identified water vole colonies at a local scale can in turn impact upon the likely survival of the local water vole metapopulation.

5.2.2 The impact of direct mortality during construction through careless site clearance and inappropriate works on water features could impact upon the survival of entire water vole colonies; this could have knock on effects upon the local water vole metapopulation, which is reliant upon the persistence of a suite of colonies to colonise vacated habitat and to permit interaction to maintain high genetic variation.

5.2.3 The barrier effects of the proposed scheme could effectively restrict water voles to small ranges, making isolated colonies vulnerable to genetic restrictions and limiting the rescue effect of dispersal from neighbouring colonies. This increases the potential for large proportions of the overall population to suffer extinction events.

6 Mitigation and Recommendations

6.1 Introduction

6.1.1 Specific mitigation measures have not been provided at this stage (refer to section 2.4). Instead, a summary has been provided, which details generic mitigation measures to address the generic impacts associated with the proposed scheme on water vole populations.

6.1.2 Road schemes can have detrimental effects upon existing water vole populations. Small fragmented populations of water voles whose survival relies upon terrestrial or aquatic links between colonies are particularly vulnerable to linear developments such as road schemes which can act as a barrier, further isolating and fragmenting populations. In addition, where roads pass directly over water features or wetlands, water voles can suffer habitat loss. There is a legal obligation to prevent and mitigate for the negative impacts of new road schemes on water vole habitat under the Wildlife and Countryside Act (1981) (as amended) and under the EIA regulations.

6.1.3 Suitable water vole mitigation measures are described in ‘Water Vole Mitigation Techniques’ (Arnott, 2001) and ‘the Water Vole Conservation Handbook’ (Strachan, 1998). These documents focus on the avoidance of mortality to water voles and on the creation of new habitat to mitigate for any losses. A further key aspect of the mitigation proposed here will be measures to avoid or mitigate for the fragmentation of the water vole population present.

6.1.4 Mitigation will aim to avoid, reduce or offset any adverse impacts associated with the road.

6.2 Generic Mitigation

6.2.1 Generic mitigation is given here to address impacts that could be suffered by all water voles within the study corridor. This mitigation will aim to address all the generic impacts identified in section 5. Reference is made to specific locations where possible.

6.2.2 An Ecologist will assist in the detailed design stage of the road scheme and an Ecological Clerk of Works will be appointed to oversee the implementation of mitigation measures.
Direct Mortality

6.2.3 Direct mortality of water voles during the site clearance or in-channel works of the Fastlink construction phase will be avoided by ensuring that no voles are present prior to the start of works. This will require a process of habitat destruction and water vole translocation before works begin. Water vole translocation will require the creation of replacement habitat at least a year in advance of any translocation exercise. This will allow vegetation to mature, creating a suitable receptor site for translocated water voles. New habitats will be created for any impacts that result in the deterioration of habitat quality in water features 4-8 (Coneyhatch Burn and drains at Coneyhatch Farm / Fisheryme Farm to Fisheryme Moss) (or any other water features identified in future surveys as containing water voles). The requirements of water vole receptor sites/habitat creation areas are described under habitat loss (paragraphs 6.2.11 to 6.2.19).

6.2.4 All water features which will be impacted by the road will be determined. Impacted water bodies will include those directly under the footprint of the scheme and water features within 20m of any works, where the ecological clerk of works considers that construction activities are likely to cause vibrations which may result in the collapse of water vole burrows.

6.2.5 Once the vegetation at water vole receptor sites has established (at least a year after their creation, or longer if deemed necessary by the ecological clerk of works), a water vole survey of potentially impacted drainage ditches which could contain water voles will be undertaken. Only water features 1-18 (Megray Burn - Crossley Burn, East Crossley Burn, Cairns Burn and Cairnfield Burn) will be resurveyed, as it is considered to be highly unlikely that any of the other water features in the AWPR corridor will be colonised within the next ten years (either because they offer unsuitable habitat or are too far away from the Fisheryme population). This survey will be carried out between May and September; the optimal time for carrying out water vole surveys. The aim of these surveys will be to identify the presence of water voles at each watercourse and to map all latrines, feeding stations and burrows. Where no water voles are identified, the water features will be made unsuitable for water voles in order to prevent colonisation prior to construction. This will be done by compacting any banks to make them impenetrable to water voles and/or by stripping all vegetation away. These water features will be kept in an unsuitable condition for water voles until works on the water feature are completed.

6.2.6 Where water voles are found to be present, a translocation procedure will be undertaken. The water vole translocation will be undertaken between 1 March and 1 May, or between 1 September and 1 November, in order to avoid separating female voles from any dependent young. The translocation procedure is based upon methods described in the Environment Agency’s Water Vole Mitigation Techniques handbook (Arnott, 2001) and is as follows:

6.2.7 Where the impacted water feature is a drainage ditch; a 20m length of bankside vegetation at each end of the watercourse will be strimmed to deter water voles from moving into the affected area. Where the affected area is an area of wetland; the affected area will be fenced off with 10mm gauge mesh fencing to a height of 500mm. The fencing will be buried into the ground to a depth of 200mm to deter water voles from burrowing into the trapping area. Water vole traps measuring 30 x 13cm will be placed at approximate 10m intervals, next to latrine sites or feeding stations, in areas of dry land and secured so that they cannot fall into the water when a vole is caught. Traps will be baited with sliced apple and carrot and checked twice a day (once in the morning and once in the evening). Captured voles will be transferred to a cardboard transportation box containing food and bedding straw and taken to the receptor site. Each animal caught will be kept separate to reduce the risk of injury through fighting. Once at the receptor site, individual water voles will be placed into release pens measuring 1m x 1m, allowing the animal to acclimatise to its new environment and create its own subterranean burrow system. Release pens will be situated at the water’s edge, with food, water and bedding material. Trapping will continue for at least seven days at each water body and will continue for four days after the last vole has been caught.

6.2.8 Once trapping has been completed, each water vole burrow will be dug out by hand to ensure that there are no remaining voles in the works area prior to the start of any activities that could result in water vole mortality. Bankside habitat along the water feature will then be rendered unsuitable.
immediately after the end of the trapping period, either through strimming or compaction, to deter water voles re-entering the cleared habitat. Such works will be carried out in the presence of an ecologist to ensure that any potentially remaining voles are unharmed. Monitoring at the receptor site will take place one month and four months after the translocation and then annually for five years.

6.2.9 The potential for water voles to be trapped in construction materials during works will be reduced through adherence to construction best practice guidelines (SEPA 2004). Relevant guidelines include ‘PPG5: Works in, near, or liable to affect water bodies’ and ‘PPG6: Working at construction and demolition sites’. This will ensure the maintenance of a tidy construction site free of any objects in which water voles could become trapped.

6.2.10 Where the road alignment passes within 50m of any part of water features 1-18 (Megray Burn to Crossley Burn, East Crossley Burn, Cairns Burn and Cairnfield Burn) which have not been made unsuitable for water voles, a buffer fence will be erected 20m from the edge of the water feature to reduce the likelihood of any works vehicles crushing water voles, their burrows or their nests.

Habitat Loss

6.2.11 Habitat loss resulting from the operational scheme will be mitigated for by the creation of additional water vole habitat and the sensitive management of existing habitat currently unoccupied by water voles.

6.2.12 Where the road will result in habitat loss at water features 4-8 (Coneyhatch Burn and drains at Coneyhatch Farm / Fishermyre Farm to Fishermyre Pond) (or any other water features identified in future surveys as having recently contained water voles), replacement habitat will be created. Any replacement habitat will be created a year in advance of works starting on the impacted water feature. This will ensure that a suitable receptor site is ready for any water voles to be translocated as well as mitigating for habitat loss.

6.2.13 Water vole mitigation habitat will be created within 200m of an existing water vole colony, as this will permit genetic exchange and recruitment between colonies. Mitigation habitat will be linked to an existing colony by either wetland or unmanaged grassland.

6.2.14 Several areas of suitable replacement habitat areas will be created as opposed to a single large one in order to spread the population over a wider area, making it less susceptible to extinction events (e.g. through mink predation).

6.2.15 Mitigation habitat will comprise drainage ditches, ponds and wetland. Wetland areas will have islands with steep banks that remain dry over winter. These will provide a winter refuge for water voles.

6.2.16 The design of any drainage ditch or ponds will include:-

- friable and loam-rich bank soils. Banks with a stony substrate are unlikely to be used by water voles;
- a bank face that is stable and vegetated with tall grasses and herbs (examples of plants eaten by water voles can be found in the Water Vole Conservation Handbook [Strachan, 1998]);
- a bank face that is stepped to provide refuge areas during peak flow;
- a depth of at least 30cm of water immediately in front of the bank to allow water voles to escape quickly and enter their burrows unseen;
- a pre-planted coir roll to protect the bank from erosion- planted up with a mixture of wetland plants, reeds, rushes and water plants;
- wetland plants in the marginal zone; and
6.2.17 The engineering of any new watercourses or re-alignment of watercourses will include meanders in order to create a more diverse flow pattern and more natural in-channel features. Uniform, straight sections will be avoided.

6.2.18 Habitat creation can also be achieved through sensitive management of existing watercourses which are currently unsuitable for water voles around the Fishermyre population. A survey of all watercourses proposed for management will be undertaken to assess the presence or absence of water voles and aid the design of a management plan. Management could include bank re-profiling, channel deepening, clearance or planting of vegetation and fencing to limit the detrimental effects of poaching by livestock.

6.2.19 Works compounds and storage sites will be sited at least 30m away from any water feature and avoid areas of set aside and wetland. This will limit the amount of water vole habitat loss.

Habitat Fragmentation and Isolation

6.2.20 Where the road passes between colonies of water voles, these will be isolated from one another. This could impact upon the survival of all the water vole colonies identified with the AWPR corridor. It is therefore important to retain a link between the various colonies identified. Underpasses or culverts cannot be used as these are unlikely to be used by water voles given the water voles perceived increased risk of predation in areas of open habitat.

6.2.21 In order to retain links between colonies, additional water vole habitat will be created west of the road alignment and water vole colonies to the east will be moved to this new habitat. Habitat creation and the translocation exercise will be as described in paragraphs 6.2.11 to 6.2.19 and 6.2.6 to 6.2.8. A line of fencing will be erected along the road alignment to prevent translocated water voles returning to their former watercourse. Fencing will comprise of 10mm gauge mesh fencing at a height of 500mm. The fencing will be buried into the ground to a depth of 200mm. This procedure will ensure that a viable reservoir population exists from which colonisation of additional areas can take place.

6.2.22 The road would act as a barrier to the colonisation of nearby watercourses. This barrier effect can be slightly reduced by the installation of culverts with mammal ledges where the road crosses drainage ditches, areas of wetland or other watercourses. Such crossing points are likely to be used only infrequently but enough water voles may use them to permit the colonisation of other areas.

Disturbance

6.2.23 Disturbance will be avoided during construction by the erection of a buffer fence. Where the road alignment passes within 50m of any part of water features 1-18 which have not been made unsuitable for water voles, a buffer fence will be erected 20m from the edge of the water feature. No works will take place in this area and workers will not enter this area, thereby preventing water voles from being disturbed.

Pollution and Other Indirect Impacts

6.2.24 During the construction phase, contractors must adhere to SEPA best practice guidelines with regards to preventing pollution incidents. 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 Water Features; and
- PPG6: Working at Construction and Demolition Sites.
This will necessitate the installation of drainage systems to divert runoff into drains, soakaways and detention basins, thus avoiding contamination of water features. Chemical and oil storage tanks will be set back at least 10m from any watercourse and secondary containment will be provided to prevent pollution incidents from occurring. Disturbance to streambeds must generally be kept to a minimum to prevent erosion and siltation. Where culverts are constructed they will be of an open bottom design and have a minimum depth of water of 300mm. Where this is not feasible, the floor of the culvert will be set at least 150mm below the bottom substrate (see Appendix A40.9: Freshwater Ecology). The operational scheme will also require the installation of a safe drainage system; further details regarding pollution control during construction and operation can be found in Chapter 39 (Water Environment) of the Environmental Statement.

**Further Survey**

Water vole colonies go through cycles of extinction and founding, this is an important feature of the metapopulation dynamics that allow water vole populations to persist. In order to set up new colonies, water voles can disperse over several kilometres. Therefore there is a chance that water features surveyed in the current survey that showed no evidence of water voles could contain water voles before construction of the road begins. Likewise, occupied sites may become vacant. It is therefore important to monitor the Fishermyle population up to the construction of the AWPR in order to identify any additional important water features of importance to water voles. Therefore watercourses 1-18 will be surveyed each year between May 1 and October 1 (it is deemed highly unlikely that any other watercourses will be colonised). The results of these surveys will be used to update the mitigation proposed here.

Likewise, monitoring of both translocated water vole populations and areas of habitat creation will take place at least annually (length of monitoring period to be determined through consultation with SNH) following the opening of the road.

**References**


Carter, S.P and Bright, P.W (2003) Reedbeds as refuges for water voles (*Arvicola terrestris*) from predation by introduced mink (*Mustela vison*). Biological Conservation 111, 371 - 376


