

### A10.4: Detailed Terrestrial and Freshwater Ecological Baseline Data

This appendix presents the detailed baseline data used to inform an evaluation of terrestrial and freshwater ecological receptors within the study area and assessment of ecological impacts.

## 1 Terrestrial Habitats

### 1.1 Consultation Information

1.1.1 The Take a Pride in Fife Environmental Information Centre (TAPIF EIC) provided information on statutory and non-statutory sites within the study area north of the Firth of Forth. The Lothian Wildlife Information Centre (LWIC) provided information on statutory and non-statutory sites south of the Firth of Forth, on woodlands classified on the Ancient Woodland Inventory and on notable species. The LWIC also provided Phase 1 habitat survey target note information. The local Botanical Society of the British Isles (BSBI) recorder provided information regarding locally rare plants.

### 1.2 Designated Sites

1.2.1 There are a number of statutorily designated sites within the study area designated for their terrestrial habitats. The Firth of Forth SPA (also a Ramsar site) is underpinned by the Firth of Forth Site of Special Scientific Interest (SSSI), which is considered to be of interest due to a number of habitats and species. Habitats of interest within this SSSI are fens, lagoons, heathland, saltmarsh and dunes, extensive reed beds and the most diverse coastal grassland in west Fife, although none of these habitat types are found in the SSSI in the vicinity of the proposed scheme (i.e. within the study area). Species of special interest include eel grasses (*Zostera* sp.), sea wormwood (*Artemisia maritima*), and pyramidal orchid (*Anacamptis pyramidalis*) (Figure 10.1).

1.2.2 There are two other SSSIs located within the study area:

- St. Margaret's Marsh SSSI (Table 1.2, Target Note 13) comprises one of the largest expanses of reed bed in Fife, and also supports areas of herb-rich grassland which includes locally uncommon species such as northern marsh-orchid (*Dactylorhiza purpurella*).
- Ferry Hills SSSI (Table 1.2, Target Note 17) contains scarce and declining habitats of unimproved calcareous and neutral grassland with patches of habitat of a more acidic nature. The site supports a wide variety of vascular plants including the locally scarce dropwort (*Filipendula vulgaris*).

1.2.3 There are also a number of terrestrial and freshwater sites with non-statutory designations (Table 1.1). TAPIF EIC provided information on the one Local Wildlife Site (LWS), which is located in the north of the study area; Jamestown Pond (Table 1.2, Target Note 11). This is a linear pond surrounded by scrub and neutral grassland which also has some calcareous influence.

1.2.4 Six Sites of Importance for Nature Conservation (SINCs) lie within the southern section of the study area; all are also classed as Local Biodiversity Sites (LBS). The largest of these is the Dundas Estate which is also designated as a Listed Wildlife Site (LWS), (Scottish Wildlife Trust (SWT)). Only part of the designated area lies within the study area. The other sites are Linn Mill Burn, Hopetoun Road (also a Wildlife Site), Back Braes Weir (also a Proposed Wildlife Site), Lindsay's Craigs and Niddy Burn and the River Almond. In addition, the River Almond, with its tributaries, is classified as a salmonid water under Schedule 1 of the Surface Waters (Fishlife) (Classification) (Scotland) Amendment Regulations 2007.

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**Table 1.1: Sites within the Study Area with Non-Statutory Designations**

Site	Grid Reference	Designation
Jamestown Pond	NT 12800 81900	LWS
Linn Mill Burn	NT 109783 - NT 113786	SINC, LBS
Hopetoun Road	NT 12000 78500	SINC, LBS, LWS
Dundas Estate	NT 11700 76500	SINC, LBS, LWS
Back Braes Weir	NT 11800 74400	SINC, LBS, PWS
Lindsay's Craigs and Niddry Burn	NT 11400 74100	SINC, LBS
River Almond	NT 12400 73900	SINC, LBS

#### Ancient Woodland Inventory

- 1.2.5 Eleven areas of woodland within the study area were found on the Ancient Woodland Inventory (AWI). Ancient Woodland comprises areas that appear as wooded on 1750 maps and are considered likely to have been continuously wooded since then. Semi-natural Ancient Woodland comprises areas that appear as wooded on 1860 maps but not on 1750 maps and have therefore appeared between these dates. These are divided into two categories depending on whether they were shown as semi-natural or plantation woodland on 1860 maps (SNH, 2008a).
- 1.2.6 On the northern side of the Firth of Forth three woodlands were recorded on the AWI and all were classed as Long-established Woodlands of Plantation Origin (category 2): St. Margaret's Hope (Table 1.2, Target Note 14), Castlandhill Wood (Table 1.2, Target Notes 7 and 10) and North Cliff Wood (Table 1.2, Target Note 18) (Figure 10.1a - b).
- 1.2.7 The LWIC provided information on AWI sites recorded south of the Forth. Eight of these AWI sites are situated within the study area. The majority of Lindsay's Craigs was classed as category 1 (Ancient Woodland of Semi-natural Origin), with a smaller area classed as category 2 (Long-established Woodlands of Plantation Origin) (Table 1.2, Target Note 40). The majority of East Shore Wood was also classed as category 1 (Table 1.2, Target Note 23) whilst the remaining woods - an area of woodland on the Dundas Estate (Table 1.2, Target Note 30), Linn Mill Burn (Table 1.2, Target Note 24), Ross's Plantation (Table 1.2, Target Note 39), Muiriehall Wood (Table 1.2, Target Note 32), the woodland strip north of Niddry Mains (Table 1.2, Target Note 33) and a strip of woodland between the Swine Burn and Humble Farm (Table 1.2, Target Note 36) - were all category 2. In addition, part of Dolphington Burn Wood was classed as category 2 (Table 1.2, Target Note 31), although this part of the woodland lay outside the study area (Figure 10.1b - c).

#### Habitats and Vegetation

- 1.2.8 This section is based on the Phase 1 habitat survey information presented in Annex D5.3 of the Strategic Transport Projects Review, Report 4, Appendix D - Environment (Transport Scotland, 2007). These data were based on information provided by Lothian Wildlife Trust and Fife Environmental Recording Network (FERN) (2001/2) with ground-truthing undertaken from public rights of way by Faber Maunsell/AECOM for the above report. Surveys of areas outside of the original survey boundary but required to provide coverage of the revised study areas were undertaken by Jacobs Arup staff in March 2008.
- 1.2.9 Additional information has been supplied by the local BSBI recorder regarding locally rare plants all of which were recorded from within statutorily and non-statutorily protected sites. Information regarding habitats present within these sites has also been utilised in this section.
- 1.2.10 The predominant terrestrial habitat within the study area comprises arable land although much of the proposed scheme to the north of the Firth of Forth would pass through urban/developed land. Such habitats are generally intensively managed and therefore of limited ecological value.

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- 1.2.11 Many of the semi-natural habitats within the study area are contained within the aforementioned statutorily and non-statutorily protected sites.
- 1.2.12 The most extensive semi-natural habitat present within the study area is woodland and many of the areas have been recorded on the AWI as described above. These woodlands are recorded on the Phase 1 habitat maps as a mix of semi-natural broad-leaved woodland, broad-leaved woodland plantation, coniferous and mixed plantation.
- 1.2.13 Other semi-natural habitats present within the study area include coastal reedbeds and saltmarsh and areas of small and fragmented unimproved and semi-improved neutral grasslands. Riparian habitats are also present alongside watercourses and other waterbodies.
- 1.2.14 NVC surveys were undertaken at the following locations:
- St. Margaret's Marsh SSSI;
  - St. Margaret's Hope; and
  - Echline Strip Woodlands.
- 1.2.15 The following paragraphs briefly describe the main habitats recorded along the proposed scheme, including habitats of conservation importance, which have been assessed as representing habitats of medium to high value.

#### **St. Margaret's Marsh SSSI**

##### St. Margaret's Marsh SSSI: Phase 1 Habitat Survey

- 1.2.16 Results of the detailed habitat survey at St. Margaret's Marsh are illustrated in Figure 10.3. St. Margaret's Marsh SSSI consists of an extensive area of reedbed dominated by common reed (*Phragmites australis*), a small area of saltmarsh and a variety of other mesotrophic grassland and tall ruderal communities forming a complex mosaic of vegetation types. On occasion these become dominated by a single species. Scattered scrub is also present on the drier areas of the marsh (Table 1.2, Target Note 13).
- 1.2.17 The marsh is roughly divided into two main areas of reedbed by a slightly higher ridge of ground which has been colonised by scrub species; mainly hawthorn (*Crataegus monogyna*), bramble (*Rubus fruticosus*) and dog-rose (*Rosa canina* agg.); with an understorey of mainly rank but occasionally herb-rich mesotrophic grassland. This grassland also extends along the landward side of the sea wall, where it becomes a more species-poor dense sward dominated by false oat-grass (*Arrhenatherum elatius*) and common couch (*Elytrigia repens*).
- 1.2.18 The reedbed vegetation is the largest habitat at St. Margaret's Marsh and is dominated by common reed. Away from the edges of the reedbed where the community forms a transition zone with a range of other habitats; saltmarsh, mesotrophic grassland and tall ruderal vegetation. The vegetation is extremely dense impeding growth of other species and resulting in a monoculture.
- 1.2.19 The saltmarsh community is situated in a high water table area adjacent to the sea wall in the southeastern corner of the site. It is species-poor and is dominated by common saltmarsh-grass (*Puccinellia maritima*) with sea aster (*Aster tripolium*), sea arrowgrass (*Triglochin maritimum*), glasswort (*Salicornia* sp.) and annual sea-blite (*Suaeda maritima*). Northern marsh-orchid (a qualifying feature of the SSSI) was not recorded.
- 1.2.20 The saltmarsh community is being encroached upon on its eastern, western and northern sides by the reedbed vegetation.
- 1.2.21 Around the western and eastern edges of the SSSI, tall ruderal vegetation is found. It is highly variable in its composition with single species stands of great willowherb (*Epilobium hirsutum*),

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raspberry (*Rubus idaeus*), common knapweed (*Centaurea nigra*) and giant hogweed (*Heracleum mantegazzianum*) present at various locations.

- 1.2.22 In the far northwestern corner of the site is a stony area of what appears to be old railway ballast which is slowly becoming colonised by ephemeral and pioneer species; wild strawberry (*Fragaria vesca*), perforate St. John's-wort (*Hypericum perforatum*), rosebay willowherb (*Chamerion angustifolium*) and smooth hawk's-beard (*Crepis capillaris*) were the most frequently encountered species.
- 1.2.23 None of the species recorded were rare or scarce although the strictly saltmarsh species are believed to be in decline (Preston et al., 2002).

#### St. Margaret's Marsh SSSI: Phase 2 Habitat Survey

- 1.2.24 Note: National Vegetation Classifications (NVC) cited below can be referenced in Rodwell (ed.) (1991 - 2000).
- 1.2.25 The predominant habitat at St. Margaret's Marsh was reedbed in which the dominant species was common reed. This vegetation may best be classified as S4a the *Phragmites australis* sub-community of the *Phragmites australis* reedbed. In some locations around the edge, the community showed a clear-cut transition to other vegetation types such as mesotrophic grassland or tall ruderal vegetation. However, elsewhere there was a transition zone where common nettle (*Urtica dioica*), and bittersweet (*Solanum dulcamara*) were frequent. This vegetation most closely matches S26d, the *Epilobium hirsutum* sub-community of the *Phragmites-australis-Urtica dioica* tall-herb fen, but it was only ever present as a thin strip 2-3m in width where the reedbed met mesotrophic grassland communities on higher ground, generally on the northeastern edge of the site.
- 1.2.26 Much of the mesotrophic grassland most closely resembled variations of MG1 *Arrhenatherum elatius* grassland. The grassland also extended along the landward side of the sea wall where it formed a species-poor dense grassy sward dominated by false oat-grass and common couch. This vegetation had an affinity with SM28 *Elymus repens* saltmarsh community but the high frequency and cover of false oat-grass suggested an element of the MG1 community. Herb species were few with rosebay willowherb and creeping thistle (*Cirsium arvense*) the only species regularly encountered, although perennial sow-thistle (*Sonchus arvensis*) was locally frequent.
- 1.2.27 The small area of saltmarsh vegetation may be classed as SM10 transitional low-marsh vegetation. However, in this vegetation type common saltmarsh grass is normally co-dominant with glasswort and annual sea-blite, whereas at St. Margaret's Marsh, the common saltmarsh grass often forms over 90% of the saltmarsh vegetation, which suggests the community may be akin to SM13 *Puccinellia maritima* saltmarsh community, albeit a particularly species-poor example.
- 1.2.28 After the reedbed vegetation, tall ruderal habitats were the most common type on the marsh. This vegetation varied in its composition, but great willowherb was a constant feature of much of it, along with rosebay willowherb, hogweed, creeping thistle and common nettle. Yorkshire-fog (*Holcus lanatus*), and false oat-grass were the commonest grass species, which suggested an element of mesotrophic grassland (MG1) type vegetation. However, the high frequency and cover of the great willowherb and other tall ruderal species suggested an affinity with OV26 *Epilobium hirsutum* community, particularly with the *Arrhenatherum elatius-Heracleum sphondylium* sub-community (OV26d) due to the common presence of those species (Rodwell, 2000).

#### **Ferry Hills SSSI**

##### Ferry Hills SSSI: Phase 1 Habitat Survey

- 1.2.29 Ferry Hills SSSI is a geological and biological SSSI across five locations stretching along the line of the A90 from North Queensferry to Rosyth (Table 1.2, Target Note 17). Only the most southerly

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section is included for its biological interest, which is classified in the Phase 1 habitat survey as unimproved grassland.

- 1.2.30 The grassland at Ferry Hills occupies the small hill at the top of the site which is split in two by an old railway cutting which is not itself covered by the SSSI and is dominated by scrub and tree species including whitebeam (*Sorbus* sp.), sycamore (*Acer pseudoplatanus*), hawthorn, rowan (*Sorbus aucuparia*) and tutsan (*Hypericum androsaemum*). Bell heather (*Erica cinerea*) was present on the rock faces. The grassland is mainly neutral and calcareous in type, but there are areas with a more acid grassland flora. Generally, the site is suffering from a lack of management resulting in the development of large stands of bracken (*Pteridium aquilinum*), scrub and ruderal species and the degradation of some of the grassland areas.
- 1.2.31 The western half of the southern section of the SSSI has a variety of habitats, although gorse (*Ulex europaeus*) covers large areas of the hillside. There are only small areas of grassland remaining and some of these have acquired a distinct mesotrophic and semi-improved character, particularly the areas at the extreme south adjacent to the built-up areas of North Queensferry and its amenity grassland. The dominant grass species were Yorkshire-fog, false oat-grass and cock's-foot (*Dactylis glomerata*) and the herb flora was poor, although pignut (*Conopodium majus*) was found in small quantities. This change has probably come about due to a lack of grazing.
- 1.2.32 Elsewhere on the site, rabbit grazing has resulted in a short sward with a wide variety of herb and grass species. Yarrow (*Achillea millefolium*), parsley-piert (*Aphanes arvensis*), eyebright (*Euphrasia officinalis* agg.), harebell (*Campanula rotundifolia*), common knapweed, pignut, heath bedstraw (*Galium saxatile*), lady's bedstraw (*Galium verum*), field scabious (*Knautia arvensis*), devil's-bit scabious (*Succisa pratensis*), ribwort plantain (*Plantago lanceolata*), tormentil (*Potentilla erecta*), cowslip (*Primula veris*), bulbous buttercup (*Ranunculus bulbosus*), common sorrel (*Rumex acetosa*), sheep's sorrel (*R. acetosella*), wild thyme (*Thymus polytrichus*), wood sage (*Teucrium scorodonia*), white clover (*Trifolium repens*) and ragwort (*Senecio jacobaea*) were all recorded in these areas. Red fescue (*Festuca rubra*) and sweet vernal-grass (*Anthoxanthum odoratum*) were also present along with spring-sedge (*Carex caryophyllea*). Most of these species are typical of circum-neutral soils or soils with a neutral to acid character.
- 1.2.33 Within the western half of the site there is also an area of partially open water; Ferry Loch, which has been described as basin mire. Large areas of this wetland were dominated by marsh cinquefoil (*Potentilla palustris*) at the time of survey with bottle sedge (*Carex rostrata*) forming large stands around the edge. Bur-reed (*Sparganium* sp.), small sweet-grass (*Glyceria declinata*), marsh speedwell (*Veronica scutellata*), soft-rush (*Juncus effusus*), sharp-flowered rush (*Juncus acutiflorus*) and lesser spearwort (*Ranunculus flammula*) were also recorded here. Sphagnum moss (*Sphagnum* spp.) was also present along with cottongrass (*Eriophorum* sp.) which formed a large stand in the centre of the wetland.
- 1.2.34 North and west of the wetland area there are large stands of bramble and bracken leading into what has been an area of scrub and heath as the site slopes down towards the A90 and the railway. This area shows clear signs of having been burnt relatively recently and is now becoming re-colonised by gorse and tall ruderal species such as rosebay willowherb. Some elements of the heath vegetation remain on exposed rock: bell heather and heather (*Calluna vulgaris*) were recorded here.
- 1.2.35 The eastern portion of the SSSI consists of either gorse, with some small heathy areas within it, or ungrazed grassland. The grassland is a semi-natural bent/fescue vegetation type with glaucous sedge (*Carex flacca*), pignut, northern marsh-orchid, eyebright, heath bedstraw, lady's bedstraw, tormentil, cowslip, germander speedwell (*Veronica chamaedrys*) and common dog-violet (*Viola riviniana*). Grasses recorded include common bent (*Agrostis capillaris*), sweet vernal-grass, crested dog's-tail (*Cynosurus cristatus*) and red fescue. Additionally, dropwort was also found here. In some parts of the grassland, species typical of improvement and/or abandonment are beginning to colonise, such as common nettle, creeping thistle, ragwort and rosebay willowherb.

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#### Ancient Woodlands

##### St. Margaret's Hope: Phase 1 Habitat Survey

- 1.2.36 St Margaret's Hope was the most complex of the semi-natural ancient woodlands in the northern part of the study area although the area classified under the AWI formed only part of the whole site (Table 1.2, Target Note 14). The complete site forms the grounds of a large house and as a result has been the subject of much modification resulting in a mixture of types including plantation, semi-natural and possibly relatively undisturbed woodland and scrub.
- 1.2.37 Much of the woodland was dominated by mature sycamore but there were parts where Scots pine (*Pinus sylvestris*) and pedunculate oak (*Quercus robur*) make significant contributions to the canopy. Other species recorded include larch (*Larix decidua*), wych elm (*Ulmus glabra*), holly (*Ilex aquifolium*), rowan, beech (*Fagus sylvatica*), cherry (*Prunus avium*), field maple (*Acer campestre*), rhododendron (*Rhododendron ponticum*) and yew (*Taxus baccata*) as well as a number of exotic species and varieties.
- 1.2.38 A number of ancient woodland indicators were recorded at the St. Margaret's Hope site; bluebell (*Hyacinthoides non-scripta*), woodruff (*Galium odoratum*), dog's mercury (*Mercurialis perennis*), slender St. John's-wort (*Hypericum pulchrum*), enchanter's-nightshade (*Circaea lutetiana*) and wood meadow-grass (*Poa nemoralis*). However, few were recorded in the same part of the wood or even in that part classed as semi-natural ancient woodland. In some parts, the ground flora was dominated by ivy (*Hedera helix*) whilst elsewhere, bare ground, moss or common nettle were prominent features.
- 1.2.39 There is also a stand of Japanese knotweed (*Fallopia japonica*) in the vicinity of the main house and three stands to the north of St. Margaret's Hope adjacent to the St. Margaret's Marsh SSSI.

##### St. Margaret's Hope: Phase 2 Habitat Survey

- 1.2.40 Note: NVC classifications cited below can be referenced in Rodwell (ed.) (1991 - 2000).
- 1.2.41 As already outlined many of these woods were dominated by sycamore. At St. Margaret's Hope, the canopy in two of the three areas was estimated as being 80-90% sycamore and more in some instances. In both cases up to 100% of the ground flora consisted of ivy, although bluebell and wood meadow-grass were recorded but only at Domin levels of 1 or 2 and only rarely.
- 1.2.42 On the highest parts of the ridge that runs through the St. Margaret's Hope site, a more diverse woodland has developed. In dry acidic situations, a semi-natural oak, holly woodland occurs, though it is much-modified by planting. The woodland shows affinities with W16 *Quercus-Betula-Deschampsia flexuosa* community (which has holly as a frequent constituent) though more northerly than typical stands of this community type. The ancient woodland indicators bluebell and wood meadow-grass were both recorded in this part of the site, but again at very low levels. Additionally another indicator, woodruff, was recorded in the community but not in any of the quadrats.

##### Castlandhill Wood: Phase 1 Habitat Survey

- 1.2.43 Castlandhill Wood is split into two sections with a small area of dense scrub dominated by gorse and intermixed with tall ruderal vegetation linking the two. The eastern section is a mixture of semi-natural and plantation woodland (Table 1.2, Target Note 7). It is sycamore dominated, but with some pedunculate oak, ash (*Fraxinus excelsior*), wych elm and beech. Ground flora associated with the woodland was typified by acid species, such as wood meadow-grass, bluebell and common dog-violet, along with cowslip and common spotted-orchid (*Dactylorhiza fuchsii*) which are more circum-neutral species. The main grass species were cock's-foot, false oat-grass and Yorkshire-fog. Additionally, in some areas, where there had been tree clearance, tall ruderal and scrub species were dominant, including raspberry, creeping thistle and great willowherb.

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- 1.2.44 The western part of the wood was larger and more diverse, with a variety of sections showing different attributes (Table 1.2, Target Note 10). In some areas pedunculate oak was rather common, or was mixed in with hawthorn, elm and ash, whilst in other areas, sycamore was the dominant species. Sessile oak (*Quercus petraea*) was also present in some areas and there were some significant stands of Scots pine, although overall, the frequency of coniferous species was too low for the woodland to be classed as mixed. Exotic species were also present including snowberry (*Symphoricarpos albus*), azalea species and sweet chestnut (*Castanea sativa*). Both parts of Castlandhill Wood showed low numbers of ancient woodland indicators; wood meadow-grass and bluebell were the only two species recorded.

#### North Cliff Wood: Phase 1 Habitat Survey

- 1.2.45 North Cliff Wood is an area of mainly sycamore woodland on very steep slopes facing south/southwest over the Firth of Forth (Table 1.2, Target Note 18). Other than sycamore, the main canopy species were wych elm, ash, holly and the occasional oak. There was a limited shrub layer, but hawthorn, elder (*Sambucus nigra*), honeysuckle (*Lonicera periclymenum*), tutsan and gooseberry (*Ribes uva-crispa*) were recorded. The ground flora was generally poor with ivy often dominating. However, bluebell and wood meadow-grass were recorded along with ground-elder (*Aegopodium podagraria*), foxglove (*Digitalis purpurea*), wild strawberry, wood avens (*Geum urbanum*), bracken, hedge woundwort (*Stachys sylvatica*), wood sage and common dog-violet.

#### East Shore Wood: Phase 1 Habitat Survey

- 1.2.46 East Shore Wood stretches along the south bank of the Firth of Forth from Society Road to Hopetoun. Not all of the area of the wood is recorded on the AWI and much of what is recorded on the AWI lies outside the study area (Table 1.2, Target Note 23). Larch was the largest component of the canopy with ash and sycamore making up most of the remainder. Beech, cherry and yew were also present but only in small quantities. The scrub layer was poorly developed and although a number of species including holly, elder, tutsan, butterfly-bush (*Buddleja davidii*) and hawthorn were recorded, they were generally uncommon.
- 1.2.47 The ground flora was also poorly developed with large areas dominated by bryophytes, common nettle or male-fern (*Dryopteris filix-mas*). In some locations this was dense. Bramble and creeping buttercup (*Ranunculus repens*) were locally dominant. A number of other species were recorded some of which, like self-heal and wood avens, were quite frequent. However, the majority were occasional to uncommon. There were also a number of garden escapes present. No ancient woodland indicator species were observed.
- 1.2.48 Towards the northern edge of the woodland, adjacent to the road, bramble and tall-herb species such as rosebay willowherb were dominant, together with creeping thistle, common nettle and red campion (*Silene dioica*). The woodland appeared to be mainly unmanaged.

#### Linn Mill Burn Woodlands: Phase 1 Habitat Survey

- 1.2.49 The woodland around Linn Mill Burn consisted of two distinct sections. There was an area of broad-leaved semi-natural woodland stretching along the burn and a triangular area of more mixed woodland adjacent to it, to the south (Table 1.2, Target Note 24). In both areas the dominant tree species was sycamore with pedunculate oak, common lime (*Tilia x europaea*), Scots pine, ash, beech, horse chestnut (*Aesculus hippocastanum*), holly and wild privet (*Ligustrum vulgare*).
- 1.2.50 The ground flora in the triangular section of woodland was particularly poorly developed due to the woodland's use as a mountain bike trail. Within the linear section the flora was generally sparse, although dog's mercury, an ancient woodland indicator, was recorded. Through the triangular section there was also a strip of tall ruderal vegetation and scrub where trees had been felled around the route of an overhead powerline.

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#### Dundas Estate Woodlands: Phase 1 Habitat Survey

- 1.2.51 One distinct area of AWI woodland on the Dundas Estate was located within the study area. However, this area did not cover all of the main body of woodland within the estate or within the study area and there were, in addition, other smaller woodland strips of more modern establishment. On the ground it was not possible to delineate the AWI area from the more recent plantings.
- 1.2.52 The area on the AWI is represented by Target Note 30 (Table 1.2) and those of more modern establishment by Target Notes 26-29 (Table 1.2). In the AWI area, sycamore was the most common species, but there was a wide variety of other species, native and introduced. Yew occasionally formed substantial stands. Rhododendron was also frequent and sometimes extensive.
- 1.2.53 In general the ground flora was poorly developed but in some open locations, dense grassy areas (mainly Yorkshire-fog) or tall ruderal vegetation had developed, although these were often outside the areas classified on the Inventory. Additionally, soft-rush was frequent in some areas. Within the study area, no ancient woodland indicator species were found in the woodlands.

#### Woodland Strip North of Niddry Mains: Phase 1 Habitat Survey

- 1.2.54 The strip of plantation woodland at NT 09720 75461 (Table 1.2, Target Note 33) was dominated by sycamore and ash. The groundflora was poor and dominated by common nettle, although bluebell, an ancient woodland indicator species, was recorded. The area was also heavily used for mountain biking and trails and jumps have been built.

#### Woodland Strip between the Swine Burn and Humble Farm: Phase 1 Habitat Survey

- 1.2.55 The strip of woodland running between the Swine Burn and Humble Farm was substantially a long narrow shelter belt only part of which lay within the study area (Table 1.2, Target Note 36). The woodland was dominated by sycamore. North of the Winchburgh road (B9080) the woodland was thinner and the ground flora was mainly dense grass. South of the road, the woodland was denser and the ground flora was less grassy, although tall ruderal species (e.g. common nettle, creeping thistle, red campion) were common and sometimes abundant. Fly tipping was also evident.

#### Muiriehall Wood: Phase 1 Habitat Survey

- 1.2.56 Only the southern part of Muiriehall Wood lies within the study area and it was mainly a mixture of ash and sycamore with Scots pine abundant in some parts (Table 1.2, Target Note 32). Beech, silver birch (*Betula pendula*), alder (*Alnus glutinosa*), larch and horse chestnut were frequent and rhododendron was abundant on the eastern side. There was little or no developed shrub layer, but occasional goat willow (*Salix caprea*), bramble and gorse.
- 1.2.57 The ground flora was poorly developed and species-poor and was dominated in some locations by broad buckler (*Dryopteris dilatata*) and common male fern. Elsewhere, rosebay willowherb and foxglove were frequent. Wood-sorrel (*Oxalis acetosella*) and common dog-violet were occasional.

#### Ross's Plantation: Phase 1 Habitat Survey

- 1.2.58 Ross's Plantation was classed as mixed plantation woodland. Much of the woodland appeared to be quite recent and there were several clearings within it which had become dominated by tall herb communities (Table 1.2, Target Note 39). Part of the woodland was dominated by Norway spruce (*Picea abies*) surrounded by broad-leaved woodland which was mainly composed of ash and sycamore. Wych elm, aspen (*Populus tremula*) and horse chestnut were also present but uncommon, and there had been underplanting with oak and ash. The canopy was generally dense.



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- 1.2.59 The shrub layer was mainly poor: honeysuckle, hawthorn and gorse were occasional in the broad-leaved section. In most of the wood there was little ground flora and where it was present it tended to be poor: only one ancient woodland indicator, enchanter's nightshade, was found, but was uncommon. In the southeast of the woodland the canopy was more open and the ground flora was dominated by species more typical of abandoned land, including false oat-grass, common nettle, red campion and hogweed. Rosebay willowherb and creeping thistle were common in some locations. Wood avens, male-fern, wild strawberry and cleavers (*Galium aparine*) were also present but were generally only occasional.

#### Lindsay's Craigs: Phase 1 Habitat Survey

- 1.2.60 Lindsay's Craigs is a mixed plantation woodland with planted exotic species and with the broad-leaved portion consisting mainly of sycamore with ash (Table 1.2, Target Note 40). The coniferous component was mainly Scots pine and larch together with coastal redwood (*Sequoia sempervirens*) which occurred only rarely. At the far eastern end of the wood, Sitka spruce (*Picea sitchensis*) was abundant.
- 1.2.61 The shrub layer included species such as elder, rhododendron and snowberry, but these were only occasional and often recorded only at the woodland edge.
- 1.2.62 The ground flora was generally poorly developed as the woody component formed a dense canopy. However, broad buckler-fern was locally abundant and common nettle was frequent. Other species recorded included red campion and wood avens. At the far eastern end, few-flowered garlic (*Allium paradoxum*) formed a dense carpet in the early spring. Only two ancient woodland indicators, bluebell and wood dock (*Rumex sanguineus*), were recorded.

#### **Other Woodlands**

#### Echline Strip Woodlands: Phase 1 Habitat Survey

- 1.2.63 The more recent plantation woods in the Dundas area (Echline Strip woodlands) (Table 1.2, Target Note 25) had a high sycamore content, but also contained a wide variety of other species. Ash, common lime, wych elm, yew, wild cherry (*Prunus avium*), silver birch, oak, beech, Scots pine, horse chestnut, rhododendron and elder were all recorded. The ground flora in all areas was variable, ranging from dense vegetation dominated by Yorkshire-fog, common nettle or creeping thistle, to areas where there was virtually a complete absence of any ground flora. Two ancient woodland indicators, enchanter's-nightshade and dog's mercury, were found. New tree planting is still occurring in parts of the woods.

#### Echline Strip Woodlands: Phase 2 Habitat Survey

- 1.2.64 The Echline Strip woodlands within the north of Dundas Estate could not be easily assigned into any NVC classification. They were not classified under the AWI and are thus regarded as relatively recent plantations. Detailed botanical assessments showed that they were sycamore/ash/horse chestnut woodlands with oak, lime, Scots pine and cherry. Out of three areas assessed, one ancient woodland indicator, enchanter's nightshade, was recorded only once.

#### Other Woodlands: Phase 1 Habitat Surveys

- 1.2.65 Five other woodland areas were recorded. Most of these were dominated or co-dominated by sycamore or were plantations, although some were possibly remnants of older woodlands. In addition there was a number of small (c. 1ha) pockets of woodland. These also tended to be dominated by sycamore.
- 1.2.66 To the north of the Firth of Forth, the woodland at Fairy Kirk consisted of a number of distinct areas (Table 1.2, Target Note 3). On steep slopes above an area of improved grassland was a semi-natural woodland of mainly sycamore, ash and wych elm with some pedunculate oak. The ground

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flora was dominated by ivy, with wild strawberry, wood sage, red campion, foxglove and wood avens also present. One ancient woodland indicator, wood meadow-grass, was also found. The wooded area spread from the steep slopes to the flatter ground where it was almost entirely sycamore and the ground flora was less diverse than elsewhere. Contiguous with the woodland was an area of mainly gorse scrub, leading to broad-leaved and mixed plantation woodland along the A90 and A921.

- 1.2.67 In the Port Edgar/Society Road area the woodland was dominated by sycamore and ash with sometimes a dense understorey of hawthorn (Table 1.2, Target Note 19). The ground flora was poor and in many areas was dominated by ivy. No ancient woodland indicator species were found. Much of the woodland was on steep slopes or ran along a steep sided disused railway cutting where fly-tipping was evident.
- 1.2.68 The area of woodland adjacent to the Dolphington Burn (Table 1.2, Target Note 31) contains a number of distinct sections, only a few of which lie within the study area. Part of the woodland may be long-established but this lay outside the study area and was used for recreation by a paintball company resulting in the lack of a ground layer and a heavily disturbed scrub layer. Much of the woodland within the study area was dominated by ash, but sycamore, Scots pine and beech were also frequent. The ground flora was generally poor, but in some parts the ancient woodland indicator, dog's mercury, was frequent. There was also an area of marshy grassland in the western part of the wood dominated by meadowsweet (*Filipendula ulmaria*), jointed rush (*Juncus articulatus*), hard rush (*Juncus inflexus*) and water forget-me-not (*Myosotis scorpioides*) and bordered by willow and alder scrub. The woodland was connected by a thin strip of scrub and trees to another, small, compartment of broad-leaved woodland. Whilst sycamore was common, wych elm was also present and there were some substantial, mature oaks. The ground flora was generally poor, although bluebell, a type of wood-rush (*Luzula* sp.) and common dog-violet were found together with a single specimen of broad-leaved helleborine (*Epipactis helleborine*).
- 1.2.69 At the southern end of the study area, three woodlands were surveyed in the Kirkliston area. These ranged in age from long-established to recent. The older woodlands in the Back Braes Weir area (Tables 1.2, Target Note 41) were sycamore dominated with some oak (pedunculate and sessile), wych elm, beech and ash. The modern planting contained a very wide range of species and the area known as Pike's Wood adjacent to the M9 contained beech, ash, rowan, alder, cherry (*Prunus* sp.), silver birch, common lime, hawthorn, yew, rowan, Scots pine, oak and dogwood (*Cornus sanguinea*). No ancient woodland indicator species were found.
- 1.2.70 Immediately west of the M9 spur at Junction 1A was a strip of plantation woodland consisting of mainly ash and larch with the occasional pedunculate oak and Norway spruce (Table 1.2, Target Note 37). This relatively modern plantation was notable for containing northern marsh-orchid and a stand of twayblade (*Listera ovata*) - a locally rare species in the region. Further west the woodland became dominated by sycamore.

#### Other Habitats

- 1.2.71 On parts of the steep slopes and rock faces at St. Margaret's Hope bordering the Firth of Forth on the western side of the woodland, there is a fringe of dense oak scrub lacking a developed groundflora (Table 1.2, Target Note 14). In association with this, there are small areas of dry grassland on the exposed rock which constitute a natural grassland, unmodified by management factors and with a large number of uncommon or local species, are hence of some conservation value.
- 1.2.72 Here the dolerite exhibits calcitic veining which supports calcareous grassland/rock habitat communities with bloody crane's-bill (*Geranium sanguineum*), meadow oat-grass (*Helictotrichon pratense*), wild onion (*Allium vineale*), kidney vetch (*Anthyllis vulneraria*), wild thyme, oxeye daisy (*Leucanthemum vulgare*), burnet rose (*Rosa pimpinellifolia*), heath-grass (*Danthonia decumbens*), harebell and biting stonecrop (*Sedum acre*). There is also a maritime element to the vegetation with thrift (*Armeria maritima*) and sea campion (*Silene uniflora*) commonly found on littoral fringes

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- 1.2.73 The locally rare dropwort was also found in this area together with a small population of Scots lovage, (*Levisticum scoticum*, c. 5 plants) on the lowest rocks. This latter plant is almost entirely confined to Scotland where it is frequent around the northern coast but is much more local in Central Scotland (Preston et al., 2002).

#### Agricultural Land

- 1.2.74 The majority of the study area was made up of arable land, with areas of poor semi-improved and improved grassland. The improved grassland consists of species typical of agricultural intensification, ryegrass (*Lolium perenne*) and white clover for instance, but also other species such as meadow foxtail (*Alopecurus pratensis*), rough meadow-grass (*Poa trivialis*) and crested dog's-tail. The herb content was low.
- 1.2.75 There were two major areas of semi-improved grassland types, both were in the northern section of the study area.
- 1.2.76 The first area, comprising a field adjacent to Castlandhill Wood, was classed as marshy grassland under the Phase 1 habitat classification due to the high cover of rush and sedge species (Table 1.2, Target Note 8). However, it is best described by Rodwell (1992) under the M23 *Juncus effusus*-*Juncus acutiflorus*-*Galium palustre* community though it clearly shows evidence of calcareous flushes and is transitional to MG5 grassland (*Cynosurus cristatus*-*Centurea nigra* community). The grassland is species-rich, but has been subject to drainage and hence shows signs of damage, typically by presence of docks (e.g. broad-leaved docks, *Rumex obtusifolius*). Hard rush and jointed rush were frequent throughout the site but, in some areas, were becoming dominant and crowding out other species. Glaucous sedge was frequent and false-fox sedge (*Carex otrubae*) was also recorded. The grass component was dominated by creeping bent (*Agrostis stolonifera*) and Yorkshire-fog with marsh arrowgrass (*Triglochin palustre*) also present. False oat-grass was becoming abundant in some areas which is suggestive of a lack of management. Herb species included northern marsh-orchid, which was abundant, common spotted-orchid and twayblade together with oxeye daisy, fairy flax (*Linum catharticum*), rough hawkbit (*Leontodon hispidus*), meadow vetchling (*Lathyrus pratensis*) and lady's-mantle (*Alchemilla filicaulis*). Parts of the field were also becoming invaded with tall ruderal species such as creeping thistle and great willowherb and there was some scrub development. At the top of the field there was the remains of a small waterbody, now completely filled with vegetation, and bulrush (*Typha latifolia*), marsh cinquefoil and the invasive alien New Zealand pygmyweed (*Crassula helmsii*) were recorded (Table 1.2, Target Note 9). The latter species is of concern as it can dominate wetland plant communities and degrade habitat of potential for amphibians and invertebrates. It propagates easily from fragments and there is therefore a risk of it being spread during construction work.
- 1.2.77 The second area of semi-improved mesotrophic grassland was recorded adjacent to the A90 and south of Dunfermline Wynd near Inverkeithing (Table 1.2, Target Note 4). It may be best described as degraded MG5, and was generally over-grazed by horses resulting in a tight short sward with the occasional areas of bare ground but retaining some herb interest. The sward was a bent-grass/fescue (*Agrostis* spp/*Fescue* spp) type with common bird's-foot-trefoil (*Lotus corniculatus*), selfheal, (*Prunella vulgaris*) yarrow, white clover, daisy (*Bellis perennis*), ribwort plantain, autumn hawkbit (*Leontodon autumnallis*), spring-sedge and hop trefoil (*Trifolium campestre*). There was also a wet flush area with northern marsh-orchid, in characteristic habitat. The remainder of the semi-improved grassland fell into two broad categories - that which appeared to have developed due to agricultural abandonment and that which was used for grazing. Both types of grassland tended to contain grass species typical of a ranker type of sward - Yorkshire-fog and cock's-foot for instance. Both types also contained herb species typical of some agricultural improvement such as white clover, creeping buttercup and common vetch (*Vicia sativa*) as well as taller species such as creeping thistle and ragwort. The grassland formed due to abandonment tended to be taller, containing a greater amount of the taller herb species and others such as mugwort (*Artemisia vulgaris*) and willowherb species. False oat-grass was also common.

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#### Open (Fresh) Water

- 1.2.78 There were several areas of open water located within the study area including Back Braes Weir (Table 1.2, Target Note 41), Humber Reservoir (Table 1.2, Target Note 34) and a number of ponds and other small waterbodies. There is only one area of open water in the northern section of the proposed scheme - Ferry Loch in the Ferry Hills SSSI. See the section on Ferry Hills SSSI for information on this waterbody (Table 1.2, Target Note 17)
- 1.2.79 The main waterbodies in the southern section are all man-made/alterd with important amenity functions. Humber Reservoir is used for angling, whilst Back Braes Weir is in a public park. Waterfowl were common on both these waterbodies. There was little aquatic vegetation at Back Braes Weir. However, much of the pond area appeared to have silted up and become colonised with reed canary-grass (*Phalaris arundinacea*) and other species forming a large swamp area. The Humber Reservoir contained aquatic vegetation. Emergent vegetation at Humber Reservoir included yellow iris (*Iris pseudacorus*), branched bur-reed (*Sparganium erectum*), meadowsweet, water-cress (*Rorippa nasturtium-aquaticum*), reed canary-grass, great willowherb and mare's-tail (*Hippuris vulgaris*). There also appeared to be evidence of the development of green filamentous algae during July and August.
- 1.2.80 Three other waterbodies were present in the southern section; Lawflat pond (NT 10400 77700), Dalmeny railway ponds (NT 14100 77000, NT 14200 77000) and a pond in woodlands near the Dolphington Burn (NT 13400 76700). The latter was a small circular pond containing no aquatic vegetation. The Dalmeny railway ponds contained large areas of dense bulrush whilst the pond at Lawflat contained only a sparse species-poor marginal community, water-cress, blue water-speedwell (*Veronica anagallis-aquatica*) and brooklime (*Veronica beccabunga*).

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Table 1.2: Target Notes for Terrestrial Habitats

Target Note Number	Grid Reference	Description
1	NT 12652 38458	Area of tall ruderal vegetation consisting of large clumps of male-fern and rosebay willowherb.
2	NT 12500 83375	Old quarry at Fairy Kirk. The quarry is used by wheeled vehicles and much of the site is bare ground with scattered trees and scrub. To the north of the site is a burnt area of gorse on bare rock with viper's-bugloss ( <i>Echium vulgare</i> ) and kidney vetch. At the base of slope there are natural springs and calcareous brown moss wet flushes. Plant species recorded include hard rush, northern marsh-orchid, fairy flax, lady's-mantle and common bird's-foot-trefoil. The scrub consists mainly of gorse along with hawthorn, elder, raspberry and rosebay willowherb.
3	NT 12444 83254	Woodland at Fairy Kirk Semi-natural deciduous woodland on a very steep bank between an improved grassland field and an old quarry. The woodland consists mainly of sycamore, ash and wych elm but with some pedunculate oak and holly. The steep slope has a ground flora dominated by ivy in many areas, but bracken, wild strawberry, wood sage, red campion, foxglove and wood avens. There was also some wood meadow-grass with false brome ( <i>Brachypodium sylvaticum</i> ) downslope. The sycamore is spreading beyond the confines of the steep slope creating a larger area of woodland, but one almost completely lacking in any other tree species. There is evidence of an old wall above the woodland with common restharrow ( <i>Ononis repens</i> ), zigzag clover ( <i>Trifolium medium</i> ) and lady's bedstraw.
4	NT 12398 82695	Semi-improved mesotrophic grassland. Horse-grazed and somewhat over-grazed but retaining basic flora in a bent-grass/fescue sward including common bird's-foot-trefoil, selfheal, yarrow, white clover, daisy, ribwort plantain, autumn hawkbit, spring-sedge and hop trefoil. There is also a wet flush area with northern marsh-orchid.
5	NT 12483 82318	Area of dense scrub and woodland on the cultivation terraces consisting of mainly sycamore, hawthorn and elder. The ground flora is mainly ivy, cleavers creeping thistle, common nettle, rosebay willowherb and wood sage. At its western edge, adjacent to the A90, the woodland merges into dense gorse scrub. The woodland is unmanaged, but is used for dumping garden and household rubbish.
6	NT 12380 82250	Location of maiden pink ( <i>Dianthus deltooides</i> ) in thin strip of grassland (maximum 10m width) at the western end of the cemetery at the edge of the rock face above the A90. Within the grassland, oxeye daisy is prominent, along with yarrow, selfheal, red campion, perforate St. John's-wort, hare's-foot clover ( <i>Trifolium arvense</i> ), common knapweed, ribwort plantain and hop trefoil. Crested dog's-tail was the dominant grass species. In addition, gorse is invading the grassland
7	NT 12114 82339	Castlandhill Wood (east) A mixture of plantation and semi-natural deciduous woodland (sycamore but some pedunculate oak, ash, elm and beech. There is an acid ground flora associated with it with wood meadow-grass, bluebell, some holly, common dog-violet, cowslip and common spotted-orchid. There are also some small areas of tall ruderal and scrub vegetation with raspberry, creeping thistle, great willowherb. Grass species recorded in this area include cock's-foot and false oat-grass.
8	NT 11955 82324	Field adjacent to and NE of Castlandhill Wood An area of species-rich, semi-natural, calcareous wet grassland which has been subject to drainage. The grass component was dominated by creeping bent, Yorkshire-fog and glaucous sedge with marsh arrowgrass and false-fox sedge also present. Herb species included northern marsh-orchid (which was abundant), common spotted-orchid and common twayblade together with oxeye daisy, fairy flax, rough hawkbit, meadow vetchling and some lady's-mantle (sometimes known as hairy lady's-mantle). Some areas were becoming overgrown with hard rush and jointed rush also with false oat-grass.
9	NT 12039 82257	Dry pond/swamp at top of field with bulrush, marsh cinquefoil and the invasive alien New Zealand pygmyweed.
10	NT 12003 82033	Castlandhill Wood (west) The larger section of Castlandhill Wood (see Target Note 7 for the smaller eastern part). Pedunculate oak, ash and elm were all present, along with a large component of sycamore. Sessile oak was also found. Some areas Scots pine was present in small stands and there was the occasional yew. Exotic species were also present,

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Target Note Number	Grid Reference	Description
		including snowberry, azalea species and sweet chestnut. The ground flora was generally sparse, but wood meadow-grass, bluebell, foxglove, bracken, red campion, male-fern, common dog-violet, bramble, ivy, selfheal and wood avens were all present. In the more open areas, Yorkshire-fog was common. There was little well defined shrub layer, but hawthorn and wild privet were recorded.
11	NT 12797 81922	<p>Jamestown Pond</p> <p>Pond in dense scrub with tall ruderal vegetation and grassland. The dense scrub consists of gorse, hawthorn, willow, bracken and brambles with Japanese knotweed also present (particularly at the western end of the pond). Small pockets of grassier vegetation occur which can have a high herb content including devil's-bit scabious, black medick (<i>Medicago lupulina</i>), fairy flax (<i>Linum catharticum</i>), common bird's-foot-trefoil, ribwort plantain, eyebright, red clover (<i>Trifolium pratense</i>), common knapweed, tufted hair-grass (<i>Deschampsia cespitosa</i>) and perforate St. John's-wort and small sedge species (<i>Carex</i> sp.). Meadowsweet was also present, and in parts, formed dense stands. Aquatic species recorded were water-plantain (<i>Alisma plantago-aquatica</i>), cuckooflower (<i>Cardamine pratensis</i>), common marsh bedstraw (<i>Galium palustre</i>), plicate sweet-grass (<i>Glyceria plicata</i>), marsh pennywort (<i>Hydrocotyle vulgaris</i>), jointed rush, compact rush (<i>Juncus conglomeratus</i>), hard rush, duckweed (<i>Lemna</i> sp.), water mint (<i>Mentha aquatica</i>), lesser spearwort and branched bur-reed.</p>
12	NT 12657 81858	Lesser meadow-rue ( <i>Thalictrum minus</i> ) present along verges of Ferryhills Road which runs between Inverkeithing and North Queensferry.
13	NT 12345 81459	<p>St Margaret's Marsh SSSI</p> <p>An area of saltmarsh and reedbed and tall ruderal vegetation. The eastern part of the site is dominated by tall ruderal and scrub species with small patches of grassland scattered amongst the taller vegetation except at the far western end where tall ruderal vegetation is again predominant. Much of the rest of the site is species-poor reedbed which consists of virtually a monoculture of common reed. There is a small patch of saltmarsh to the south of the site with a small area of open water and a thin strip of mesotrophic grassland, amongst which couch grass (<i>Elytrigia repens</i>) is common, separates the saltmarsh/reedbed from the sea wall. There is a small area of saltmarsh dominated by common saltmarsh-grass with sea aster, sea arrowgrass, glasswort and annual sea-blite. In the western part of the site there is a large stand of giant hogweed. NVC assessments were carried out on the saltmarsh and reedbed communities.</p>
14	NT 12381 81115	<p>St. Margaret's Hope</p> <p>A large area of semi-natural woodland which makes up the grounds of an old house and is only part managed. There are relics of 'ancient' woodland and also those of substantial exotic planting. The ground flora varies from being relatively diverse to areas that are dominated by ivy. In some areas Sycamore is the dominant canopy species and in other areas oak is common, or the canopy is mixed. Wood meadow-grass, dog's mercury, bluebell and woodruff were all recorded.</p> <p>In some parts of the woodland, the natural feature of wood meadow-grass is replaced by false brome downslope which seems to be characteristic of woodland on steep slopes in the area over dolerite. On extreme top on rock outcrops dwarf oak/holly woodland with an acid ground flora develops including wavy hair-grass (<i>Deschampsia flexuosa</i>), bluebell and slender St. John's-wort.</p> <p>Near the base of the rock-faces that look out over the Firth of Forth there are maritime cliff- rock exposures where the dolerite with calcite veins forms unaltered calcareous grassland/rock habitat communities with bloody crane's-bill, downy oat-grass (<i>Helictotrichon pubescens</i>), wild onion, dropwort, kidney vetch, wild thyme, oxeye daisy, burnet rose, heath-grass, harebell and biting stonecrop. There is also a small population of Scots lovage, (c. 5 plants) on the lowest rocks. There is a coastal fringe of oak scrub.</p> <p>NVC assessments were carried out in some parts of the woodland at St. Margaret's Hope.</p>
15	NT 12665 81320	Grassy and disturbed area between wooded areas with rubble and rubbish. Grassy areas tend to be rather rank, whilst there are also some herb dominated areas including short annual species and tall ruderal species. Herb species recorded included yarrow, walted thistle ( <i>Carduus crispus</i> ), common knapweed, common centaury ( <i>Centaureum erythraea</i> ), rosebay willowherb, creeping thistle, marsh thistle ( <i>Cirsium palustre</i> ), foxglove, wild teasel ( <i>Dipsacus fullonum</i> ), great willowherb, eyebright, wild strawberry, lady's bedstraw, perforate St. John's-wort, meadow vetchling, oxeye daisy, common bird's-foot-trefoil, black medick, red bartsia ( <i>Odontites vernus</i> ), common restharrow, ribwort plantain, greater plantain, silverweed ( <i>Potentilla anserina</i> ), cowslip, selfheal, bramble, white campion ( <i>Silene latifolia</i> ), red clover, white clover, wood sage, colt's-foot ( <i>Tussilago farfara</i> ), common nettle and hairy tare ( <i>Vicia hirsuta</i> ). Butterfly-bush, bracken, raspberry and gorse were also present. Grass and rush species recorded included false oat-grass, crested dog's-tail, cock's-foot, tufted hair-grass, Yorkshire-fog, soft-rush and fine grasses.

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Target Note Number	Grid Reference	Description
16	NT 12888 81287	<p>Ferry Hills SSSI</p> <p>The eastern half of the SSSI is mainly unmanaged grassland and dense scrub, largely gorse, with some small patches of acid grassland/heath on the thinner soils within the gorse dominated areas; common milkwort (<i>Polygala vulgaris</i>) was recorded here. Dropwort was also recorded at the site. There was evidence of dog-walking in the area. The grassland is semi-natural bent/fescue vegetation type with glaucous sedge, pignut, northern marsh-orchid, eyebright, heath bedstraw, lady's bedstraw, tormentil, cowslip, germander speedwell and common dog-violet. Grasses recorded include sweet vernal-grass, crested dog's-tail and fescue species. Some areas were being invaded with bramble.</p>
17	NT 12801 81104 (centre of wetland area)	<p>Ferry Hills SSSI</p> <p>A complex mosaic of grassland, dense scrub, fen (with some open water), bracken and tall ruderal vegetation.</p> <p>The wetland area is classed as a seasonally-flooded basin mire in the SSSI citation. Large areas of this were dominated by marsh cinquefoil at the time of survey, but bottle sedge was also present in large amounts around the edge along with bur-reed, small sweet-grass, marsh speedwell, soft-rush, sharp-flowered rush and lesser spearwort. Sphagnum moss was also present along with cottongrass in the centre of the wetland area.</p> <p>Large areas to the south and east of the wetland are dominated by gorse. Within this area are small patches of herb-rich grassland, a mixture of calcicolous species and those of a more acidic nature. Yarrow, parsley-piert (<i>Aphanes arvensis</i>), eyebright (<i>Euphrasia officinalis</i> agg.), harebell, spring-sedge, common knapweed, pignut, heath bedstraw, lady's bedstraw, field scabious, ribwort plantain, tormentil, cowslip, bulbous buttercup, common sorrel, sheep's sorrel, wild thyme, wood sage, white clover and ragwort were all recorded in these areas. Red fescue and sweet vernal-grass were also present.</p> <p>To the southeast of the wetland is an area of more mesotrophic and rank grassland containing substantial amounts of false oat-grass, cock's-foot and Yorkshire-fog as well as species such as pignut. To the north and west of the site are areas of dense bracken and also areas that appear to have been burnt and as a result are becoming invaded with tall ruderal species and scrub - rosebay willowherb, gorse, bramble, bracken - and mesotrophic grasses although heathy species such as bell heather and heather can also be found. There are also some small patches of acid grassland.</p> <p>The old railway cutting does not form part of the SSSI. The vegetation here is dominated by whitebeam (<i>Sorbus aria</i> agg.), sycamore and hawthorn along with rowan and tutsan. Within the rather rocky ground layer, spring-sedge, pignut, foxglove, common spotted-orchid, perforate St. John's-wort, bulbous buttercup, cowslip, heath groundsel (<i>Senecio sylvaticus</i>), devil's-bit scabious (<i>Succisa pratensis</i>), bilberry (<i>Vaccinium myrtillus</i>) and common dog-violet were recorded. Bell heather was also recorded on the rock faces. Bark stripping was also evident. The cutting separates the two halves of the SSSI: for the eastern half (see Target Note 16).</p>
18	NT 12766 80827	<p>North Cliff Wood</p> <p>Area of secondary woodland regenerated from old oak acid woodland (as identified by ground flora) on very steep banks. The main canopy species was sycamore, but wych elm, ash, holly and the occasional oak were also present. Maximum tree height was c. 20m. There was a limited shrub layer consisting of hawthorn and elder. Honeysuckle, tutsan and gooseberry were also present. In some areas, ivy was the dominant ground flora, but in others there was a greater diversity of plants including ground-elder, foxglove, wild strawberry, wood avens, bluebell, wood meadow-grass (<i>Poa nemoralis</i>), bracken, hedge woundwort, wood sage and common dog-violet.</p>
19	NT 12045 78517	<p>Broad-leaved plantation woodland south of Port Edgar.</p> <p>Path and disused railway line runs through it. Steeply embanked on both sides. Dominated by ash and sycamore. Understorey poor: occasional hawthorn and bramble. Groundflora poor. Dominated by ivy; frequent ash saplings and seedlings; occasional wood avens, herb-robert and common nettle.</p>
20	NT 11919 78580	<p>Location of giant hogweed within a fenced compound of apparently abandoned items.</p>
21	NT 16606 78628	<p>Inchgarvie House. Small area of plantation woodland.</p> <p>Plantation woodland c. 0.1ha between main road to Port Edgar and drive to Inchgarvie House. The wood is on a steep bank and consists of mainly beech, sycamore and wych elm. The shrub layer consists of hawthorn, rhododendron, elder, holly and yew. There is a poorly developed ground flora, bare ground is the dominant feature, but ivy, wood avens, common nettle, bramble, raspberry, herb-robert, hogweed, hairy-brome (<i>Bromopsis ramosa</i>), foxglove and male-fern are all present in small amounts.</p>

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Target Note Number	Grid Reference	Description
22	NT 11403 78709	Location of Japanese knotweed in an area approximately 5m long and 1m wide along the road verge. Also approximately 60m east at NT 11559 78701 within the fenced Port Edgar area.
23	NT 11215 78747	<p>East Shore Wood. Plantation woodland</p> <p>A large area of established plantation woodland stretching along the south side of the Firth of Forth from Linn Mill westwards. Larch is the largest component of the canopy with ash and sycamore making up most of the remainder. Beech, cherry and yew are also present but are generally rare. The scrub layer is poorly developed - holly, elder, tutsan, butterfly-bush and hawthorn were all recorded but were rare. The groundflora was poorly developed; large areas were covered by bryophytes and elsewhere common nettle and male-fern were dominant. In parts, this vegetation can be quite dense. Bramble and creeping buttercup were locally dominant. Other species recorded were self-heal, wood avens, raspberry (occasional - frequent) and spear thistle (<i>Cirsium vulgare</i>), field forget-me-not (<i>Myosotis arvensis</i>), germander speedwell, soft-rush, honeysuckle, hedge woundwort, red campion, broad-leaved dock, broad-leaved willowherb (<i>Epilobium montanum</i>), common figwort (<i>Scrophularia nodosa</i>) (rare). There were also some garden escapees present in the woodland. Towards the northern edge of the woodland, adjacent to the road, bramble and tall-herb species such as rosebay willowherb were dominant. The woodland appears to be relatively unmanaged - dead standing and fallen wood was recorded.</p> <p>At NT 11053 78625 to the south of East Shore Wood is a small area of woodland where common lime, pedunculate oak and sycamore are the dominant tree species. Rhododendron, laurel (<i>Laurus nobilis</i>) and horse chestnut line the road to the south. Grey squirrels (<i>Sciurus carolinensis</i>) were seen here.</p>
24	NT 11081 78286	<p>Broad-leaved woodland.</p> <p>Dominated by sycamore. Frequent pedunculate oak; occasional common lime, Scots pine, ash and beech; rare horse chestnut. Shrub layer: occasional holly, bramble, wild privet, honeysuckle and rhododendron are present. The groundflora is poor: common nettle, ground ivy, rosebay willowherb and rare dog's mercury are present. Linn Mill Burn runs through the woodland it has a fast flow rate, it is 1-2m wide, the substrate is mud, the earth banks are 0.5m high, no aquatic vegetation. Continuous scrub and treeline along Linn Mill Burn. The area north of the burn is used for mountain biking. Incidental sighting of a Buzzard (<i>Buteo buteo</i>) recorded.</p>
25	NT 11608 77236	<p>Mixed plantation woodland known as the Echline Strip in the north of the Dundas Estate.</p> <p>10% conifer: 90% broad-leaved. Long established woodland. Frequent ash and sycamore. Occasional common lime, horse chestnut, yew, beech and pedunculate oak. Rare wych elm, elder, alder, silver birch and wild cherry. Dense stands of rhododendron. The groundflora is species poor. Common nettle is the dominant species. Frequent cleavers, male fern and cock's-foot. Occasional creeping thistle, ground-ivy (<i>Glechoma hederacea</i>), creeping buttercup, germander speedwell and field forget-me-not. Rare hogweed, broad-leaved willowherb, red campion, dog's mercury, enchanter's-nightshade, bracken and hedge woundwort. Sycamore seedlings present. Scots pine with drey. Deer tracks in middle of woodland. Some deadwood and small log piles. The southwest of the wood has old building remains which offer potential for bat roosts. A NVC assessment was carried out in this woodland.</p>
26	NT 12469 77299	<p>Broad-leaved plantation woodland.</p> <p>Mature shelterbelt surrounding arable fields in the north of the Dundas Estate. Frequent sycamore and ash; occasional Scots pine, common lime and horse chestnut; rare wild cherry, pedunculate oak and beech. Shrub layer poor: rare elder and one stand of bramble. The groundflora is also poor: common nettle is locally dominant in some areas and frequent throughout the wood. Abundant cock's-foot; frequent false oat-grass and cleavers; occasional broad-leaved dock, wood avens, curled dock (<i>Rumex crispus</i>) and cow parsley (<i>Anthriscus sylvestris</i>); rare tufted hair-grass. There is a small round pool, steep sided, 2.5mx2.5m, possibly the end of a field drain. Three-quarters of surface was covered with duckweed. Several potential bat trees. Several log piles potential refugia. A lot of standing and fallen deadwood. NVC assessments were carried out in parts of this woodland.</p>
27	NT 11455 77051	<p>Strip of broad-leaved plantation woodland.</p> <p>Dense mature canopy. Abundant horse chestnut; frequent sycamore; occasional ash; rare silver birch, beech and yew. The shrub layer consists of occasional rhododendron and elder. The groundflora is species poor. Dominated by common nettle. Creeping buttercup and cleavers are frequent; occasional cock's-foot, germander speedwell, field forget-me-not, broad-leaved willowherb and male fern. Stoat observed in the arable field to the west of the site.</p>



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Target Note Number	Grid Reference	Description
28	NT 11710 76920	Mixed plantation woodland. 15% conifer: 85% broad-leaved. Very dense mature woodland. Canopy composition is mixed: ash, sycamore, common lime, yew, wild cherry and elder trees and shrubs. The groundflora is very poor with lots of bare ground, locally frequent common nettle and occasional broad buckler-fern.
29	NT 12453 76911	Broad-leaved woodland in the north of the Dundas Estate. Paved access track runs through it and there is a golf course to the south. The canopy varies from being very open to closed. Sycamore is dominant. There is occasional yew, common lime, cherry, pedunculate oak and beech. Rhododendron is locally dominant in some places particularly along the track. There is also occasional elder. Groundflora species include: areas locally dominated by common nettle. There is frequent creeping thistle, creeping buttercup and common ragwort. Foxglove ( <i>Digitalis purpurea</i> ) is locally frequent whilst common figwort is rare. Some fallen deadwood present.
30	NT 13290 76947	Broad-leaved woodland likely to be of long established plantation origin. Small area beside former road. Some of the trees are very old. Frequent fallen dead wood. Lots of fly-tipping. Canopy contains beech and sycamore. Elder and bramble are occasional. The groundflora is dominated by common nettle; with frequent cleavers, rosebay willowherb, creeping buttercup; occasional herb-robert, honeysuckle, field forget-me-not; rare thyme-leaved speedwell ( <i>Veronica serpyllifolia</i> ), broad-leaved helleborine and bluebell. A NVC assessment was carried out on this woodland.
31	NT 13385 76616	Dolphington Burn Wood. Mixed woodland. Dense canopy. Part of the woodland is used by a paint ball company. Part of the woodland is likely to be of long established plantation origin. Ash is the dominant tree species, some very old trees present, but sycamore, Scots pine and beech are also frequent. The groundflora is poor. Common nettle is locally dominant, dog's mercury is frequent and creeping buttercup, wood avens, broad buckler-fern and curled dock are occasional. A small pond is located at NT 13420 76683. In the western part of the wood is an area of marsh with hard rush, jointed rush, meadowsweet and water forget-me-not abundant. Willow, alder and birch scrub surround the area. The woodland is linked to the woodland directly to the north (see Target Note 30) by a treeline with shrubs that runs beside a former road.
32	NT 12433 75721	Large area of broad-leaved plantation woodland. An area of dense woodland mainly surveyed from paths. It is in need of management although some parts have been recently underplanted. Dominated by ash and sycamore with beech, silver birch, Scots pine, alder, larch and horse chestnut frequent. There are some more mature trees in the eastern part of the wood, but also areas dominated by rhododendron. The shrub layer was poor: goat willow, bramble and gorse are occasional. The ground flora was dominated by ferns, broad buckler and common male fern present. Rosebay willowherb, foxgloves and sycamore seedlings frequent. Wood sorrel occasional.
33	NT 09720 75461	Strip of broad-leaved plantation woodland north of Niddry Mains. Used for mountain biking as jumps and trails have been built. Very dense canopy dominated by sycamore and ash. Occasional cherry, sweet chestnut and common lime. Shrub layer: occasional hawthorn, dog-rose, bramble, hazel ( <i>Corylus avellana</i> ) and rhododendron. Dense ground flora dominated by common nettle. There is also abundant cock's-foot, cow parsley and cleavers; frequent broad-leaved dock and wood avens and occasional hogweed and bluebell. Rock pile refugia are also present along with some standing and fallen deadwood.
34	NT 10515 75430	Humbie Reservoir. Large area of deep standing water. Marginal vegetation: yellow iris, branched bur-reed, meadowsweet, water-cress ( <i>Rorippa nasturtium-aquaticum</i> ), reed canary-grass and great willowherb. Mare's-tail ( <i>Hippuris vulgaris</i> ) present in reservoir. Coots and mallards also present and the waterbody is used for by an angling club.
35	NT 10936 75032	Swine Burn. Approximately 0.75-1.5m wide, moderate - fast flow rate, water depth approximately 15cm, silt and cobble substrate, earth banks. It runs to the south of Swineburn Wood, is culverted under the M9 road and continues through an arable field. Intermittent aquatic marginal vegetation. Abundant meadowsweet and great willowherb. Frequent yellow iris and reed canary-grass. Occasional branched bur-reed. Bank vegetation tall herb: dominated by rosebay willowherb, hogweed and common nettle. Frequent broad-leaved dock and curled dock. Rush species, cock's-foot and

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Target Note Number	Grid Reference	Description
		false oat-grass are frequent. Otter spraint at end of tunnel under motorway NT 09540 75834.
36	NT 11083 74836	Strip of broad-leaved woodland between the Swine Burn and Humber Farm. A narrow strip of broad-leaved woodland approximately 10-20m wide. The canopy was dominated by sycamore with some beech, ash and oak. The ground flora was generally poor with tall ruderal species such as creeping thistle, common nettle, red campion and garlic mustard ( <i>Alliaria petiolata</i> ) abundant. Fly tipping was evident, particularly at the extreme southern end adjacent to the Swine Burn. North of the B9080, the woodland was more open and the ground flora grassier with species typical of unmanaged rough grassland common (Yorkshire-fog, cock's-foot).
37	NT 11391 74601	Strip of mixed plantation woodland running alongside the M9 road embankment. 15% conifer: 85% broad-leaved. Abundant ash; frequent larch; occasional pedunculate oak; rare Norway spruce ( <i>Picea abies</i> ). Natural regeneration of ash seedlings and saplings. The groundflora consists of abundant common nettle and cleavers; frequent wood avens; occasional broad-leaved willowherb, Yorkshire-fog, rough meadow-grass ( <i>Poa trivialis</i> ), daisy, hogweed, creeping thistle, bramble, broad-leaved dock, cock's-foot and bent grass, rare red campion and northern marsh-orchid. Some fallen dead wood present. Stand of common twayblade. Within the woodland groundflora are small patches locally dominated by oxeye daisy and an area locally dominated by common nettle. The Swine Burn runs west - east through the woodland (Target Note 36).
38	NT 10328 74605	Rough grassland, trees and scrub. Small complex area (c. 0.5ha) of rough grassland, herb rich areas and trees and scrub, and to the west merging into either dense tall ruderal vegetation along the Niddy Burn or sparse ephemeral vegetation on the spoil heap. The tall ruderal vegetation consisted largely of species such as creeping thistle and spear thistle, rosebay willowherb, common nettle, and wild teasel with dog-rose, raspberry and bramble. Grass species were either rank types or species indicated of semi-improved grassland; Yorkshire-fog, false oat-grass, cock's-foot and crested dog's-tail were all recorded. Also recorded were species of most damp conditions including meadowsweet, glaucous sedge, hard rush, and soft-rush. Other species recorded included meadow crane's-bill ( <i>Geranium pratense</i> ), crosswort ( <i>Cruciata laevipes</i> ), tufted vetch ( <i>Vicia cracca</i> ), selfheal, common bird's-foot-trefoil, meadow vetchling, yellow-rattle ( <i>Rhinanthus minor</i> ), field forget-me-not, common knapweed, white clover, broad-leaved dock, hop trefoil, black medick, creeping buttercup, eyebright, Goat's-beard ( <i>Tragopogon pratensis</i> ), ribwort plantain, greater plantain ( <i>Plantago major</i> ), common ragwort, colt's-foot, red bartsia, burdock ( <i>Arctium</i> sp.) and wild strawberry. Goat willow, hawthorn, silver birch and cherry were also recorded.
39	NT 10586 74604	Ross's Plantation. Mixed plantation woodland. Most of the woodland is recent. The canopy is dense with several clearings dominated by tall herb communities. There is an area dominated by Norwegian spruce surrounded by broad-leaved woodland dominated by ash and sycamore. Wych elm and horse chestnut are rare. Underplanted with oak and ash. Shrub layer poor: honeysuckle, hawthorn and gorse occasional in broad-leaved section. Ground flora poor very little cover in most of the wood. In the southeast the canopy is more open, in this area the ground flora is dominated by false oat-grass; common nettle, red campion, wood avens, male-fern, wild strawberry, hogweed ( <i>Heracleum sphondylium</i> ), cleavers, occasional; enchanter's-nightshade, rare.
40	NT 11179 74192	Lindsay's Craigs. Mixed plantation wood. 15% conifer: 85% broad-leaved. Dense canopy with a mixture of species: sycamore, ash, yew, Scots pine, wych elm, larch and beech frequent; coastal redwood, rare. Sitka spruce ( <i>Picea sitchensis</i> ) was abundant at the far eastern end of the. Occasional elder, rhododendron and snowberry at the woodland edge. Groundflora poor. Broad buckler-fern abundant; common nettle, frequent; wood avens, occasional; bluebell, rare. Few-flowered garlic was the dominant ground flora in the far eastern part of the wood. The Niddy Burn runs through a section of the woodland in the west then to the south of the woodland. The channel width varies from 1.5m-4m, slow flow rate, substrate pebbles and cobbles. Little marginal vegetation, rare reed canary-grass, banks dominated by terrestrial grasses and rosebay willowherb. Aquatic vegetation: green algae.

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Target Note Number	Grid Reference	Description
41	NT 11922 74297	<p>Kirkliston public park, woods and pond (Back Braes Weir and Wood)</p> <p>Within the park are areas of amenity grassland, plantation woodland and semi-natural plantation woodland. The semi-natural woodland is dominated by sycamore, with elm (<i>Ulmus</i> sp.), oak (<i>Quercus</i> sp.), ash and beech. Rowan and hawthorn are also present along with raspberry. The woodland is heavily disturbed due to public access and the groundflora is generally poor; wood avens and herb-robert were the most prominent species. The tallest trees are over 20m in height.</p> <p>Adjacent to the motorway is an area known as Back Braes Wood which is a relatively recently planted area of woodland with an area of amenity grassland. Beech, ash, rowan, alder, cherry, silver birch, common lime, hawthorn, yew, rowan, Scots pine, oak and dogwood were all present along with a variety of amenity species. The groundflora was poorly developed - Yorkshire-fog and other rack grasses were prominent and the most distinctive herbs were tall ruderal species such as creeping thistle and rosebay willowherb.</p> <p>The Swine Burn runs through the main part of the park and towards the top of this is a man-made waterbody. This has been much reduced in size due to development of swamp vegetation consisting mainly of reed canary-grass.</p>
42	NT 12375 73969	<p>Poor semi-improved grassland next to River Almond.</p> <p>Closely rabbit grazed. Frequent red fescue and Yorkshire-fog. High herb content dominated by ribwort plantain; frequent white clover; occasional common mouse-ear (<i>Cerastium fontanum</i>), yarrow, slender St. John's-wort, field horsetail (<i>Equisetum arvense</i>), creeping buttercup and crossword, rare common spotted-orchid and oxeye daisy.</p>

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Table 1.3: Botanical Species List

English Name	Latin Name
Alder	<i>Alnus glutinosa</i>
Annual sea-blite	<i>Suaeda maritima</i>
Ash	<i>Fraxinus excelsior</i>
Aspen	<i>Populus tremula</i>
Autumn hawkbit	<i>Leontodon autumnallis</i>
Azalea species	
Beech	<i>Fagus sylvatica</i>
Bell heather	<i>Erica cinerea</i>
Bent grass	<i>Agrostis</i> sp.
Bilberry	<i>Vaccinium myrtillus</i>
Biting stonecrop	<i>Sedum acre</i>
Black medick	<i>Medicago lupulina</i>
Bloody crane's-bill	<i>Geranium sanguineum</i>
Bluebell	<i>Hyacinthoides non-scripta</i>
Blue water-speedwell	<i>Veronica anagallis-aquatica</i>
Bottle sedge	<i>Carex rostrata</i>
Bracken	<i>Pteridium aquilinum</i>
Bramble	<i>Rubus fruticosus</i>
Branched bur-reed	<i>Sparganium erectum</i>
Broad buckler-fern	<i>Dryopteris dilatata</i>
Broad-leaved dock	<i>Rumex obtusifolius</i>
Broad-leaved helleborine	<i>Epipactis helleborine</i>
Broad-leaved willowherb	<i>Epilobium montanum</i>
Brooklime	<i>Veronica beccabunga</i>

English Name	Latin Name
Bulbous buttercup	<i>Ranunculus bulbosus</i>
Bulrush	<i>Typha latifolia</i>
Burdock	<i>Arctium</i> sp.
Burnet rose	<i>Rosa pimpinellifolia</i>
Bur-reed	<i>Sparganium</i> sp.
Butterfly-bush	<i>Buddleja davidii</i>
Cherry	<i>Prunus</i> sp.
Cleavers	<i>Galium aparine</i>
Coastal redwood	<i>Sequoia sempervirens</i>
Cock's-foot	<i>Dactylis glomerata</i>
Colt's-foot	<i>Tussilago farfara</i>
Common bird's-foot-trefoil	<i>Lotus corniculatus</i>
Common centaury	<i>Centaurium erythraea</i>
Common dog-violet	<i>Viola riviniana</i>
Common figwort	<i>Scrophularia nodosa</i>
Common knapweed	<i>Centaurea nigra</i>
Common lime	<i>Tilia x europaea</i>
Common marsh bedstraw	<i>Galium palustre</i>
Common milkwort	<i>Polygala vulgaris</i>
Common mouse-ear	<i>Cerastium fontanum</i>
Common nettle	<i>Urtica dioica</i>
Common ragwort	<i>Senecio jacobaea</i>
Common reed	<i>Phragmites australis</i>
Common restharrow	<i>Ononis repens</i>

English Name	Latin Name
Common saltmarsh-grass	<i>Puccinellia maritima</i>
Common sorrel	<i>Rumex acetosa</i>
Common spotted-orchid	<i>Dactylorhiza fuchsii</i>
Compact rush	<i>Juncus conglomeratus</i>
Cottongrass	<i>Eriophorum</i> sp.
Couch grass	<i>Elytrigia repens</i>
Cow parsley	<i>Anthriscus sylvestris</i>
Cowslip	<i>Primula veris</i>
Creeping bent	<i>Agrostis stolonifera</i>
Creeping buttercup	<i>Ranunculus repens</i>
Creeping thistle	<i>Cirsium arvense</i>
Crested dog's-tail	<i>Cynosurus cristatus</i>
Crosswort	<i>Cruciata laevipes</i>
Cuckooflower	<i>Cardamine pratensis</i>
Curled dock	<i>Rumex crispus</i>
Daisy	<i>Bellis perennis</i>
Devil's-bit scabious	<i>Succisa pratensis</i>
Dog's mercury	<i>Mercurialis perennis</i>
Dog-rose	<i>Rosa canina</i>
Downy oat-grass	<i>Helictotrichon pubescens</i>
Dropwort	<i>Filipendula vulgaris</i>
Duckweed	<i>Lemna</i> sp.
Elder	<i>Sambucus nigra</i>
Elm	<i>Ulmus</i> sp.
Enchanter's-nightshade	<i>Circaea lutetiana</i>

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English Name	Latin Name
Eyebright	<i>Euphrasia officinalis</i> agg.
Fairy flax	<i>Linum catharticum</i>
False brome	<i>Brachypodium sylvaticum</i>
False oat-grass	<i>Arrhenatherum elatius</i>
False-fox sedge	<i>Carex otrubae</i>
Few-flowered garlic	<i>Allium paradoxum</i>
Field forget-me-not	<i>Myosotis arvensis</i>
Field horsetail	<i>Equisetum arvense</i>
Field scabious	<i>Knautia arvensis</i>
Foxglove	<i>Digitalis purpurea</i>
Garlic mustard	<i>Alliaria petiolata</i>
Germander speedwell	<i>Veronica chamaedrys</i>
Giant hogweed	<i>Heracleum mantegazzianum</i>
Glasswort	<i>Salicornia</i> sp.
Glaucous sedge	<i>Carex flacca</i>
Goat willow	<i>Salix caprea</i>
Goat's-beard	<i>Tragopogon pratensis</i>
Gooseberry	<i>Ribes uva-crispa</i>
Gorse	<i>Ulex europaeus</i>
Greater plantain	<i>Plantago major</i>
Ground-elder	<i>Aegopodium podagraria</i>
Ground-ivy	<i>Glechoma hederacea</i>
Hairy tare	<i>Vicia hirsuta</i>
Hairy-brome	<i>Bromopsis ramosa</i>
Hard rush	<i>Juncus inflexus</i>

English Name	Latin Name
Harebell	<i>Campanula rotundifolia</i>
Hare's-foot clover	<i>Trifolium arvense</i>
Hawthorn	<i>Crataegus monogyna</i>
Hazel	<i>Corylus avellana</i>
Heath bedstraw	<i>Galium saxatile</i>
Heath groundsel	<i>Senecio sylvaticus</i>
Heather	<i>Calluna vulgaris</i>
Heath-grass	<i>Danthonia decumbens</i>
Hedge woundwort	<i>Stachys sylvatica</i>
Herb-robert	<i>Geranium robertianum</i>
Hogweed	<i>Heracleum sphondylium</i>
Holly	<i>Ilex aquifolium</i>
Honeysuckle	<i>Lonicera periclymenum</i>
Hop trefoil	<i>Trifolium campestre</i>
Hornwort	<i>Ceratophyllum</i> sp.
Hornbeam	<i>Carpinus betulus</i>
Horse chestnut	<i>Aesculus hippocastanum</i>
Ivy	<i>Hedera helix</i>
Japanese knotweed	<i>Fallopia japonica</i>
Jointed rush	<i>Juncus articulatus</i>
Kidney vetch	<i>Anthyllis vulneraria</i>
Lady's bedstraw	<i>Galium verum</i>
Lady's-mantle	<i>Alchemilla filicaulis</i>
Lady's-mantle	<i>Alchemilla</i> spp.
Larch	<i>Larix decidua</i>

English Name	Latin Name
Laurel	<i>Laurus nobilis</i>
Lesser meadow-rue	<i>Thalictrum minus</i>
Lesser spearwort	<i>Ranunculus flammula</i>
Maiden pink	<i>Dianthus deltoides</i>
Male-fern	<i>Dryopteris filix-mas</i>
Mare's-tail	<i>Hippuris vulgaris</i>
Marsh arrowgrass	<i>Triglochin palustre</i>
Marsh cinquefoil	<i>Potentilla palustris</i>
Marsh pennywort	<i>Hydrocotyle vulgaris</i>
Marsh speedwell	<i>Veronica scutellata</i>
Marsh thistle	<i>Cirsium palustre</i>
Meadow crane's-bill	<i>Geranium pratense</i>
Meadow vetchling	<i>Lathyrus pratensis</i>
Meadowsweet	<i>Filipendula ulmaria</i>
New Zealand pygmyweed	<i>Crassula helmsii</i>
Northern marsh-orchid	<i>Dactylorhiza purpurella</i>
Norway spruce	<i>Picea abies</i>
Oak	<i>Quercus</i> sp.
Oxeye daisy	<i>Leucanthemum vulgare</i>
Parsley-piert	<i>Aphanes arvensis</i>
Pedunculate oak	<i>Quercus robur</i>
Pendulous sedge	<i>Carex pendula</i>
Pignut	<i>Conopodium majus</i>
Plicate sweet-grass	<i>Glyceria plicata</i>
Raspberry	<i>Rubus idaeus</i>

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English Name	Latin Name
Red bartsia	<i>Odontites vernus</i>
Red campion	<i>Silene dioica</i>
Red clover	<i>Trifolium pratense</i>
Red fescue	<i>Festuca rubra</i>
Reed canary-grass	<i>Phalaris arundinacea</i>
Rhododendron	<i>Rhododendron ponticum</i>
Ribwort plantain	<i>Plantago lanceolata</i>
Rosebay willowherb	<i>Chamerion angustifolium</i>
Rough hawkbit	<i>Leontodon hispidus</i>
Rough meadow-grass	<i>Poa trivialis</i>
Rowan	<i>Sorbus aucuparia</i>
Scots lovage	<i>Levisticum scoticum</i>
Scots pine	<i>Pinus sylvestris</i>
Sea arrowgrass	<i>Triglochin maritimum</i>
Sea aster	<i>Aster tripolium</i>
Selfheal	<i>Prunella vulgaris</i>
Sessile oak	<i>Quercus petraea</i>
Sharp-flowered rush	<i>Juncus acutiflorus</i>
Sheep's sorrel	<i>Rumex acetosella</i>
Silver birch	<i>Betula pendula</i>
Silverweed	<i>Potentilla anserina</i>
Slender St. John's-wort	<i>Hypericum pulchrum</i>
Small sweet-grass	<i>Glyceria declinata</i>
Snowberry	<i>Symphoricarpos albus</i>
Soft-rush	<i>Juncus effusus</i>

English Name	Latin Name
Spear thistle	<i>Cirsium vulgare</i>
Sphagnum moss	<i>Sphagnum spp.</i>
Spiked water-milfoil	<i>Myriophyllum spicatum</i>
Spring-sedge	<i>Carex caryophylla</i>
Sweet chestnut	<i>Castanea sativa</i>
Sweet vernal-grass	<i>Anthoxanthum odoratum</i>
Sycamore	<i>Acer pseudoplatanus</i>
Thyme-leaved speedwell	<i>Veronica serpyllifolia</i>
Tormentil	<i>Potentilla erecta</i>
Tufted hair-grass	<i>Deschampsia cespitosa</i>
Tufted vetch	<i>Vicia cracca</i>
Tutsan	<i>Hypericum androsaemum</i>
Twayblade*	<i>Listera ovata</i>
Viper's-bugloss	<i>Echium vulgare</i>
Water mint	<i>Mentha aquatica</i>
Water-cress	<i>Rorippa nasturtium-aquaticum</i>
Water forget-me-not	<i>Myosotis scorpioides</i>
Water-plantain	<i>Alisma plantago-aquatica</i>
Wavy hair-grass	<i>Deschampsia flexuosa</i>
Wetland thistle	<i>Carduus crispus</i>
White campion	<i>Silene latifolia</i>
White clover	<i>Trifolium repens</i>
Whitebeam	<i>Sorbus aria agg.</i>
Wild cherry	<i>Prunus avium</i>

English Name	Latin Name
Wild onion	<i>Allium vineale</i>
Wild privet	<i>Ligustrum vulgare</i>
Wild strawberry	<i>Fragaria vesca</i>
Wild teasel	<i>Dipsacus fullonum</i>
Wild thyme	<i>Thymus polytrichus</i>
Wood avens	<i>Geum urbanum</i>
Wood dock	<i>Rumex sanguineus</i>
Wood meadow-grass	<i>Poa nemoralis</i>
Wood sage	<i>Teucrium scorodonia</i>
Woodruff	<i>Galium odoratum</i>
Wych elm	<i>Ulmus glabra</i>
Yarrow	<i>Achillea millefolium</i>
Yellow iris	<i>Iris pseudacorus</i>
Yellow-rattle	<i>Rhinanthus minor</i>
Yew	<i>Taxus baccata</i>
Yorkshire-fog	<i>Holcus lanatus</i>
Zigzag clover	<i>Trifolium medium</i>

\* Due to taxonomic revision, twayblade, *Listera ovata*, is often now referred to as *Neottia ovata*.

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## 2 Badger (Confidential)

2.1.1 Refer to Appendix A10.5 (Confidential Badger and Otter Information).

## 3 Bats

### 3.1 Consultation Information

3.1.1 Consultation with Echoes Ecology Ltd (ecological bat consultancy) regarding previous survey data identified several bat roosts in and around the study area south of the Firth of Forth and in the vicinity of the Union Canal as shown in Table 3.1. In addition, Echoes Ecology Ltd was able to confirm the presence of three species of bats - soprano pipistrelle (*Pipistrellus pygmaeus*), common pipistrelle (*P. pipistrellus*) and Daubenton's bat (*Myotis daubentonii*) in the area, based on field and capture data. As shown in Table 3.1, at least two large maternity colonies inside dwelling houses are present; other roosts are mainly in trees (especially Daubenton's bats).

**Table 3.1: Consultation Results from Echoes Ecology Ltd.**

Date	OS Grid Reference	Location	Species of Bat	Notes
May 2001	NT 08700 75300	Winchburgh	Soprano pipistrelle Common pipistrelle Daubenton's bat	Field records of foraging and commuting bats
May 2006	NT 09200 75200	Winchburgh	Daubenton's bat	Roosting inside an ash tree
May 2006	NT 07700 74900	Winchburgh	Daubenton's bat	Roosting inside an oak tree
May 2007	NT 08300 78300	Hopetoun Estate	Daubenton's bat	Roosting inside an oak tree
July 2007	NT 08800 74700	Winchburgh	Soprano pipistrelle	Maternity roost inside a dwelling house
July 2007	NT 06800 76600	Craigton	Daubenton's bat	Field capture
July 2007	NT 07000 76000	Hopetoun Estates	Soprano pipistrelle	100+ maternity colony roosting inside a dwelling house
Aug 2007	NT 06800 76600	Craigton	Daubenton's bat	Field capture
Sep 2007	NT 06800 76600	Craigton	Daubenton's bat	Field capture

3.1.2 TAPIF EIC provided a single recorded brown long-eared bat (*Plecotus auritus*) record within the study area north of the Firth of Forth; no further information regarding the record is available. Fife and Kinross Bat Group provided a single recorded domestic roost within a 1km buffer zone (unidentified bat species) and further records of five species within regular flight range of the site: Soprano pipistrelle (*Pipistrellus pygmaeus*), Common pipistrelle (*P. pipistrellus*), brown long-eared bat (*Plecotus auritus*), Daubenton's bat (*Myotis daubentonii*) and Natterer's bat (*Myotis nattereri*).

3.1.3 The Bat Conservation Trust (BCT), Lothians Bat Group, LWIC and Central Scotland Bat Group were unable to provide information regarding the presence of bats or roosts within the study area. Scottish Natural Heritage (SNH) and Scottish Environment Protection Agency (SEPA) provided advice about the legal requirements for survey for European Protected Species (EPS) but provided no further information on the location of bats or roosts within the study area.

### 3.2 Data Search

3.2.1 The BATS and The Millennium Link (BaTML) project ([www.batml.org.uk](http://www.batml.org.uk)) identified the presence of at least five species of bats within the BaTML study area, all of which have been found to be roosting. The estimated number of bats and roosts present within the BaTML study area is shown

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in Table 3.2 though the actual number of roosts associated with the canal network is likely to be significantly higher (Middleton, 2006).

**Table 3.2: Information Publicly Available from Bats and the Millennium Link (BaTML)**

Species of Bat	Number of Known Roosts	Estimated Number of Individual Bats Using Roosts
Soprano pipistrelle	7	2000
Common pipistrelle	2	60
Daubenton's	6	300
Natterer's	2	5
Brown long-eared	2	3

3.2.2 The draft Setting Forth Environmental Statement ES (ERM, 1996) identifies the infrequent recording of brown long-eared bats roosting in tunnels and bridges, and the tentative use of pillboxes in the grounds of Pitreavie Castle (Rosyth) as hibernacula.

3.2.3 A data search on National Biodiversity Network (NBN) Gateway (National Biodiversity Network, 2008) identified the presence of common and soprano pipistrelle, brown long-eared and Daubenton's bats within the study area. Specifically, pipistrelle bats have been recorded in the 1km squares at Rosyth (NT 1184) and Fordell (NT 1485); brown long-eared bats in the 1km squares at Fordell (NT 1485), Dundas (NT 1176), and the 100m square at Burn Craigs Wood (NT091767); Daubenton's bats have been recorded in the 1km grid squares at (NT 0775) northwest of Winchburgh, and within the 2km square that includes Old Philipstoun and Winchburgh; Natterer's bats (*M. nattereri*) have been recorded within 100m of NT091767 (Burn Craigs Wood), common pipistrelle within the 2km square that includes Winchburgh, and soprano pipistrelle within the 2km square at Winchburgh and the 1km square at Craigton (NT 0776). It is not clear whether the records relate to field capture, roost or other data.

3.2.4 The NBN Gateway provided records of soprano pipistrelle and brown long-eared bat within the study area as shown in Table 3.3.

**Table 3.3: Consultation Records from NBN Gateway**

Species of Bat	Approximate Start Date of Record	Approximate End Date of Record	Grid Reference
Soprano pipistrelle	02/07/2001	02/07/2001	NT 07T
Soprano pipistrelle	09/07/2001	09/07/2001	NT 07X
Soprano pipistrelle	18/03/2002	18/03/2002	NT 07T
Soprano pipistrelle	28/03/2002	28/03/2002	NT 07X
Soprano pipistrelle	03/04/2002	03/04/2002	NT 07T
Soprano pipistrelle	10/04/2002	10/04/2002	NT 07X
Soprano pipistrelle	25/07/2005	25/07/2005	NT 07X
Soprano pipistrelle	17/04/2002	17/04/2002	NT 07T
Soprano pipistrelle	29/07/2004	29/07/2004	NT 07X
Soprano pipistrelle	26/04/2004	26/04/2004	NT 07X
Soprano pipistrelle	01/07/2004	01/07/2004	NT 07T
Soprano pipistrelle	24/04/2005	24/04/2005	NT 07T
Soprano pipistrelle	04/07/2005	04/07/2005	NT 07T
Brown long-eared bat	01/01/1971	31/12/1971	NT 17
Brown long-eared bat	01/01/1988	31/12/1988	NT 0976 (Burn Craigs/Swineburn)
Brown long-eared bat	01/01/1988	31/12/1988	NT 09100 76500 (Burn Craigs)
Brown long-eared bat	01/01/1988	31/12/1988	NT 0976 (Burn Craigs/Swineburn)



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- 3.2.5 Scottish Bats online journal (Haddow & Herman, 2001) lists the presence of common pipistrelle, unconfirmed pipistrelle, brown long-eared and Daubenton's bat within the study area.
- 3.2.6 In addition to the above species, the Distribution Atlas of Bats in Britain and Ireland (Richardson, 2000) includes the potential presence of whiskered bats (*M. mystacinus*) which are considered likely to be found throughout Scotland; Natterer's bat and Nathusius' pipistrelle which are considered scarce and Leisler's bats (*Nactalus leisleri*) which were stated to be a rare migrant in the north. Brown long-eared bat is common and widespread throughout Great Britain. Noctule bat is known to be present in southern Scotland.

### 3.3 Survey Results

- 3.3.1 Areas of similar habitat (e.g. woodland areas, urban areas) have been assessed according to their suitability for roosting, foraging and commuting bats, as described in the habitat profile assessment. It should be noted that bats are a mobile species and therefore habitat areas should not be considered in isolation.

#### North of the Firth of Forth

##### Habitat Description

- 3.3.2 North of the Firth of Forth there are no areas specifically designated or notified for the presence of bats within 1km of the study area.
- 3.3.3 The habitats in this section are characterised by urban areas associated with the towns of North Queensferry, Rosyth and Inverkeithing, interspersed with industrial areas including operational quarries, docks and light industry around Jamestown and between Rosyth and Inverkeithing. These areas have inherently low value to bats due to the high levels of disturbance and the absence of roosting opportunities in buildings and trees.
- 3.3.4 To the west of the M90 up to admiralty slips there are a number of areas of habitat considered to be suitable for roosting, foraging and commuting, including St. Margaret's Hope which is contiguous with North Cliff Wood in North Queensferry; and Castlandhill Woods. These woodlands are mature broad-leaved woodlands and provide areas of foraging and roosting habitat scarce elsewhere in the locality. Fairy Kirk is situated between Rosyth and Inverkeithing and includes a large disused quarry, woodland and damp habitats. In addition there are a number of linear features along roads, hedgerows and fences which are suitable for commuting. Additional features of potential importance to bats include wetland habitats around St. Margaret's Marsh SSSI, however no potential hibernacula were recorded in this section. Habitats are described in Table 3.4 and shown on Figure 10.4a.

##### Roost Survey Results

- 3.3.5 Bat roost surveys were carried out at all stand-alone buildings, trees and other man-made structures throughout the northern part of the study area as described in Appendix A10.3, Section 3 (Bats).
- 3.3.6 Only one building roost was identified at Craig Dhu (NT 12692 80528); two tree roosts were also recorded (NT 12726 80516 and NT 12518 80768).

##### *Buildings*

- 3.3.7 The area north of the Firth of Forth is characterised by towns (North Queensferry, Inverkeithing and Rosyth) with large numbers of buildings with high roosting potential. A total of 14 standalone buildings and building complexes were surveyed during daylight hours in this section (Tables 3.6, 3.7 and Figure 10.4a). An emergence survey was undertaken at one property (Craig Dhu) but no emergence or roost return behaviour was observed at the building.

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#### *Trees*

- 3.3.8 A total of eight trees with roost potential were recorded within the study area north of the Firth of Forth (Figure 10.4a). These are all located in the habitats around St. Margaret's Hope and North Cliff. In addition two trees at Craig Dhu (North Queensferry) were classified as 1a trees (confirmed roosts) as bats were tracked back to the trees during surveys. The results of tree surveys are shown in Table 3.5.

#### Bat Survey Transect Results

- 3.3.9 A total of four bat survey transects were completed within the study area north of the Forth, incorporating the habitats around The Dales, Inverkeithing, Fairy Kirk, Castlandhill, North Queensferry, North Cliff Wood, as described in Appendix A10.3, Section 3.2.16 – 3.2.20 (Bat Survey Transects). The results are described in Table 3.8.
- 3.3.10 The four transects showed low levels of bat activity, with soprano pipistrelles being the most frequently recorded species and a few common pipistrelles being the only other bats detected.
- 3.3.11 For the purposes of this investigation <5 bats = low activity, 5-10 bats = moderate activity and >10 bats = high activity.

#### Commuting Route Survey Results

- 3.3.12 A total of seven potential commuting routes were surveyed (Table 3.9). These were identified in walkover surveys and included hedgerows, walls, woodland edges and other linear features in locations likely to be affected by the proposed scheme through the creation of new, or extension of existing, infrastructure.
- 3.3.13 An additional four potential commuting routes were identified in walkover surveys but were not surveyed due to security implications of leaving bat survey equipment in urban areas. These commuting routes (2, 3, 8 and 9) are not included in the results.
- 3.3.14 Based on the matrix described in Appendix A10.3, Section 3.2.21 – 3.2.26 (Commuting Route Surveys) the relative importance of commuting routes was assessed, as shown in Table 3.11. Commuting Route (CR) 10 is the only one with high levels of activity: CR 6 (Castlandhill Wood), CR 5 (Lothians View Path) and CR 11 (the Forth Road Bridge) were of moderate value, CR 4 (Hedgerow) and CR 1 (railway forming west side of Inverkeithing Junction) were of low value and CR 7 was of moderate value.
- 3.3.15 All of the potential commuting routes identified were shown to be used by commuting bats. In particular, high levels of bat activity were recorded in St. Margaret's Hope (CR 10) and along the path at Lothians View (CR 5). Two species were identified with soprano pipistrelle dominant and small numbers of common pipistrelle. The species present and average number of bat passes recorded during the commuting route surveys are given in Table 3.9.

#### South of the Firth of Forth

##### *Habitat Description*

- 3.3.16 South of the Firth of Forth there are no areas specifically designated or notified for the presence of bats within the study area.
- 3.3.17 The habitats are characterised by mature broad-leaved woodland of long-established origin, interspersed with arable and semi-improved fields. The urban areas of Kirkliston and South Queensferry dominate the landscape to the extreme north and south of this area, and include suburban areas with amenity habitats offering potential roost sites. Duddingston Pond, Hopetoun Fisheries, Humber Reservoir, the River Almond and other waterbodies provide excellent foraging

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habitat, and the areas are well connected via woodland shelterbelts, hedgerows, railway lines and other linear features suitable for bats to commute. Additional features of potential importance to bats include ice houses in Newliston, Hopetoun and Dundas; while culverts also provide potential for hibernating bats. Habitats are described in Table 3.4 and shown on Figure 10.4b-c.

#### Roost Survey Results

3.3.18 Bat roost surveys were carried out at all stand-alone buildings, trees, bridges, ice houses, and other structures throughout the southern part of the study area as described in the bat survey strategy.

3.3.19 A total of 19 roosts were identified in the south, including 16 in buildings and three in trees, confirmed during daytime and/or evening surveys conducted in the study area.

#### *Buildings*

3.3.20 A total of over 40 individual buildings and building complexes were surveyed in the study area south of the Firth of Forth (Table 3.7 and Figure 10.4b-c).

3.3.21 Daytime building surveys identified a number of buildings which were in use, had been used or had the potential to be used for roosting by bats. In order to confirm the presence, species and number of bats using buildings for roosting, emergence surveys were conducted at 15 buildings which had external signs of bat activity or anecdotal evidence from personal communications with land owners/tenants that there were bats in the property.

3.3.22 Emergence surveys confirmed the presence of bats at 9 of the buildings (Table 3.6 and Figure 10.4b-c).

3.3.23 14 buildings were confirmed as roosts (1a), one building was considered a potential roost (1b) (Table 3.6). All building roosts identified were soprano pipistrelle roosts.

#### *Trees*

3.3.24 A total of 80 trees within the study area south of the Firth of Forth were identified as having roosting potential (Table 3.5, and Figure 10.4b-c). In addition a tree in Swineburn Wood (NT 10759 75755) was classified as being a confirmed roost, due to the presence of droppings discovered during the walkover survey.

3.3.25 One further tree roost near Dundas Mains (NT 11205 76981) was identified as a bat roost as a result of back-tracking bats to the roost during a survey transect (Figure 10.4b).

3.3.26 An anecdotal record of a tree roost (1b) was noted for Dundas Estate, (NT 11400 76500) resulting from a personal communication with a tenant (refer to Figure 10.4b)

#### Bat Survey Transect Results

3.3.27 Bat transects are shown on Figure 10.4.

3.3.28 A total of twelve bat survey transects were completed within the study area south of the Firth of Forth, which are summarised below and detailed in Table 3.8. Activity results were determined from 1½ hours to 3 hours activity surveys rather than a whole night's survey. Activity was measured as <5 bats = low activity, between 5 -10 bats = moderate activity, and >10 bats = high activity.

#### Commuting Route Survey Results

3.3.29 Bat commuting routes are shown on Figure 10.4.

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- 3.3.30 A total of 28 potential commuting routes were surveyed south of the Firth of Forth as described in Appendix 10.3, Section 3.2.21 (Commuting Route Surveys). These were identified in walkover surveys and included hedgerows, walls, woodland edges and other linear features which are located directly on the route of the proposed scheme.
- 3.3.31 Commuting bats were recorded at all of the identified potential commuting routes in the southern study area in varying numbers (Table 3.9). For this study, the assessment of commuting route use and overall activity levels are based on the mean number of passes (to the nearest whole number) over the number of visits: <25 bats = low; 26 - 50 bats = moderate and >50 bats = high. In general it can be seen that the complex network of linear features in the study area support a number of bats and a number of bat species; all linear features may contribute toward the overall suitability of the area to support bats, and facilitate movements of bats between habitat areas. Mean number of passes and bat species present are given in Table 3.9 for the different commuting routes.
- 3.3.32 CR 10 includes the scores from three remote (AnaBat) bat detector surveys to reflect the level of remote survey effort in St Margaret's Hope, which could not be accessed for manual surveys at night. The commuting route consists of three branches, each of which was surveyed separately as identified in Table 3.9.
- 3.3.33 Assigning each of the commuting routes in the south of the Firth of Forth a value based on the matrix described in Appendix A10.3, Table 3.2 (Scoring of Commuting Route Evaluation Criteria), the relative importance of commuting routes was assessed, as shown in Table 3.10. Of the 28 commuting routes, CR 13 (South Queensferry) and CR 22 (Dundas) were the only commuting routes assessed as having high importance, 19 were of moderate importance and seven were of low importance to bats.

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**Table 3.4: Bat Habitat Descriptions**

Site	Roost Value	Foraging Value	Commuting Value	Habitat Description
Rosyth	High	Medium	Medium	A modern urban area with high inherent roosting potential for species such as pipistrelles. Foraging habitat limited to small areas of amenity grassland, suburban habitats and gardens, Brankholm Burn and the Wilderness (burn/riparian, wet woodland and scrub habitat). Commuting routes to foraging habitat at Castlandhill Wood and Fairy Kirk exist along road verges.
Inverkeithing	High	Low	Medium	A modern urban area with high inherent roosting potential for species such as pipistrelles. Large areas of amenity grassland with low inherent foraging value exist in the town while the town is surrounded by arable and poor semi-improved grassland. Foraging habitat is available nearby at Fairy Kirk, Ferry Hills and The Dales Wood; commuting habitat exists along tree-lined roads.
Fairy Kirk	Low	High	Medium	A disused open-cast stone quarry situated to the east of Inverkeithing adjacent to the M90. The area surrounding the quarry includes gorse scrub and immature to semi-mature mixed woodland habitat. A semi-natural broad-leaved woodland adjacent to the quarry and wet flushes at the base of the quarry offer some foraging potential scarce in the locality.
Castlandhill Woods	High	High	Medium	Castlandhill Wood consists of mixed broad-leaved plantation and semi-natural deciduous woodland with sycamore and some oak and ash. Mature trees offer roost potential, and the habitats provide foraging opportunities for all species typically found in the region. The woods are surrounded by species-rich grassland, semi-improved grassland, arable fields and swamp which provide some foraging opportunities. Castlandhill Cottages are on an exposed hill but provide some roost opportunities and a 'stepping stone' between roosting habitat in Rosyth and foraging habitat at the wood. In addition, local roads and field boundaries offer some commuting potential.
St. Margaret's Hope Wood	High	Medium	Low	Area of semi-natural mature broad-leaved woodland with relics of ancient woodland and exotic plantation. Dead wood, decaying trees, ivy, holes etc provide good roosting potential and provide excellent foraging potential. Woodland is close and ecologically contiguous with North Cliff Wood (North Queensferry). The habitats within St. Margaret's Hope provide foraging opportunities for all species typically found in the region. The Firth of Forth and associated maritime cliffs are of inherently low value to bats. St. Margaret's Marsh SSSI is situated adjacent to the Wood; saltmarsh, mesotrophic grassland and reed habitats combined with small areas of open water may increase the foraging habitat resource although the area is very exposed.
North Cliff Wood	Medium	Medium	Low	Area of secondary mixed broad-leaved woodland generated from old acid oak woodland and with limited shrub layer, on very steep banks. The woodland is close to and ecologically contiguous with St. Margaret's Hope under the existing Forth Road Bridge. Roosting potential is limited to small numbers of ivy-clad trees but the woodland offers sheltered foraging habitat scarce elsewhere in North Queensferry.
North Queensferry	High	Medium	Medium	An urban area with a high roosting potential for bats in buildings, with semi-improved grassland and amenity areas including gardens offering some foraging potential. North Cliff Wood and St. Margaret's Hope are good foraging areas for bats to the west of North Queensferry. Ferry Hills and associated mosaic of semi-improved grassland, tall ruderal, scrub and fen habitats with some open water provide some foraging habitat. The Forth Road Bridge and the Forth Rail Bridge link North Queensferry with South Queensferry across the estuary (bridges 2-2.5km long). Locally important CR habitat is provided by a railway cutting, minor roads (including the road that leads toward St. Margaret's Hope). The M90 verges also provide some commuting potential.

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Site	Roost Value	Foraging Value	Commuting Value	Habitat Description
South Queensferry	High	Medium	Low	Urban area with trees, hedgerows and streetlamps bordering roads and paths. Amenity grassland areas also present within the area. Strip of mixed secondary woodland to the south of the town (dense canopy with frequent beech, sycamore and ash occasional Scots pine; poor shrub layer and ground flora). Jock's Hole woodland is a broad-leaved secondary woodland with a burn running through it, dense canopy and dominated by ash and sycamore with abundant deadwood. Such areas provide foraging opportunities scarce in the locality and act as 'stepping stone' between foraging and roosting habitats either side of South Queensferry including East Shore Wood and Hopetoun to the west, Dundas to the south, and Dalmeny to the east. Area is bordered by the Firth of Forth to the north.
Port Edgar and west of South Queensferry	High	Medium	Low	Mixture of woodland, arable fields and buildings. East Shore Wood borders the access road between Hopetoun and South Queensferry and comprises mature broad-leaved woodland, providing an excellent CR between these habitats. Mature woodland shelterbelts surrounding Inchgarvie and bordering the Linn Mill Burn also provide suitable commuting habitat. Port Edgar Marina includes a WWII army barracks and associated guard house, storage rooms and bunker which are considered to be suitable for roosting habitat. They are also strategically placed close to foraging habitat at Linn Mill Burn and East Shore Wood. Ice house present at Icehouse Hill provides suitable hibernaculum for <i>Myotis</i> , brown long-eared or pipistrelle species. Ice house sheltered by small area of broad-leaved woodland of mixed species composition and includes abundant deadwood. Moderately sized body of open water located at Duddingston Pond, surrounded by semi-improved grassland and some large mature horse chestnut trees provides some relatively exposed aquatic foraging habitat. Hedgerows, tree lines and woodlands form connective links between this area and other adjoining areas including Dundas (southeast), Swineburn (south) and South Queensferry (east).
Dalmeny	High	High	High	Area to the east of South Queensferry includes arable land interspersed with mature broad-leaved shelterbelts and woodland at Cock's Hill Wood. Industrial areas at oil storage depot and Royal Elizabeth Yard. The A90 and main rail line pass through the area which provides connecting habitat between high value roosting and foraging habitat at Dundas and Dalmeny Estates.
North of Dundas	Low	Medium	High	A collection of arable fields bordering South Queensferry. Stone walls, road verges and mixed species hedgerows provide connectivity between South Queensferry and Dundas, East Shore Wood, Hopetoun and Linn Mill Burn.
Dundas (North Section)	High	High	High	Mature broad-leaved woodland areas interspersed with arable fields and semi-improved grassland. Large areas of tree cover and shelter and high, dense rhododendron hedgerows also present. Woodland around North Lodge, Greenacre and Echline Strip predominantly long-established mature broad-leaved plantation woodland and mixed plantation woodland with mixed species composition and frequent sycamore, ash and horse chestnut, and dense canopy. Several 2a potential trees and standing deadwood present, and a small pond also present, providing excellent roosting and foraging resource for all species typically found in the region. Habitat areas connected to the rest of the Dundas Estate via mature broad-leaved woodland and shelterbelts and tree-lined tracks; and with roosting habitat at South Queensferry via species-poor hedgerows, walls and lanes.
Dundas (Central)	High	High	High	Large area with mature woodland interspersed with arable land, semi improved grassland, amenity grassland and waterbodies, providing mosaic of habitats with excellent foraging potential for all the bat species typically found in the region. Dundas Wood is comprised of a number of woodland areas; Dundas Hill and surrounding woodland - mixed woodland, sloping, very dense cover; Barrenraig Wood - mixed plantation woodland, large diverse canopy, deadwood present; Moat Knowe – broad-leaved woodland, sycamore dominant; and rhododendron lined track leading from North Lodge to Castle. Large Golf Course (Amenity grassland) with woodland copses. Shelterbelts and hedgerows provide excellent connectivity within Dundas and to surrounding woodland areas. An ice house with hibernation potential is present close to Dundas Loch and curling pond (south section).

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Site	Roost Value	Foraging Value	Commuting Value	Habitat Description
Milton and Dolphington	High	High	High	Area to the east of Dundas Estate. Predominantly arable land with a large area of dense mixed woodland present (Dolphington Burn Wood - area dominated by ash, some of the woodland areas is of long established plantation woodland origin, the remainder is being used for leisure purposes). Tree line links this woodland to woodland in the north with shrubs running alongside the former road, containing potential tree roosts. Milton and Dolphington Burn provide areas of excellent foraging and roosting habitat and connectivity between habitats in South Queensferry and Dalmeny with those in Dundas.
Dundas (South)	High	High	High	Large area of broad-leaved plantation woodland in the southernmost area in Dundas Estate. Several clearings present and Dundas Loch and several smaller waterbodies provide excellent sheltered aquatic foraging habitat. Small disused quarry to the north of the curling pond provides potential swarming site. Coniferous plantation to the west of this area is dominated by larch and to the east of the area is Sitka spruce with low inherent value for roosting and foraging. Broad-leaved woodland edges provide good edge foraging habitat. Small area of long-established woodland in middle of improved grassland fields also provides 'stepping stone' habitat; excellent connectivity with other areas of roosting and foraging habitat within Dundas Estate, and at Humble and Swineburn via shelterbelts and hedgerows.
Swineburn Wood	High	High	High	Broad-leaved plantation woodland with confirmed tree roost and potential tree roost present and dense canopy. Some replanting and recent felling evident. Dominated by sycamore with frequent oak. Hopetoun Fisheries occupies a small pond in the southwest of the wood which provides good foraging habitat. Swine Burn runs directly to the south of the woodland and provides a link between the study area and Union Canal (via M9 culvert) which is known to be important for Daubenton's bats.
Carmelhill and Muiriehall Woods	High	High	High	Broad-leaved plantation woodlands (with potential tree roosts) and thickets present. Disused quarry is now filled with water and provides a sheltered aquatic foraging resource. Carmelhill Wood has a dense canopy and mixed species with sycamore, elm, ash and beech present. Humble Reservoir runs along to the South of this area - large reservoir of deep standing water, steep sides and surrounded by semi-improved grassland and wetland with excellent foraging habitat. Muiriehall Wood – broad-leaved plantation woodland with dominant ash and sycamore. Tracks and paths and the railway line provide linear features considered to offer good foraging potential. Woodland areas surrounded by semi-improved grassland and some arable land with low inherent value to bats. Excellent connectivity with Humble, Swineburn, Dundas and respective foraging and roosting habitat via hedgerows and shelterbelts.
Humble	Medium	High	High	Area surrounding Humble Farm includes arable land and some improved grassland with low inherent value to bats. There are also some small areas of woodland; roads, paths and fields are bordered by mature trees and hedgerows and broad-leaved plantation woodland with mixed species composition, and the mainline railway and verges, which provide connectivity with Dundas, Carmelhill, Swineburn, Dundas and Lindsay's Craigs. Large quarry ponds present at Humble Quarry surrounded by sycamore and ash and mixed woodland with some deadwood present, providing sheltered aquatic foraging resource.
Kirkliston	Medium	Medium	Low	Suburban area with trees, hedgerows and streetlamps bordering roads and paths. Amenity grassland areas exist within the town. The River Almond, Niddry Burn, Swine Burn and Back Braes Weir provide aquatic and wetland habitat and an excellent foraging and commuting resource which is scarce elsewhere in the study area. A disused railway line provides excellent commuting potential between Kirkliston and habitat areas to the northeast (South Queensferry, Dalmeny). The surrounding habitats are predominantly arable land, semi-improved and improved grassland with inherently low potential for bats. The A8000, M9 link road and B9080 provide connectivity with foraging and roosting areas in Dundas and Humble.
Ross's Plantation, Lindsay's Craigs	Medium	Medium	High	Various woodland areas present, with arable land and semi improved grassland. Ross's Plantation is recently planted mixed plantation woodland and has a dense canopy with several clearings suitable for bat foraging. Dominant species - Norway spruce with broad-leaved trees forming the perimeter of the woodland. Lindsay's Craigs is mixed plantation woodland with dense canopy and mixed species composition. Niddry Burn runs along the south of the woodland past Overton Farm. Niddry Burn and the M9 verges provide connectivity between these woodland areas and roosting/foraging habitat at Humble, Kirkliston and Carmelhill.

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**Table 3.5: Bat Tree Survey Results**

Location	Grid Reference	Tree Species	Roost Category	Age	Survey Results
St. Margaret's Hope	NT 12444 81126	Beech	2a	Mature	Large crack in trunk
	NT 12444 81126	Beech	2b	Mature	Small slits all over trunk
	NT 12424 81120	Sycamore	2b	Mature	Holes at 1.5metres and under branches
	NT 12422 81083	Sycamore	2a	Mature	Hollow core, split branches
	NT 13025 83551	Dead wood - Pedunculate Oak	2b	Dead	Hollow in trunk (tiny hole at top of it)
	NT 12100 82324	Ash	2a	Mature	Very large gap in hollow trunk
	NT 12122 82321	Ash	2a	Mature	Split in trunk with a tiny hole
North Cliff	NT 12948 80729	Sweet chestnut	2a	Very mature	Cracks in bark
North Queensferry	NT 12505 80785	Sycamore	1a	Mature	Single pipistrelle bat observed emerging from ivy covering the tree at the edge of St Margaret's Hope.
Craig Dhu, North Queensferry	NT 12692 80528	Pedunculate Oak	1a	Mature	Single pipistrelle bat observed returning to roost in the tree following dawn survey.
South Queensferry	NT 11887 78596	Sycamore	2b	Mature	Cavities under bark On railway embankment in wooded valley
Inchgarvie/ Linn Mill	NT 10730 77850 ( two trees)	Unknown	2a	Mature	Holes in trunk
Dundas Castle & Estate	NT 11171 76991	Unknown	1a	Mature	Tree roost located in copse of mature broad-leaved woodland. Adjacent to Dundas Mains whilst conducting a dawn transect (T.10 - 12/08/08, six soprano pipistrelles seen circling in small clearing in the canopy and then entering the tree).
	NT 11400 76500	Unknown	1b	Mature	Consultation with the tenant (name unknown, The Chalet, Dundas, August 2008, pers. comm., Claire Hopkins, Jacobs Arup): bats seen coming out of rhododendron bush (Oct-Nov 2007). Investigated by surveyors - mature sycamore located directly behind this with a large hole which may have been the access point for a potential bat roost.
	NT 11890 76815	Pedunculate Oak	2a	Very Mature	Large splits/cracks all over
	NT 11888 76846	Pedunculate Oak	2a	Mature	Holes all over
	NT 12714 76946	Sycamore	2a	Mature	Hollow trunk hole at 2m
	NT 12701 76967	Sycamore	2a	Mature	Crack running up the trunk
	NT 12803 76974	Pedunculate Oak	2a	Mature	Buckle in one of limbs at 10m
	NT 12802 76999	Beech	2b	Mature	Three holes (at 3m, 3.5m, 9m)



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Location	Grid Reference	Tree Species	Roost Category	Age	Survey Results
	NT 12764 77023	Sycamore	2a	Semimature	Large, long gaps all along trunk
	NT 12723 77022	Sycamore	2b	Mature	Large hole at 2.5m
	NT 12723 76998	Dead wood	2b	Dead	Hole in branch at 5m
	NT 12416 76937	Beech	2a	Mature	Hole at 7m
	NT 12382 76943	Silver Birch	2a	Mature	Large hole at 1.5 m and 5m
	NT 12270 76957	Sycamore	2a	Mature	Hollow trunk and hole at 6m
	NT 12196 76968	Sycamore	2a	Mature	Hole at 8m and 11m
	NT 12210 76998	Unknown	2a	Mature	Large fissure
	NT 11689 76907	Unknown	2a	Mature	Woodpecker holes and hollow rotten trunk
	NT 11693 76931	Sycamore	2a	Mature	Elbow hole at 3m and hollow at 7m
	NT 12488 77117	Ash	2b	Mature	Crack and split in trunk at 10m
	NT 12496 77218	Sycamore	2a	Semimature	Deep small hole at 3m and hollow at 7m
	NT 12383 77338	Sycamore	2a	Mature	Holes in old section of trunk at 3-4m
	NT 12329 77332	Sycamore	2a	Mature	Excellent holes in trunk
	NT 12279 77333	Ash	2a	Mature	Narrow crack in trunk at 3m - rotting
	NT 11873 77304	Sycamore	2a	Mature	Hole in trunk at 4m
	NT 11618 77194	Ash	2b	Very Mature	Crack all the way up
	NT 11352 77205	Sycamore	2a	Mature	Hole at 1m & 5m
	NT 11251 77041	Sycamore	2a	Mature	Hole at 2m. south aspect
	NT 12053 76380	Unknown	2a	Mature	Cracks on undersides of branches
	NT 12053 76380	Scots Pine	2b	Mature	Hole at 6m
	NT 11934 76345	Unknown	2a	Mature	Hole at 5m leading into hollow trunk
	NT 11929 76319	Pedunculate Oak	2b	Mature	Many gaps in trunk
	NT 11891 76292	Sycamore	2a	Mature	Hole at 8m
	NT 11885 76305	Pedunculate Oak	2b	Mature	Many holes and cracks
	NT 12007 76242	Pedunculate Oak	2b	Mature	Crack from ground to 8m
	NT 12096 75807	Dead wood - ash	2b	Dead	Small holes in rotting trunk at 5m
	NT 12119 75772	Hazel	2a	Mature	Large vertical crack (north aspect) at 3-8m
	NT 12118 75810	Dead wood - beech	2a	Dead	Holes in hollow trunk at 2m

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Location	Grid Reference	Tree Species	Roost Category	Age	Survey Results
	NT 11965 75917	Silver Birch	2a	Mature	Hole at 1.5m (south aspect)
	NT 11765 76076	Unknown	2a	Mature	Large hole at 4m
	NT 11604 76185	Unknown	2a	Dead	Large holes at 6m & 6.5m
	NT 11321 76348	Beech	2a	Mature	10cm hole going up into dead branch
	NT 11418 76478	Sycamore	2a	Mature	Many holes in trunk and branches
	NT 11258 76455	Sycamore	2a	Mature	Holes into rotting (north facing) at 8m
	NT 12419 76443	Beech	2a	Mature	Woodpecker hole in deadwood
	NT 12414 76237	Sycamore	2b	Mature	Holes and cracks in dead wood branches
	NT 12569 75778	Unknown	2a	Mature	10cm hole (north aspect) at 10m. Crack above
Dalmeny Estate & Humbie Farm	NT 13665 77132	Pedunculate Oak	2a	Mature	Many holes. One at 10m in branch
	NT 13553 77078	Sycamore	2a	Mature	4 holes leading to hollow trunk
	NT 13719 77136	Sycamore	2a	Mature	Holes in damaged limb (5m and 8m)
	NT 13794 77187	Pedunculate Oak	2b	Mature	Several holes in trunk at several heights
	NT 13807 77193	Pedunculate Oak	2a	Mature	Many splits. 2 holes (3m and 5m)
	NT 13298 76915	Beech	2a	Mature	One very long split (at 8m) hollow
	NT 11097 75159	Pedunculate Oak	2a	Mature	Crack in branch at 8m, at edge of mature broad-leaved shelterbelt
	NT 11325 75410	Unknown	2a	Dead	Hollow trunk. Hole at 7m, in shelterbelt at Humbie Farm
	NT 11217 75403	Unknown	2b	Dead	In shelter belt at Humbie Farm
NT 11162 75413	Ash	2a	Mature	Hole at 5m. East facing, in shelterbelt at Humbie Farm	
Swineburn Wood	NT 10759 75755	Sycamore	1a	Mature	Large hole in trunk. Droppings present.
	NT 09661 76512	Beech	2a	Mature	Gap/hole close to ground level.
	NT 09667 76508	Sycamore	2a	Semi mature	Deadwood at heart; cracks, gaps and holes present.
	NT 09674 76480	Scots Pine	2a	Semi mature	Loose bark
	NT 09671 76386	Silver Birch	2b	Semi mature	Hole at 7m
	NT 09687 76351	Field	2a	Mature	Long crack in bark
	NT 09661 76334	Silver Birch	2b	Mature	Crack in bark
	NT 09687 76294	Hornbeam	2a	Semi mature	Small holes at 1m and 2m at field edge
NT 10064 75953	Beech	2b	Semi mature	Within 10m of Swineburn. Hole at 2.5m	

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Location	Grid Reference	Tree Species	Roost Category	Age	Survey Results
	NT 10765 75753	Sycamore	2a	Mature	Hole at 2.5m, in trunk, next to cottage
	NT 10804 75374	Beech	2b	Mature	"Elbow" holes, next to reservoir
	NT 10858 75583	Ash	2b	Mature	Cavity in bark, next to quarry pond
	NT 11045 75612	Ash	2a	Mature	Cavity at 3m, next to quarry pond
	NT 10993 76571	Beech	2a	Mature	Hole at 1.5m, next to quarry pond
	NT 10993 76571	Dead wood	2a	Dead	Hollow trunk inside, next to quarry pond
Royal Elizabeth Yard	NT 13730 76245	Unknown	2b	Mature	Loose bark
Newliston Estate	NT 11826 73888	Sycamore	2a	Veteran	Long crack 2-3m high in trunk
Newliston Estate	NT 11878 73923	Sycamore	2b	Semi mature	Hole at 2m
	NT 12694 84609	Beech	2a	Mature	Long crack up to 3m
	NT 11245 74273	Beech, sycamore	2b	Semi mature	Cracks
Hopetoun Estate - Duddingston	NT 10264 78003	Ash	2a	Mature	Cracks and loose bark leading to crevice in trunk. In woodland behind house.
Philipstoun / Winchburgh	NT 09280 75600	Unknown	2a	Mature	Tall mature tree with small holes.
Lindsay's Craigs	NT 11573 74049 (a whole row of trees)	Unknown	2a	Mature	Row of trees with cracks, splits and woodpecker holes.

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**Table 3.6: Building Survey Results (Confirmed Roosts)**

Grid Reference Building Name / Complex Building Type	Roost Category	Survey Results	Date of Emergence Survey and Weather Conditions
NT 12692 80528 Craig Dhu House/Outhouse	1a	Single recent dropping on porch. Broken door at 1.5m; holes and gaps also present 2.5-5m above the ground. Another hole present above security light at 5m. No bats observed emerging or entering the building during the survey on 03/09/08. However, a tree roost was located nearby.	03/09/08 and 04/09/08 Dry, Calm, 10°
NT 11699 78693 Port Edgar Marina and Barracks Building Complex Outbuildings/warehouses/sheds /large complex of buildings	1a	Single dropping on wall of old guard's hut. Many gaps under roof tiles, loose holes and gaps on all buildings in the barracks. Small ventilation bricks on buildings. No bats recorded emerging or entering the buildings during emergence surveys carried out on 27/05/08. Low levels of pipistrelle foraging activity on AnaBats.	27/05/08 Dry, Calm, 14°
NT 10542 77661 Lawflat House House/outbuildings	1a	Doors left open to outbuildings with wooden rafters. A few small gaps in roof and wall. Numerous droppings seen on walls of house and outbuildings on inspection prior to emergence survey. Consultation with owner (Mr. Strachan, landowner, pers. comm. August 2008): Bats seen directly behind the house on the back porch and are often seen feeding over the nearby loch at dusk by the property owner. Emergence survey carried out on 28/08/08 confirmed the presence of a roost. Four soprano pipistrelles entering at dawn, one soprano pipistrelles emerging at dusk.	28/08/08 and 29/08/08 Dry, Calm, 16°, 90% Cloud Cover (CC)
NT 11171 76991 Dundas Mains House/outhouse/cottages	1a	Seven droppings present on window seal and wall (recent) at main house. Gap under wooden soffit boards and beams. Roof in good condition, but other potential entrances present. No bat emergence or entry to property observed during survey on 11/08/08 or 12/08/08. Tree roost located nearby.	11/08/08 and 12/08/08 Dry, Light wind, 19.5°, 100% CC
NT 12813 77080 Ashley Homes 1 & 2 (Dundas) House	1a	One recent dropping found directly beneath gap under soffit board. Fissure at 2.5m on North facing wall. Consultation with tenant (Mr. Rowsell, landowner, pers. comm. September 2008): Informed surveyors that he has heard bats in the evening. Gaps present under pipes providing access to roost. Emergence survey confirmed the presence of a roost on 04/09/08 and 05/09/08. Three soprano pipistrelles recorded emerging at dusk.	04/09/08 and 05/09/08 Dry, Calm, 30% CC
NT 12880 77073 The Old Dairy House (Dundas) Houses/Garage/outhouse	1a	Two droppings on garage door. Holes under roof tiles present between 4-6m in height, possible entrances at ventilation slats. Consultation with the tenant (name unknown, landowner, pers. comm. July 2008): informed surveyors that they have bats in the property. Emergence survey carried out on 22/07/08/ and 23/07/08. No bats seen emerging or entering the building during this survey.	22/07/08 and 23/07/08 Dry, Calm, 20°, 60% CC
NT 11624 76769 Chapel Acre (Dundas) House	1a	One recent dropping found on chair on south side of house under security light. Potential roost entrance 2.5m above ground. Gaps present in roof where wall meets wooden soffit boards allowing for roost entrances all around the building. Emergence survey confirmed the presence of a roost, with two soprano pipistrelles emerging at dusk on 03/09/08 and three soprano pipistrelles entering at dawn on 04/09/08.	03/09/08 and 04/09/08 Dry, Calm, 10°, 40% CC

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Grid Reference Building Name / Complex Building Type	Roost Category	Survey Results	Date of Emergence Survey and Weather Conditions
NT 11638 76884 Greenacre House/outbuildings/clock house	1b	One dropping found on window of main house just below potential access point. Loose slate or brick at 6m leaving a gap approximately 5cm in diameter. No bats seen leaving or entering building during evening or dawn surveys on 01/09/08 and 02/09/08. Bat detected 2 minutes after sunset - roost likely to be located close by.	01/07/08 Light rain, Light wind, 15°, 100% cloud cover
NT 12863 76414 Milton Cottage House/garage	1a	Two recent droppings found in old Victorian outbuilding. Freshly grouted building. New PVC windows. New roof in one part of building. Holes and gaps above drain pipes in places allowing access to roost. Gaps in roof tiles. Confirmed roost. Six soprano pipistrelle bats seen entering building on gable end under the guttering while conducting a dawn survey transect (T.12, 19/08/08).	19/08/08 Light rain, Light/Moderate Wind, 15°, 100% CC
NT 11854 76021 Boat House (Dundas)	1a	One old dropping on wall. Dead Daubenton's bat found on wall of boathouse during other surveys. No emergence confirmed.	02/09/08 Dry, Calm, 9°, 30% CC
NT 11845 76002 Curling Hut (Dundas) Curling hut	1a	Three droppings on front door. Lack of cobwebs, many cracks and fissures, holes and gaps provide potential roost access points. Emergence survey confirmed presence of a roost for one soprano pipistrelle which emerged at dusk on 01/09/08 and one soprano pipistrelle entered at dawn on 02/09/08.	01/09/08 and 02/09/08 Dry, Calm, 9°, 30% CC
NT 12233 75810 Cherrytree Cottage House/garage	1a	Old stone building with old but well kept roof. Ten or more droppings present on garage door indicating presence of roost above, possibly between roof tiles. Potential roost entrances including several holes and gaps between stones and wood cladding are found all around the building. Emergence survey confirmed roost of five emerging soprano pipistrelles at dusk on 21/08/08 and four soprano pipistrelles entering at dawn on 22/08/08.	21/08/2008 and 22/08/08 Light Rain. Light Wind, 14°, 100% CC. Heavy rain developed.
NT 12563 75675 South Lodge (Dundas) House	1a	Five bat droppings present on western side of house on wall 2m above ground. Roost entrance likely to be gable end above porch; other potential roost entrances present around the building. Consultation with tenant (name unknown, tenant, pers. comm. September 2008): The owner/tenant has never seen bats in the building. He had bumblebees removed from the loft earlier in the season. No emergence or entry observed during surveys on 03/09/08 and 04/09/08.	03/09/08 and 04/09/08 Dry, Calm, 9°, 95% CC. Light drizzle developed
NT 10134 76017 and NT 10170 76000 Swineburn Cottage and kennels House	1a	Seven recent droppings on window sill and wall on south side of building. Continuous gap under wooden soffit boards and beam. Roof in good condition. Other recent droppings were found: two on porch, two on small doors, some on walls. Emergence survey on 26/08/08 and 27/08/08 confirmed the presence of a soprano pipistrelle roost in both the cottages and the adjacent kennels and out buildings, with two emerging at dusk and three entering at dawn.	26/08/08 and 27/08/08 Light rain, moderate wind, 16°, 100% CC

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Grid Reference Building Name / Complex Building Type	Roost Category	Survey Results	Date of Emergence Survey and Weather Conditions
NT 10779 75725 Carmel Cottages House	1a	<p>Small number of droppings found under guttering on back wall. A number of potential access points at various locations around the building.</p> <p>Consultation with owner (name unknown, landowner, pers. comm. September 2008): owner confirmed bats had been seen at dusk but he has not seen them enter the building.</p> <p>Building strategically located on linear feature with potential as commuting route. Single droppings located above window on the wooden guttering, on glasshouse roof and on roof of coal bunker.</p> <p>Emergence survey on 02/09/08 confirmed the presence of a roost. Four soprano pipistrelles emerging at dusk, four soprano pipistrelles entering at dawn.</p>	02/09/08 and 03/09/08 Dry, Calm, 12°, 95% CC
NT 11475 75486 Humbie Farm and Building Complex House/barn/outhouse	1a	<p>Main house is very old with broken tiles, gaps in roof and direct access to roof under guttering. Stables have high potential for roosting.</p> <p>Emergence survey carried out on 19/08/08. Small number of bats observed emerging from southwest corner of building and foraging nearby.</p>	19/08/08 Light-Moderate rain, calm - light winds, 16°, 90-100% CC

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**Table 3.7: Bat Building Survey Results (Potential Roosts)**

Building Name/Complex Building Type	Roost Potential Category	Survey Results
NT 12426 81200 Weldean Cottages (Outhouse/garage)	2b	Cobwebs all along undersides of eaves of buildings.
NT 12050 82687 Pitconachie House and other buildings (House/outhouses/garage)	2b	Loose slates; holes and gaps - large hole to east of building (30cmx30cm).
NT 11876 82043 Castlandhill House & unnamed building (Houses)	2a	Old navy house. Old building, in good condition. Roof has a few missing tiles. Cellar with many potential hibernation sites. Broken window/door at 4m; 2 loose tiles at 4m; crack/fissure at 4m; hole/gap at 4m and 6m. Hole/gap at 3m; many cracks/fissures; loose slate/brick. Burned out building. Holes/gaps in roof. Gaps under soffit board. Possible roost potential. Disturbance may be a factor.
NT 11918 81984 Castlandhill Farm and Steading (Farmhouse and outbuildings)	2a	Redeveloped farm next to signal station. Many cracks along top wall under roof fissure e.g. at 1m; gap at 30cm. Old brick building with gaps. Gaps under soffit board in building in courtyard.
NT 11994 82646 Castlandhill Terrace complex 5-9 (Houses)	2b /3	New roof, no cracks. Low roost potential overall. Loose boards on power station. Row of new garages across road with a few tiles missing. Row of cottages. Gaps under soffit boards. Roofs in moderate condition - a few loose tiles. Gaps at gable ends of properties. Loose slate/brick at 6m; crack/fissure at 3m; holes at 3-5m.
NT 11903 82743 Old Signal Station(House/outhouse)	2a	Flat roof on building. Most roost potential in outbuildings and extension. Gaps under soffit board at all aspects.
NT 12772 80939 Community Centre (Outhouse)	3	Prefabricated. No access points except some gaps between wooden slats. Flat roof.
NT 12533 80868 Queensferry Hotel (Hotel building)	2b/3	Ventilation. Hole (northeast aspect). Little or no other potential.
NT 12511 81077 St. Margaret's-Cottage at Gate (House)	2a	Loose slates south and north-facing, 4m above ground. No evidence for use by bats. Strategically located within area of woodland.
NT 12376 80953 St. Margaret's Hope (House)	2b	Well sealed with hardly any gaps. Only potential is in the roof.
NT 12928 80603 North Cliff (House)	2	Loose slate brick.
NT 12700 80523 Craig Dhu Cottage (House/outhouses)	2a	Honeysuckle on house, wooden shed - gaps under drain. Wood cladding on walls of the outhouse.

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Building Name/Complex Building Type	Roost Potential Category	Survey Results
NT 12501 80702 and NT 12534 80685 Ferrycraigs House & Tigh Na Grian (Houses)	2b	Ferrycraigs House has south-facing cracks and gaps around 7m above ground, Tigh-na-Grian has ventilation and gaps around the house at around 2.5m height.
NT 11441 78605 Inchgarvie House (House)	2a	Outhouse: openings to loft. Gaps on lead flashing and roof tiles. More potential than main house. Garage (wooden): North facing, gaps under wooden plates and soffit boards. Overshadowed by yew and lime trees.
NT 11641 78604 Inchgarvie Lodge (House)	2b	Lodge consists of modern building designed with few suitable cracks. Slats in small tower may enable access to bats.
NT 13914 78240 The Forts (House)	3	Survey was abandoned due to the difficulty of accessing the property.
NT 10249 77965 Icehouse (Dundas/ Duddingston) (Icehouse)	2a	A few cracks, but stable temperature and some potential as bat hibernaculum.
NT 11129 77333 Whitegate (House)	2b	Missing tiles at 6m, possibility of roosting under lead flashing.
NT 11285 76965 Derelict kennel building at Dundas Mains (House)	2a	Overgrown derelict building.
NT 11169 76989 Row of 4 cottages at Dundas mains (Row of cottages)	2b	Modern and well kept house roof in good condition. Derelict building to west of house has many gaps and holes. In walls as well as missing tiles. Open and exposed.
NT 11661 76872 Greenacre - Bothy (Outhouse)	2a	Stable buildings.
NT 11661 76872 Greenacre - next to bothy (House)	2a	Derelict building next to bothy. Roof still attached (i.e. shelter), and some windows missing (potential access points).
NT 11640 76879 Greenacre - west part of building complex (House)	2a	Gaps between wooden soffit boards. Holes at west gable end in between bricks. Wall clean and in good condition. Adjacent to derelict buildings.
NT 12700 77068 Dundas Home Farm Steadings (House)	2b	Hole in wooden beam above garage. Gap under roof join.
NT 11817 76698 Dundas Castle (Castle)	2a	Holes above boarded windows. Holes along drainage pipes, most potential inside courtyard.



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Building Name/Complex Building Type	Roost Potential Category	Survey Results
NT 11498 76479 Derelict Building (near walled garden - Dundas) (Shed)	2b	Holes in ceiling (slate/wooden roof). Small building. Lots of vegetative cover.
NT 12774 76351 Milton Farm (House/Outhouse/Barn)	2a	Older buildings and outhouses have more potential than house. Many undisturbed outbuildings with many potential access points.
NT 14060 76278 Royal Elizabeth Yard (Outhouses/warehouses/garages)	3	Many warehouses & distribution buildings ~1950's. Single layer brick/walls and corrugated roof. Very low potential. Few areas suitable for roosting.
NT 11548 76346 Icehouse adjacent to Dundas Loch (Icehouse)	2a	Blocked off to humans but gaps of 5-10cm between boards and stone.
NT 11348 76405 Castle Loch (House)	2a	Gaps under wooden cladding.
NT 11332 76428 The Chalet (Dundas) (House)	2a	Gaps behind wall and above satellite antenna. Old garage on left of house with gaps at locked door.
NT 09674 76111 Swineburn Bridge (Stone Bridge)	2a	Several cracks between masonry on underside of bridge. Suitable for hibernating or roosting.
NT 10778 75533 Humbie cottages (Cottages)	2b	Renovations ongoing at present. Although the roof is not directly affected, disruption is likely.
NT 10899 74267 Burn Bank Cottage Overton (House)	2a	Direct access into roof over alarm box in front of house. Gaps at gable end of house where roof edges haven't been sealed (derelict buildings backing onto burn). Consultation with owner/tenant (Name unknown, owner/tenant, pers. comm. July 2008): the owner/tenant is regularly in roof, and has not seen any droppings.
NT 10962 74288 West Cottage Overton (House)	2b	Gaps under drain pipes directly into eaves. Consultation with owner/tenant (name unknown, pers. comm. July 2008): they have seen bats foraging locally at dusk while they have been out walking.
NT 10964 74117 Overton house (House)	2b	First cottage when entering Overton along the main road from Humbie.
NT 10951 74122 Overton House and Farm (House/Outhouses)	2b	Owner did not allow survey to be carried out. Consultation with owner (name unknown, owner, pers. comm. July 2008): no bats ever seen.
NT 12977 74979 Almondhill House Steadings and Cottages (House/Outhouse)	2b (house) 3(steading)	Recently converted steadings and cottages. Very well sealed up. No signs of activity around properties.

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Table 3.8: Bat Survey Transect Results

Transect Number	Location	Species Present	Dates of Survey	Transect Habitat Description	Weather Conditions	Activity	Mean Passes per Survey		Mean Level of Activity at Dawn and Dusk Surveys	
							Dawn	Dusk	Dawn	Dusk
1	The Dales	Common and soprano pipistrelles	12/06, 13/06, 27/08, 28/08	Covers the area of The Dales Woodland and the area north of Inverkeithing junction. It includes areas of woodland, arable land, scrub and lamp-lit roads.	Dry, calm, mild, high levels of cloud cover on all surveys.	Commuting, foraging, feeding buzzes.	6.5	6	Low	Low
2	Inverkeithing	Common and soprano pipistrelles	17/07, 02/09, 03/09	This transect covers western Inverkeithing, Fairy Kirk and the overbridge over the A90 to Rosyth.	Light wind and rain, mild temperatures, high cloud cover for all surveys.	Commuting and foraging.	2	2	Low	Low
3	Castlandhill	Common and soprano pipistrelles	27/08, 28/08 (one survey completed)	This transect covers Castlandhill Woods, Whinny Hill and the B980 Ferry Toll road. The activity in this area was found to be low with the total number of bat passes recorded during the surveys being 13.	Dry, calm (dawn); moderate winds and low temperatures (dusk).	Commuting and foraging.	4	9	Low	Low
4	North Queensferry	Soprano pipistrelle	23/07, 24/07, 27/08, 28/08	This transect covered the area around St. Margaret's Hope along the B981 between North Cliff Wood and North Queensferry to the east and Castlandhill Wood to the north.	All surveys dry, warm temperatures, light - moderate wind.	Commuting and foraging.	5	3	Low	Low
5	Kirkliston/Humbie	Common and soprano pipistrelle	14/05, 04/08, 08/08	Covered the area north of Kirkliston (scrubland, fields) and Kirkliston town, including some arable land, semi improved and improved grassland towards Humbie past the underpass under the M9.	Dry, calm, mild. Rain on 2 <sup>nd</sup> dawn survey.	Commuting and foraging.	11	13	Low	High
6	South Queensferry (South and East)	Common and soprano pipistrelles	21/07, 22/07, 01/09, 02/09	Along the eastern side of South Queensferry, following the cycle track through a large area of mixed secondary woodland, Jock's Hole Wood and past Dalmeny Station. Both common and soprano pipistrelles identified as commuting and foraging in the area.	Dry, calm - moderate winds, very mild temperatures.	Commuting and foraging.	15.5	26	High	High
7	Duddingston/Lawflat	Soprano pipistrelles	24/07, 05/08, 01/09, 02/09	Covers the area of arable land at Duddingston, Duddingston Wood, along Linn Mill Burn and Lawflat. Contains areas of open water and old farm buildings.	Dry, moderate winds, high levels of cloud cover on all surveys.	Commuting and foraging.	2.5	11	Low	High

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							Mean Passes per Survey		Mean Level of Activity at Dawn and Dusk Surveys	
8	North of Dundas	Common and soprano pipistrelle	26/05, 27/05, 13/08, 14/08	Covered the area to the northeast of Dundas. It covered areas of arable land and improved grassland, along with some smaller woodland areas along the roadside. Arable fields have hedgerows or stone walls providing continuous linear features	Dry, moderate - light wind, high cloud cover. Heavy rain at start of second dusk survey.	Commuting and Foraging.	10.5	5.5	High	Moderate
9	Dalmeny (east)	Soprano pipistrelles	22/07	Along road between Dalmeny and Dalmeny house, along shelterbelts in arable fields.	Dry, light wind, mild.	Commuting and foraging.	27	15	High	High
10	Dundas Estate (North)	Common and soprano pipistrelle	09/06, 10/06, 11/08, 12/08	This transect covered the northern most section of the Dundas Estate. It contained areas of arable land, semi improved grassland, mature broad-leaved woodland e.g. the Echline Strip, dense hedgerows of rhododendron and included the buildings at Dundas Mains, Greenacre, and Dundas Home Farm.	Dry with light - moderate winds on both surveys.	Commuting and foraging.	18.5	18	High	High
11	Dundas Estate (Central)	Soprano pipistrelle	10/06, 11/06, 25/08, 26/08	Covers the central area of Dundas Estate and encompasses areas of mature woodland, arable land, semi improved grassland, amenity grassland, waterbodies, dense hedgerows of rhododendron and passes many buildings including South Lodge, Dundas Castle, Craigend, Cherrytree Cottage, and the Golf Club	Dry, calm - moderate winds, mild temperatures.	Commuting and foraging.	27	18	High	High
12	Milton and Dolphington	Common and soprano pipistrelles	09/07, 03/08, 18/09, 19/09	Transect covers the area to the east of Dundas along the main road past Dolphington Wood. It includes areas of arable land, dense mixed woodland, continuous treelines, with Dolphington Burn running through the middle of the transect area	All surveys light rain, calm with high cloud cover.	Commuting, foraging and social calls.	18	20.5	High	High
13	Dundas Estate (South)	Soprano pipistrelle and Daubenton's	01/07, 02/07, 01/09, 02/09	Southern most area of Dundas Estate, which includes large areas of broad-leaved plantation woodland (with several clearings), a large boating pond, a walled garden, an icehouse, curling shed, a dovecot and other buildings. Commuting and foraging bats were identified along with some social calls.	First surveys dry, calm, light winds. Second surveys cold.	Commuting, foraging and social calls.	20	13	High	High
14	Swineburn/ Muiriehall	Common, soprano & unidentified	29/05, 30/05, 25/08,	Covering the areas of Swineburn Wood, Muiriehall Wood, Carmelhill Wood, and Humber Reservoir and along to the main road (the B9080).	Dry, calm, mild for all surveys.	Commuting and foraging.	14	33	High	High

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							Mean Passes per Survey		Mean Level of Activity at Dawn and Dusk Surveys	
		pipistrelles and Daubenton's	26/08	The habitats consisted of a mixture of broad-leaved plantation woodlands and thickets with numerous flooded quarry ponds, a standing dead tree, arable land, improved grassland, and a railway line to the south which was crossed during the transect.						
15	Carmelhil/ Humbie	Common, soprano & unidentified pipistrelles and Daubenton's	29/05, 30/05, 25/08, 26/08	Results are combined with transect 14 due to movement of bats between the two transects and the overlap of accessible walk ways through the area.	Dry, calm, mild for all surveys.	Commuting and foraging	14	33	High	High
16	Kirkliston/ Humbie	Common and soprano pipistrelle	14/05, 04/08, 08/08	Covered the area north of Kirkliston (scrubland, fields) and Kirkliston town, including some arable land, semi improved and improved grassland towards Humbie past the underpass under the M9.	Dry, light wind, warm (first surveys); dry, calm, high cloud cover (second surveys).	Commuting and foraging	11	10.5	High	High

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**Table 3.9: Bat Commuting Route Survey Results**

Commuting Route (CR)	Location	Commuting Route Habitat Description	Species Present	Average Number of Bat Passes	Level of Activity
1	Railway along Inverkeithing North Junction	The main railway line which runs north - south to Inverkeithing North Junction. Despite being a linear feature the line is exposed and not lined with vegetation at this location.	Soprano pipistrelle	13	Low
2	Along main road (A921)	Open ground/scrub land bordered by a treeline to the south.	The survey was not completed in this location due to the lack of cover in which to place the bat survey equipment.		
3	Fairy Kirk	Area of woodland on a steep slope. Open quarry at base of slope.	The survey was not completed in this location due to the lack of cover in which to place the bat survey equipment.		
4	Hedgerow between Rosyth and South Queensferry	A discontinuous hedgerow and scrub-lined road running north to south towards Rosyth.	Soprano pipistrelle Common pipistrelle	2	Low
5	Lothians View Path	Lies along the path to the Lothians View which is a collection of buildings on top of a hill.	Soprano pipistrelle Common pipistrelle	393	High
6	Castlandhill Woods	The edge of Castlandhill Wood, which is well connected to Rosyth via hedges, stone walls and other field boundaries.	Soprano pipistrelle Common pipistrelle	16	Low
7	Rosyth relief road	B road adjacent to Castlandhill Wood. Connects habitats around St. Margaret's Hope to roosting opportunities in Rosyth/Dunfermline.	Soprano pipistrelle Common pipistrelle	5	Low
8	Disused railway line	Area of woodland on a steep slope. Open quarry at base of slope.	The survey was not completed in this location due to the lack of cover in which to place the bat survey equipment.		
9	B road to North Queensferry	Area of woodland on a steep slope. Open quarry at base of slope.	The survey was not completed in this location due to the lack of cover in which to place the bat survey equipment.		
10	St. Margaret's Hope	Located on roads and driveways within St. Margaret's Hope connecting habitats within the woodland area and along the main road between North Queensferry and North Cliff to the east, and Castlandhill Woods to the north. Three branches of the path were surveyed within the area.	Soprano pipistrelle Common pipistrelle	117 18 8	High Low Low
11	Forth Road Bridge	Carries the A90 south - north across the Firth of Forth, connecting roosting and foraging habitats and providing a sheltered linear feature across an inhospitable area for bats. (The Forth Rail Bridge also provides potential for commuting).	Soprano pipistrelle Common pipistrelle	2	Low
12	South Queensferry	Society Road, which is a tree-lined road with low-level street lighting and continuous linear habitat features including (from east - west) South Queensferry, Inchgarvie, Linn Mill Burn, East Shore Wood and Hopetoun.	Soprano pipistrelle Common pipistrelle	3	Low

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Commuting Route (CR)	Location	Commuting Route Habitat Description	Species Present	Average Number of Bat Passes	Level of Activity
13	South Queensferry	A continuous hedgerow running through a large area of improved and semi-improved grassland. Connects habitats including (from east - west) South Queensferry, Inchgarvie and East Shore Wood.	Soprano pipistrelle Common pipistrelle	175	High
14	South Queensferry	Species-poor discontinuous hedgerow running east - west between South Queensferry and Linn Mill Burn/East Shore Wood through arable and semi-improved fields. Connectivity provided between Inchgarvie, South Queensferry and East Shore Wood.	Soprano pipistrelle Common pipistrelle	11	Low
15	South Queensferry	Species-poor discontinuous hedgerow running east - west between South Queensferry and a strip of sycamore-dominated broad-leaved woodland through arable fields. Provides indirect connectivity between roosting habitat in South Queensferry and foraging habitat in East Shore Wood.	Soprano pipistrelle	2	Low
16	South Queensferry	The A904 and associated discontinuous species-poor hedgerow, fence and mature standard trees forms the basis of this CR. It provides connectivity between (from east - west) South Queensferry-foraging-Hopetoun.	Soprano pipistrelle Common pipistrelle	13	Low
17	Dundas	Continuous hedgerow between arable fields and linking the A904 (CR 16) and the minor road at White Gate (CR 18). Provides connectivity between South Queensferry to the north, and Dundas Estate to the south.	Soprano pipistrelle Common pipistrelle <i>Myotis</i> sp.	76	High
18	Minor road at White Gate	Minor Road at White Gate and associated continuous hedgerow, stone walls and fences, which borders arable fields, and passes small woodland copses including White Gate. Connects roosting habitat in South Queensferry and foraging and commuting habitat in Dundas Estate and Duddingston.	Soprano pipistrelle Common pipistrelle	26	Moderate
19	Dundas	Discontinuous hedgerows, fences and stone walls running north - south through arable land between the A904 and the Echline Strip. These routes provide connectivity between roosting habitat in South Queensferry and foraging and roosting habitat in Dundas Estate, as well as with CR 16.	Soprano pipistrelle Common pipistrelle	6	Low
20	Dundas	Discontinuous hedgerows, fences and stone walls running north - south through arable land between the A904 and the Echline Strip. These routes provide connectivity between roosting habitat in South Queensferry and foraging and roosting habitat in Dundas Estate, as well as with CR 16.	Soprano pipistrelle Common pipistrelle	18	Low
21	Dundas	Discontinuous hedgerows, fences and stone walls running north - south through arable land between the A904 and the Echline strip. These routes provide connectivity between roosting habitat in South Queensferry and foraging and roosting habitat in Dundas Estate, as well as with CR 16.	Soprano pipistrelle Common pipistrelle	10	Low
22	Dundas	Hedgerow-bordered track into Dundas Estate, off the minor road at White Gate (CR 18), and past White Gate House. Provides indirect connectivity between South Queensferry, Lawflat and Duddingston to the north, Dundas Estate to the south.	Soprano pipistrelle Common pipistrelle <i>Myotis</i> sp.	166	High
23	Dundas	The northern side of the Echline Strip which consists of mature mixed plantation woodland, bordered to the north by arable fields. CR provides continuous area of edge habitat connecting roosting and foraging habitat within Dundas Estate and to commuting routes 19, 20, 21, 22, 25 and 30.	Soprano pipistrelle Common pipistrelle	24	Low
24	South Queensferry	Sheltered disused railway line lined with trees and bordered with scrub and small pockets of woodland. Provides linear feature connecting (east - west) habitats in Dalmeny Estate, Dalmeny village, Dolphington Burn Wood and Dundas Estate.	Soprano pipistrelle Common pipistrelle	65	High

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Commuting Route (CR)	Location	Commuting Route Habitat Description	Species Present	Average Number of Bat Passes	Level of Activity
25	Dundas	Formed by the inner boundary of the Echline Strip (mixed plantation woodland). Connectivity provided between the woodland and the arable fields in the Dundas Estate by extended strips of woodland and field boundaries that link in directly with CR 27.	Soprano pipistrelle <i>Myotis</i> sp.	37	Moderate
26	Dundas	Formed from field borders consisting of hedgerows, fence lines and stone walls. All provide connectivity to Dundas Estate and from Dundas Estate to Duddingston woodland.	Soprano pipistrelle Common pipistrelle <i>Myotis</i> sp.	59	High
27	Dundas	Tree-lined track with associated continuous hedgerow and occasional mature standard trees. This CR runs east - west through the north of Dundas Estate and links Dundas Home Farm and Dundas Mains and habitats in between. Connectivity provided within Dundas Estate and also areas such as Milton, Dolphington and CR 22, 24, 25 and 26.	Soprano pipistrelle Common pipistrelle <i>Myotis</i> sp.	92	High
28	Dundas	Formed from field borders consisting of hedgerows, fence lines and stone walls. All provide connectivity to Dundas Estate and from Dundas Estate to Duddingston woodland.	Soprano pipistrelle Common pipistrelle <i>Myotis</i> sp.	76	High
29	Dundas	Formed from field borders consisting of hedgerows, fence lines and stone walls. All provide connectivity to Dundas Estate and from Dundas Estate to Duddingston woodland.	Soprano pipistrelle Common pipistrelle <i>Myotis</i> sp.	143	High
30	Dundas	Formed from field borders consisting of hedgerows, fence lines and stone walls. All provide connectivity to Dundas Estate and from Dundas Estate to Duddingston woodland.	Soprano pipistrelle Common pipistrelle <i>Myotis</i> sp.	14	Low
31	Dundas/Carmelhill	Field boundary and woodland edge habitat running north - south between Dundas Estate and Carmelhill Wood. Provides connectivity directly between two large areas of excellent bat foraging and roosting habitat, and with commuting routes 30, 32, 34 and 35.	Soprano pipistrelle Common pipistrelle Daubenton's	51	High
32	Dundas/Carmelhill	Field boundary running to the south of Dundas Estate. It forms a border between arable land (marshy area and ponds present) and links in with the mature woodland in Dundas Estate.	Soprano pipistrelle Common pipistrelle <i>Myotis</i> sp.	52	High
33	Swineburn along the Union Canal	Field boundaries with hedgerows, with a fishery and mature woodland situated to the north of the route. Swineburn Wood and suburban area of Winchburgh provide good roosting and foraging habitat while linear features such as road, canal and hedgerows along the field boundary provide good foraging habitat on either side.	Soprano pipistrelle Common pipistrelle <i>Myotis</i> sp.	15	Low
34	Swineburn	Continuous hedgerow-bordered main road running between Swineburn Wood and Carmelhill Wood. Bordered by arable fields and woodland areas the road connects habitats including (east to west) Humber Quarry pond, Carmelhill Wood, Swineburn Wood and Muiriehall Wood, and indirectly with habitats at Humber to the east, the Union Canal to the south and minor road at White Gate (CR 18) to the north.	Soprano pipistrelle Common pipistrelle <i>Myotis</i> sp.	96	High

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Commuting Route (CR)	Location	Commuting Route Habitat Description	Species Present	Average Number of Bat Passes	Level of Activity
35	Humbie	Main road bordered with hedgerows running east - west through the Humbie Estate. Provides connectivity with roosting habitat at Humbie Farm and foraging habitat at Carmelhill Wood and Dundas Estate and CR 31. Bordered by arable and improved grassland.	Soprano pipistrelle Common pipistrelle <i>Myotis</i> sp.	145	High
36	Swineburn	Swine Burn forms CR 36 and runs parallel to CR 34, and enters Swineburn Wood via a culvert under the M9, past Hopetoun Fisheries Pond, into the woodland and into Humbie Reservoir. It forms an extended continuous linear feature in the landscape and provides connectivity between Swineburn Wood, Muiriehall Wood, Carmelhill Wood, Humbie Quarry and Kirkliston.	Soprano pipistrelle Common pipistrelle <i>Myotis</i> sp.	61	High
37	Swineburn (railway)	Formed by the main line railway and associated verge habitat located to the south of Swineburn Wood. Provides linear feature connecting habitats over large area including (east to west) Dalmeny Estate, Dundas Estate, Kirkliston, Humbie, Carmelhill Wood, Muiriehall Wood, Swineburn Wood and Priestinch Wood and also links with CR 38.	Soprano pipistrelle Common pipistrelle <i>Myotis</i> sp.	11	Low
38	B9080 between Winchburgh Kirkliston	The B9080 road and associated hedgerow habitat forms the basis of CR 38 and provides a linear feature between Kirkliston and Winchburgh via Humbie, Carmelhill and Swineburn	Soprano pipistrelle Common pipistrelle	5	Low
39	B road between Ross's Plantation Lindsay's Craigs	Formed by the road between Ross's Plantation and Lindsay's Craigs. It is bordered by arable land with hedgerows and walls forming the field boundaries. Niddy Burn runs to the south of Lindsay's Craigs. Provides connectivity between the two woodland areas and with Kirkliston and Humbie.	Soprano pipistrelle Common pipistrelle	7	Low



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Table 3.10: Relative Importance of Bat Commuting Routes

Commuting Route Number/ Location	Species Value	Value to Number of Bats	Distance from Roost/Potential Roosts	Complexity of Linear features	Total Score
1	1	1	1	2	5
2	-	-	-	-	-
3	-	-	-	-	-
4	1	1	1	2	5
5	1	5	5	3	14
6	1	1	5	5	12
7	1	1	4	5	11
8	-	-	-	-	-
9	-	-	-	-	-
10(a,b,c)	1	4	5	5	15
	1	1	5	5	12
	1	1	5	5	12
11	1	1	5	3	10
12	2	1	5	4	12
13	2	4	5	4	16
14	1	1	4	3	10
15	1	1	4	3	10
16	2	1	3	3	11
17	2	3	5	4	14
18	2	2	4	3	11
19	1	1	3	3	8

Commuting Route Number/ Location	Species Value	Value to Number of Bats	Distance from Roost/Potential Roosts	Complexity of Linear features	Total Score
20	1	1	3	3	8
21	1	1	4	3	9
22	2	4	5	5	16
23	1	2	5	5	13
24	1	3	5	5	14
25	1	2	5	5	13
26	2	2	5	5	14
27	2	3	5	5	15
28	2	3	3	3	11
29	2	4	5	3	14
30	2	1	3	3	9
31	2	2	3	4	11
32	2	2	2	3	9
33	2	1	5	3	11
34	2	3	5	3	13
35	1	4	5	3	13
36	2	3	5	5	15
37	2	1	4	3	10
38	1	1	2	3	7
39	1	1	4	3	9

## **Forth Replacement Crossing**

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#### **3.4 Autumn and Winter Bat Survey Results**

- 3.4.1 The criteria used for assessing the level of activity for the purposes of this investigation are: <25 bats = low activity; 25-50 bats = moderate activity and >50 bats = high activity. It is expected that levels of bat activity at swarming sites would be higher than those recorded during summer activity surveys due to larger number of bats present during swarming.
- 3.4.2 Bat detectors were deployed at nine features in autumn 2008. No evidence of swarming activity was recorded during these surveys (Table 3.11).
- 3.4.3 Bat activity surveys were undertaken at four features in autumn 2008. No evidence of swarming bats was observed during these surveys (Table 3.12).
- 3.4.4 It is therefore concluded that none of the features within the study area which were assessed for swarming potential are used for swarming by bats.
- 3.4.5 Hibernaculum surveys were undertaken at six features over the winter. No bat passes were recorded on any of the days of survey or on any of the visits, and no bats were observed to be hibernating inside any of the structures, despite a thorough search. It is possible that bats roosting deep inside crevices were not recorded, however no bat activity was recorded on static bat detectors, even during relatively mild conditions in December 2008 and January 2009. The survey effort employed precluded identification of hibernacula in trees and buildings.

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**Table 3.11: Results of Autumn AnaBat Detector Surveys**

Feature	Dates of Survey and Weather Conditions	GPS	Species/Total Number of Bat Passes	Level of Activity	Summary
Port Edgar Bunker	13/10/08 - 15/10/08 Dry - light rain, light winds, approximately 10°C.	NT 11536 78739	Soprano pipistrelle	Low	Low levels of pipistrelle activity between 1 - 4 hours after sunset. No evidence of swarming.
Dundas Dovecot	27/10/08 - 30/10/08 Dry, calm, between 5-10°C.	NT 11482 76768	Daubenton's bat (1)	Low	Single bat pass approximately 4 hours after sunset. No evidence of swarming.
Dundas Ice house	27/10/08 - 30/10/08 Dry, calm, between 5-10°C.	NT 11548 76348	Daubenton's bat	Low	Single bat pass detected around 4 hours after sunset. No evidence of swarming.
Dundas Quarry	06/10/08 - 08/10/08 Dry - light rain, calm - light wind, between 5-10°C.	NT 11305 76473	None detected	None	No evidence of swarming.
Swineburn Culvert	06/10/08 - 08/10/08 Dry - light rain, calm - light wind, between 5-10°C.	NT 10834 75336	Daubenton's bat (22)	Low	Bat activity concentrated around 5-6 hours after sunset. Low number of passes indicates site is unlikely to be used for swarming. Feature may be used as a roost.
Humbie Dovecot	06/10/08 - 08/10/08 Dry - light rain, calm - light wind, between 5-10°C.	NT 11528 75628	Soprano pipistrelle (26)	Moderate	Moderate pipistrelle activity indicates that feature provides foraging opportunities. No evidence of swarming.
Humbie Quarry	06/10/08 - 08/10/08 Dry - light rain, calm - light wind, between 5-10°C.	NT 10937 75692	Daubenton's bat (133) Soprano pipistrelle (39) and Common pipistrelle (3)	High	High levels of activity throughout the night indicate that area is suitable for foraging. No evidence of swarming confirmed.
Lindsay's Craigs Ice House	21/10/08 - 23/10/08 Dry, light - moderate wind, approximately 10°C.	NT 11636 74200	None detected	None	No evidence of bats using feature.
Charles's Bridge	21/10/08 - 23/10/08 Dry, light - moderate wind, approximately 10°C.	NT 10670 74667	None detected	None	No evidence of bats using feature.

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**Table 3.12: Results of Autumn Bat Activity Surveys**

Location	Dates of Survey and Weather Conditions	Grid Reference	Activity	Species/Total Number of Passes	Level of Activity	Summary
Fairy Kirk Quarry	16/10/8 Dry, light wind, 10°C, 40% cloud cover.	NT 12450 83178	None	None observed	None	No activity recorded. No evidence of swarming.
Dundas Quarry	6/10/08 Dry with occasional light rain, calm, 9°C, 85% cloud cover.	NT 11305 76473	Commuting, Foraging and Social calls	Common pipistrelle (1) Soprano pipistrelle (1)	Low	Activity limited to foraging pipistrelle species around woodland areas. No evidence of swarming.
Humbie Quarry	21/10/08 Dry, light wind, 11°C, 60% cloud cover	NT 10928 756 85	Commuting, Foraging and Social calls	Daubenton's bat (11) Soprano pipistrelle (11) Common pipistrelle (1)	Low	Activity limited to foraging over the reservoir and along woodland edges. No evidence of swarming.
Lindsay's Craigs Ice House	7/10/08 Dry, light wind, 6°C, 25% cloud cover	NT 11564 74179	Foraging	Soprano pipistrelle (3)	Low	Activity limited and restricted to soprano pipistrelle (not known to be a swarming species) around woodland and edge habitats. No evidence of swarming.

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## 4 Terrestrial Breeding Birds

### 4.1 Introduction

4.1.1 Baseline information with respect to estuarine birds is presented in Chapter 11 (Estuarine Ecology).

### 4.2 Consultation Information

4.2.1 SNH and the Royal Society for the Protection of Birds (RSPB) did not identify any existing records of terrestrial birds within the study area.

### 4.3 Incidental Observations

4.3.1 An adult and a juvenile barn owl (*Tyto alba*) Wildlife and Countryside Act (WCA)1i (as amended), Joint Nature Conservation Committee (JNCC) Amber List, Local Biodiversity Action Plan (LBAP) were recorded at Duddingston Farm, which lies at the southwestern corner of quadrat S9. Twelve grey partridge (*Perdix perdix*) were recorded in fields comprising quadrats S8 and S9 during the other ecological surveys JNCC Red List, UK Biodiversity Action Plan (UKBAP) and LBAP. In addition, a single green sandpiper (*Tringa ochropus*) was recorded at the west end of Dundas Loch (quadrat S4) during the first survey visit. This species was most likely a wintering visitor and is not considered a breeding species.

### 4.4 Previous Survey Information

4.4.1 St. Margaret's Marsh SSSI is situated to the north of the Firth of Forth immediately west of the proposed alignment. The site comprises a mosaic of coastal reed bed habitat with smaller areas of saltmarsh, scrub and tall ruderal vegetation, comprising a total area of 24.01ha.

4.4.2 The breeding bird survey of St. Margaret's Marsh SSSI undertaken by Jacobs et al. (2007b) recorded 138 breeding bird territories of 21 species within the boundary of the SSSI. Table 4.1 shows the species recorder together with the respective number of territories held by each species.

4.4.3 SNH's 'Management Strategy for St. Margaret's Marsh SSSI 1998/9 - 2002/3' notes five to ten pairs of water rail (*Rallus aquaticus*) (0.34%-1.4% of UK breeding population) recorded within the last ten years. A pair of marsh harriers (*Circus aeruginosus*) held a territory within the SSSI boundary in 1995 but were not recorded in subsequent years.

### 4.5 Survey of Terrestrial Breeding Birds

4.5.1 The quadrats have been grouped into tables according to their location in relation to the three main areas of works: Ferrytoll Junction, Queensferry Junction and M9 Junction 1A.

4.5.2 Survey results, including population estimates, are presented in Tables 4.1 to 4.4.

4.5.3 A total of 71 breeding bird species were recorded throughout the 14 quadrats during the bird surveys, of which: none were WCA1i species;

- eight were JNCC Red List Species (bullfinch (*Pyrrhula pyrrhula*), grasshopper warbler (*Locustella naevia*), house sparrow (*Passer domesticus*), linnet (*Carduelis cannabina*), reed bunting (*Emberiza schoeniclus*), skylark (*Alauda arvensis*), song thrush (*Turdus philomelos*), starling (*Sturnus vulgaris*));
- twenty-four were JNCC Amber List species (black-headed gull (*Larus ridibundus*), cormorant (*Phalacrocorax carbo*), curlew (*Numenius arquata*), dunnoek (*Prunella modularis*), eider (*Somateria mollissima*), fulmar (*Fulmarus glacialis*), gadwall (*Anas strepera*), goldcrest

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(*Regulus regulus*), green woodpecker (*Picus viridis*), greylag goose (*Anser anser*), herring gull (*Larus argentatus*), house martin (*Delichon urbica*), kestrel (*Falco tinnunculus*), lapwing (*Vanellus vanellus*), lesser black-backed gull (*Larus fuscus*), meadow pipit (*Anthus pratensis*), mute swan (*Cygnus olor*), oystercatcher (*Haematopus ostralegus*), sand martin (*Riparia riparia*), shelduck (*Tadorna tadorna*), stock dove (*Columba oenas*), swallow (*Hirundo rustica*), willow warbler (*Phylloscopus trochilus*), yellowhammer (*Emberiza citronella*);

- eleven were UKBAP Species (bullfinch, grasshopper warbler, starling, curlew, dunnoek, herring gull, house sparrow, lapwing, reed bunting, song thrush, yellowhammer);
- eight were Fife LBAP Species (skylark, linnet, reed bunting, bullfinch, song thrush, house martin, lapwing and sand martin);
- eleven were Edinburgh Biodiversity Partnership Species (skylark, linnet, reed bunting, bullfinch, song thrush, swift (*Apus apus*), great spotted woodpecker (*Dendrocopos major*), yellowhammer, sand martin, common tern (*Sterna hirundo*), lapwing); and
- five were West Lothian LBAP Species skylark, reed bunting, grey partridge, bullfinch and song thrush.

**Table 4.1: Breeding Bird Survey of St. Margaret's Marsh SSSI (Jacobs et al. 2007)**

Species	Number of Territories
Blackbird ( <i>Turdus merula</i> )	12
Blackcap ( <i>Sylvia atricapilla</i> )	2
Blue tit ( <i>Parus caeruleus</i> )	10
Chaffinch ( <i>Fringilla coelebs</i> )	5
Dunnoek	9
Garden Warbler ( <i>Sylvia borin</i> )	1
Goldcrest	2
Great tit ( <i>Parus major</i> )	5
Greenfinch ( <i>Carduelis chloris</i> )	3
Linnet	1
Long-tailed tit ( <i>Aegithalos caudatus</i> )	1
Magpie ( <i>Pica pica</i> )	1
Pied wagtail ( <i>Pied Wagtail</i> )	1
Reed bunting	9
Robin ( <i>Erithacus rubecula</i> )	6
Sedge warbler ( <i>Acrocephalus schoenobaenus</i> )	27
Song thrush	6
Whitethroat ( <i>Sylvia communis</i> )	9
Willow warbler	17
Wood pigeon ( <i>Columba palumbus</i> )	7
Wren ( <i>Troglodytes troglodytes</i> )	21

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Table 4.2: Estimated Populations of Terrestrial Breeding Birds within Quadrats N1 - N3 (Ferrytoll Junction)

Species	N1	N2	N3
Blackbird	9	3	27
Blackcap	0	5	1
Black-headed gull	0	10	5
Blue tit	14	20	36
Bullfinch	0	0	1
Buzzard ( <i>Buteo buteo</i> )	0	7	1
Carrion crow ( <i>Corvus corone</i> )	10	4	14
Chaffinch	15	31	21
Collared dove ( <i>Streptopelia decaocto</i> )	0	0	1
Coot ( <i>Fulica atra</i> )	0	3	0
Cormorant	0	3	1
Curlew	0	0	1
Dunnock	1	3	7
Eider	0	5	17
Goldfinch ( <i>Carduelis carduelis</i> )	1	10	3
Great black-backed gull ( <i>Larus marinus</i> )	0	4	0
Great tit	8	12	29
Green woodpecker	4	0	0
Greenfinch	5	5	15
Grey heron ( <i>Ardea cinerea</i> )	0	0	2
Herring gull	0	20	16
House sparrow	0	0	28
Jackdaw ( <i>Corvus monedula</i> )	10	8	2
Kestrel	0	3	1
Lapwing	0	1	0
Lesser black-backed gull	2	3	1
Lesser whitethroat ( <i>Sylvia curruca</i> )	0	0	1

Species	N1	N2	N3
Linnet	11	10	3
Long-tailed tit	0	15	0
Magpie	1	5	13
Mallard ( <i>Anas platyrhynchos</i> )	2	4	0
Meadow pipit	1	0	0
Moorhen ( <i>Gallinula chloropus</i> )	0	1	0
Mute swan	0	3	0
Oystercatcher	0	1	4
Pheasant ( <i>Phasianus colchicus</i> )	0	5	0
Raven ( <i>Corvus corax</i> )	1	0	0
Red-breasted merganser ( <i>Mergus serrator</i> )	0	15	2
Reed bunting	0	5	0
Robin	5	8	15
Rook ( <i>Corvus frugilegus</i> )	0	2	0
Shelduck	0	0	1
Song thrush	3	3	3
Starling	0	0	21
Stock dove	3	4	0
Swallow	2	3	4
Swift	0	10	0
Treecreeper ( <i>Certhia familiaris</i> )	1	0	0
Whitethroat	0	5	1
Willow warbler	0	8	0
Wood pigeon	14	20	45
Wren	7	23	17

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Table 4.3: Estimated Populations of Terrestrial Birds within Quadrats S1 - S6 (Queensferry Junction)

Species	S1	S2	S3	S4	S5	S6
Blackbird	6	1	9	7	17	1
Blackcap	0	0	2	0	0	0
Black-headed gull	7	22	0	0	0	0
Blue tit	8	1	25	5	16	1
Bullfinch	0	2	0	0	0	0
Buzzard	0	0	2	0	2	0
Carrion crow	0	2	12	3	3	2
Chaffinch	9	9	18	11	24	9
Chiffchaff ( <i>Phylloscopus collybita</i> )	0	19	2	1	1	0
Coal tit ( <i>Parus ater</i> )	0	3	0	0	1	0
Collared dove	0	7	0	0	0	0
Cormorant	4	0	0	0	0	0
Duncock	0	5	0	7	0	0
Eider	11	22	0	0	0	0
Feral pigeon ( <i>Columba livia (domest.)</i> )	0	15	0	0	0	0
Goldcrest	0	0	0	0	1	0
Goldfinch	0	0	10	1	5	7
Great spotted woodpecker	0	0	2	0	3	0
Great tit	0	7	16	10	14	1
Green woodpecker	0	0	3	0	1	0
Greenfinch	0	5	1	0	0	0
Herring gull	11	0	0	0	10	0

Species	S1	S2	S3	S4	S5	S6
House martin	0	1	0	0	0	0
House sparrow	0	83	0	9	1	3
Jackdaw	0	7	0	0	0	0
Lesser black-backed gull	0	22	3	0	2	0
Long-tailed tit	0	0	5	0	0	0
Magpie	0	4	5	0	0	1
Oystercatcher	14	0	0	0	0	0
Pheasant	0	0	15	2	3	0
Pied wagtail	0	1	0	0	0	0
Raven	0	0	3	0	0	0
Robin	3	1	5	2	6	1
Shelduck	14	22	0	0	0	0
Skylark	0	0	0	9	0	2
Song thrush	0	5	3	1	3	0
Starling	0	20	3	0	0	0
Stock dove	5	0	0	0	0	0
Swallow	2	1	0	0	0	0
Whitethroat	0	0	2	2	0	0
Willow warbler	0	2	2	0	4	0
Wood pigeon	0	7	32	1	36	1
Wren	5	7	7	8	18	4
Yellowhammer	0	0	3	0	2	2



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Table 4.4: Estimated Populations of Terrestrial Birds within Quadrats S7 - S11 (M9 Junction 1A)

Species	S7	S8	S9	S10	S11
Blackbird	11	14	14	9	11
Blackcap	12	0	3	0	0
Black-headed gull	9	0	0	0	0
Blue tit	8	4	18	5	23
Bullfinch	5	0	0	0	2
Buzzard	3	0	4	4	2
Carrion crow	0	0	1	2	2
Chaffinch	24	6	18	28	17
Chiffchaff	0	0	16	5	2
Coal tit	0	0	4	0	0
Coot	10	0	0	0	0
Dipper ( <i>Cinclus cinclus</i> )	0	0	0	0	1
Duncock	5	2	5	5	1
Gadwall	10	0	0	0	0
Goldcrest	0	0	3	0	0
Goldfinch	5	4	6	13	4
Grasshopper warbler	0	0	0	0	1
Great tit	15	5	17	7	9
Greenfinch	0	5	5	0	0
Grey heron	3	0	0	0	0
Greylag goose	0	6	0	0	0
House martin	0	0	0	33	0
House sparrow	6	14	0	0	0
Jay ( <i>Garrulus glandarius</i> )	0	0	3	0	0
Kestrel	0	3	0	0	0
Lapwing	0	6	0	0	0
Linnet	14	2	0	0	0

Species	S7	S8	S9	S10	S11
Little grebe ( <i>Tachybaptus ruficollis</i> )	8	0	0	0	0
Long-tailed tit	0	0	0	4	0
Magpie	0	0	4	2	0
Mallard	9	1	2	2	11
Moorhen	5	0	0	0	6
Mute swan	7	0	0	0	2
Oystercatcher	3	0	0	2	0
Pheasant	3	6	9	4	0
Pied wagtail	0	3	2	0	0
Robin	0	1	6	42	12
Sand martin	0	0	69	0	0
Sedge warbler	2	0	0	0	0
Skylark	3	9	23	30	0
Song thrush	0	0	3	5	6
Starling	0	1	0	0	0
Swallow	3	15	12	6	0
Treecreeper	0	0	3	0	0
Tufted duck ( <i>Aythya fuligula</i> )	5	0	0	0	0
Whitethroat	7	1	1	3	4
Willow warbler	4	0	15	5	2
Wood pigeon	2	5	12	2	6
Wren	22	7	27	17	27
Yellowhammer	10	2	6	4	0

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## 5 Terrestrial Wintering Birds

### 5.1 Survey of Terrestrial Wintering Birds

5.1.1 The survey quadrats have been grouped into tables according to their location in relation to the three main areas of works: Ferrytoll Junction, Queensferry Junction and M9 Junction 1A.

5.1.2 Survey results are presented in Tables 5.1 to 5.3.

5.1.3 A total of 65 species were recorded overwintering throughout the 14 quadrats during the bird surveys, of which:

- one was an Annex 1 species (greylag goose);
- three were WCA1i species; (redwing (*Turdus iliacus*), fieldfare (*Turdus pilaris*) and greylag goose);
- nine were JNCC Red List species (bullfinch, house sparrow, linnet, reed bunting, skylark, song thrush, starling, yellowhammer and grey partridge);
- twenty-one were JNCC Amber List species (black-headed gull, cormorant, curlew, dunnoek, goldcrest, greylag goose, herring gull, kestrel, lapwing, lesser black-backed gull, meadow pipit, mute swan, oystercatcher, stock dove, mistle thrush (*Turdus viscivorus*), redshank (*Tringa tetanus*), redwing, common snipe (*Gallinago gallinago*), teal (*Anas crecca*), pink-footed goose (*Anser brachyrhynchus*) and water rail);
- twelve were UKBAP species (bullfinch, starling, curlew, dunnoek, herring gull, house sparrow, lapwing, reed bunting, song thrush, yellowhammer, grey partridge and starling);
- eight were Fife LBAP species (skylark, linnet, reed bunting, bullfinch, common snipe, redshank, song thrush and lapwing);
- nine were Edinburgh Biodiversity Partnership Species (skylark, linnet, reed bunting, bullfinch, song thrush, grey partridge, great spotted woodpecker, yellowhammer and lapwing); and
- five were West Lothian Strategic BAP species (skylark, reed bunting, grey partridge, common snipe, redshank, bullfinch and song thrush).

**Table 5.1: Status, frequency and maximum count of terrestrial wintering bird species recorded within Quadrats N1 - N3 (Ferrytoll Junction). (Key: ev = early/first survey, lv = late/second survey)**

Species Present	Quadrats					
	N1		N2		N3	
	Frequency	Max. count	Frequency	Max. count	Frequency	Max. count
Blackbird	II	18 (ev)	II	5 (ev)	I	17 (ev)
Black-headed gull	I	30 (ev)	-	0	-	0
Blue tit	II	16 (lv)	II	1 (ev, lv)	II	16 (ev)
Buzzard	II	2 (lv)	II	1 (ev, lv)	II	6 (lv)
Bullfinch	-	0	-	0	II	3 (ev)
Carrion crow	II	24 (ev)	II	18 (ev)	II	5 (ev)
Chaffinch	II	5 (lv)	II	6 (lv)	II	9 (ev)
Coal tit	I	3 (ev)	-	0	I	5 (ev)
Curlew	I	9 (ev)	-	0	-	0
Dunnoek	I	3 (ev)	II	2 (lv)	I	2 (ev)
Feral pigeon	I	35 (ev)	-	0	-	0
Goldcrest	-	0	I	1 (lv)	-	0

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Species Present	Quadrats					
	N1		N2		N3	
	Frequency	Max. count	Frequency	Max. count	Frequency	Max. count
Goldfinch	II	8 (lv)	I	7 (lv)	II	15 (ev)
Great-spotted woodpecker	I	2 (lv)	I	1 (ev)	I	1 (ev)
Great tit	II	39 (lv)	I	4 (lv)	II	13 (ev)
Greenfinch	II	3 (ev)	-	0	II	3 (lv)
Greylag goose	-	0	I	100 (lv)	-	0
Grey Heron	-	0	I	1 (lv)	-	0
Herring gull	I	3 (ev)	-	0	-	0
House sparrow	I	8 (ev)	-	0	I	18 (ev)
Jackdaw	I	15 (lv)	-	0	-	0
Kestrel	I	1 (ev)	-	0	-	0
Linnet	I	2 (lv)	-	0	-	0
Long-tailed tit	I	1 (ev)	I	3 (lv)	-	0
Magpie	I	6 (ev)	II	2 (lv)	II	7 (lv)
Oystercatcher	I	12 (ev)	-	0	-	0
Pied Wagtail	I	1 (ev)	-	0	-	0
Pheasant	I	3 (ev)	I	1 (lv)	-	0
Pink-footed goose	-	0	I	100 (lv)	-	0
Redshank	I	2 (ev)	-	0	-	0
Reed bunting	-	0	I	3 (lv)	-	0
Robin	II	21 (lv)	II	4 (ev)	II	3 (ev, lv)
Rook	-	0	I	25 (ev)	-	0
Snipe	-	0	I	2 (ev)	-	0
Song thrush	II	3 (ev)	I	1 (lv)	I	1 (ev)
Sparrowhawk ( <i>Accipiter nisus</i> )	I	1 (ev)	-	0	I	1 (ev)
Tree Creeper	I	3 (lv)	-	0	-	0
Water rail	-	0	I	1 (lv)	-	0
Wood pigeon	II	8 (lv)	II	4 (lv)	II	13 (ev)
Wren	I	6 (ev)	II	6 (ev, lv)	II	10 (ev)
Yellowhammer	-	0	I	1 (lv)	-	0
Total = 41	31		25		19	

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**Table 5.2: Status, frequency and maximum count of terrestrial wintering bird species recorded within Quadrats S5 S6, S7, S8, S9, S10 and S11 (Queensferry Junction). (Key: ev = early/first survey, lv = late/second survey)**

Species Present	Quadrats													
	S1		S2		S3		S4		S5		S6		S7	
	Frequency	Max. Count	Frequency	Max. Count	Frequency	Max. Count	Frequency	Max. Count	Frequency	Max. Count	Frequency	Max. Count	Frequency	Max. Count
Blackbird	II	16 (ev)	II	18 (lv)	I	19 (ev)	II	7 (lv)	I	2 (ev)	II	8 (ev)	II	8 (ev)
Blue tit		7 (ev)	II	8 (ev)	I	13 (ev)	II	8 (lv)	I	2 (ev)	II	9 (ev)	II	7 (lv)
Buzzard	II	1 (ev, lv)	II	4 (lv)	II	3 (ev)	II	3 (ev)	I	1 (lv)	-	0	I	3 (lv)
Bullfinch	-	0	I	4 (ev)	I	4 (ev)	-	0	-	0	I	1 (ev)	-	0
Carrion crow	I	10 (ev)	II	6 (ev)	II	7 (ev)	II	6 (ev)	I	4 (lv)	-	0	II	4 (ev)
Chaffinch	I	12 (ev)	II	42 (ev)	I	44 (ev)	II	24 (lv)	II	1 (ev, lv)	II	7 (lv)	II	7 (lv)
Coal tit	I	2 (lv)	-	0	I	4 (ev)	II	2 (ev, lv)	-	0	-	0	-	0
Collared dove	-	0	I	1 (lv)	-	0	-	0	-	0	I	2 (lv)	-	0
Coot	I	11 (lv)	-	0	-	0	-	0	-	0	-	0	-	0
Cormorant	I	1 (ev)	-	0	-	0	-	0	-	0	-	0	-	0
Dunnock	I	1 (ev)	I	4 (ev)	I	4 (ev)	I	4 (ev, lv)	I	1 (ev)	II	8 (ev)	I	1 (lv)
Fieldfare	I	15 (ev)	-	0	I	1 (lv)	-	0	I	75 (ev)	-	0	-	0
Goldcrest	II	4 (ev)	-	0	I	9 (ev)	I	4 (ev)	-	0	I	1 (ev)	I	1 (ev)
Goldfinch	II	3 (ev)	I	5 (ev)	I	7 (ev)	I	5 (lv)	II	19 (ev)	-	0	I	7 (ev)
Great-spotted woodpecker	I	1 (ev)	I	1 (ev)	-	0	I	1 (lv)	-	0	-	0	I	1 (lv)
Great tit	II	5 (ev)	II	10 (ev)	II	4 (lv)	I	4 (lv)	I	2 (ev)	II	5 (ev,lv)	I	5 (lv)
Greenfinch	-	0	-	0	I	3 (ev)	-	0	-	0	II	5 (lv)	II	3 (lv)
Grey partridge	-	0	-	0	-	0	-	0	I	8 (lv)	-	0	-	0
Greylag goose	-	0	-	0	-	0	-	0	I	19 (lv)	-	0	-	0
Grey Heron	I	2 (lv)	-	0	-	0	-	0	-	0	-	0	-	0
Herring gull	-	0	-	0	-	0	I	1 (ev)	-	0	I	2 (lv)	-	0
House sparrow	-	0	I	3 (ev)	-	0	-	0	-	0	I	13 (ev)	I	2 (ev)

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Species Present	Quadrats													
	S1		S2		S3		S4		S5		S6		S7	
	Frequency	Max. Count	Frequency	Max. Count	Frequency	Max. Count	Frequency	Max. Count	Frequency	Max. Count	Frequency	Max. Count	Frequency	Max. Count
Jackdaw	-	0	I	3 (ev)	-	0	I	5 (lv)	I	20 (lv)	I	1 (ev)	I	2 (ev)
Jay	-	0	-	0	I	2 (ev)	-	0	-	0	-	0	-	0
Kestrel	-	0	-	0	-	0	-	0	I	2 (lv)	-	0	-	0
Little grebe	II	4 (lv)	-	0	-	0	-	0	-	0	-	0	-	0
Linnet	I	15 (ev)	-	0	-	0	I	20 (lv)	I	5 (ev)	-	0	-	0
Long-tailed tit	-	0	I	6 (ev)	II	12 (ef)	I	4 (lv)		0	I	5 (ev)	I	4 (ev)
Maggie	I	2 (ev)	I	3 (ev)	I	2 (ev)	I	2 (ev)	I	4 (ev)	II	10 (lv)	I	5 (lv)
Mallard	I	8 (lv)	-	0	-	0	-	0	-	0	-	0	-	0
Mistle thrush	-	0	I	1 (lv)	I	9 (ev)	-	0	-	0	-	0	I	1 (lv)
Moorhen		2 (lv)	-	0	-	0	-	0	-	0	-	0	-	0
Mute swan	II	3 (lv)	-	0	-	0	-	0	-	0	-	0	-	0
Pied Wagtail	-	0	I	1 (ev)	-	0	-	0	-	0	-	0	-	0
Pheasant	I	4 (lv)	I	7 (ev)	I	18 (lv)	II	19 (ev)	I	3 (ev)	-	0	-	0
Red-legged partridge ( <i>Alectoris rufa</i> )	I	2 (lv)	-	0		0	-	0	-	0	-	0	-	0
Redshank	I	4 (ev)	-	0	-	0	-	0	-	0	-	0	-	0
Redwing	I	25 (ev)	II	7 (lv)	I	16 (lv)	I	5 (lv)	-	0	I	12 (lv)	-	0
Reed bunting	-	0	-	0	-	0	II	1 (ev,lv)	-	0	-	0	-	0
Robin	II	4 (lv)	II	7 (lv)	I	9 (ev)	II	7 (ev)	I	2 (ev)	II	6 (ev)	I	3 (ev)
Rook	-	0	-	0	-	0	-	0	-	0	I	4 (lv)	I	3 (lv)
Siskin ( <i>Carduelis spinus</i> )	-	0	-	0	I	1 (lv)	-	0	-	0	I	1 (lv)	-	0
Skylark	-	0	-	0	-	0	I	3 (lv)	-	0	-	0	-	0
Snipe	I	1 (lv)	-	0	-	0	-	0	-	0	-	0	-	0
Song thrush	I	1 (lv)	-	0	I	3 (lv)	I	1 (lv)	I	1 (ev)	I	2 (lv)	I	1 (ev)

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Species Present	Quadrats													
	S1		S2		S3		S4		S5		S6		S7	
	Frequency	Max. Count	Frequency	Max. Count	Frequency	Max. Count	Frequency	Max. Count	Frequency	Max. Count	Frequency	Max. Count	Frequency	Max. Count
Sparrowhawk	I	1 (lv)	-	0	I	1 (ev)	-	0	-	0	-	0	-	0
Starling	-	0	I	6 (ev)	I	2 (ev)	-	0	-	0	II	12 (lv)	-	0
Stock dove	-	0	-	0	-	0	-	0	I	1 (lv)	-	0	-	0
Teal	I	34 (lv)	-	0	-	0	-	0	-	0	-	0	-	0
Tree Creeper	I	1 (lv)	I	1 (ev)	I	3 (ev)	II	2 (ev, lv)	-	0	I	2 (ev)	I	7 (ev)
Tufted duck	I	2 (lv)	-	0	-	0	-	0	-	0	-	0	-	0
Waxwing ( <i>Bombycilla garrulous</i> )	I	14 (ev)	-	0	-	0	I	5 (lv)	-	0	I	5 (lv)	-	0
Wood pigeon	I	24 (lv)	II	130 (ev)	I	c. 400 (ev, lv)	II	c.300 (lv)	I	c.505 (ev)	I	6 (lv)	I	1 (lv)
Wren	I	6 (ev)	II	3 (ev)	II	4 (ev)	II	4 (lv)	I	2 (ev)	II	2 (lv)	II	6 (ev)
Yellowhammer	I	1 (lv)	-	0	-	0	I	3 (lv)	-	0	-	0	-	0
Total = 55	36		24		27		27		21		24		22	

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**Table 5.3: Status, frequency and maximum count of terrestrial wintering bird species recorded within Quadrats S1, S2, S3 and S5 (M9 Junction 1A). (Key: ev = early/first survey, lv = late/second survey)**

Species Present	Quadrats							
	S8		S9		S10		S11	
	Frequency	Max. Count	Frequency	Max.Count	Frequency	Max. Count	Frequency	Max. Count
Blackbird	II	9 (ev)	I	1 (ev)	II	6 (lv)	II	7 (ev)
Black-headed gull	I	7 (lv)	I	c.350 (lv)	II	33 (ev)	-	0
Blue tit	II	10 (lv)	I	3 (lv)	II	11 (ev,lv)	II	8 (lv)
Buzzard	II	2 (ev, lv)	II	6 (ev)	II	1 (ev, lv)	I	6 (ev)
Bullfinch	-	0	II	2 (ev, lv)	-	0	I	2 (ev)
Carrion crow	II	6 (lv)	I	28 (lv)	II	7 (lv)	II	11 (ev)
Chaffinch	II	8 (ev)	II	33 (ev)	II	21 (ev)	II	12 (lv)
Coal tit	I	5 (ev)	I	1 (lv)	-	0	II	3 (lv)
Collared dove	I	2 (lv)	I	0	I	1 (lv)	I	1 (ev)
Dunnock	II	2 (ev)	-	0	-	0	I	5 (ev, lv)
Feral pigeon	-	0	-	0	I	20 (lv)	I	0
Goldcrest	I	2 (ev)	I	2 (ev)	II	7 (ev)	I	12 (ev)
Goldfinch	I	5 (lv)	I	29 (ev)		18 (lv)		31 (lv)
Great-spotted woodpecker	-	0	-	0	I	1 (ev)		0
Great tit	I	7 (lv)	I	1 (ev)	I	7 (ev)	I	9 (lv)
Greenfinch	I	2 (lv)	I	8 (ev)	-	0	I	1 (ev)
Grey partridge	-	0	I	2 (lv)	-	0	-	0
Grey Wagtail ( <i>Motcailla cinerea</i> )	-	0	II	2 (ev)	-	0	I	1 (lv)
Greylag goose	-	0	-	0	-	0	I	c.250 (lv)
Grey Heron	-	0	I	1 (lv)	-	0	-	0
Herring gull	I	2 (lv)	I	c. 250 (lv)	II	10 (lv)	-	0
House sparrow	II	8 (lv)	-	0	I	8 (lv)	-	0
Jackdaw	II	24 (lv)	-	0	I	11 (lv)	-	0
Kestrel	-	0	I	1 (ev)	-	0	I	2 (ev)
Lapwing	-	0	-	0	I	3 (ev)	-	0

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Species Present	Quadrats							
	S8		S9		S10		S11	
	Frequency	Max. Count	Frequency	Max.Count	Frequency	Max. Count	Frequency	Max. Count
Lesser black-backed gull	-	0	I	3 (lv)	I	6 (lv)	-	0
Linnet	I	2 (lv)	I	42 (ev)	-	0	-	0
Long-tailed tit	-	0	II	7 (ev)	I	8 (ev)	I	8 (ev)
Magpie	I	3 (ev, lv)	-	0	I	2 (ev, lv)	I	3 (ev)
Mallard	-	0	-	0	II	60 (ev)	-	0
Meadow pipit	-	0	II	1 (ev, lv)	-	0	-	0
Mistle thrush	-	0	I	2 (lv)	-	0	-	0
Moorhen	-	0	-	0	I	1 (lv)	-	0
Mute swan	-	0	-	0	I	2 (ev)	I	2 (lv)
Oystercatcher	I	1 (lv)	-	0	-	0	-	0
Pied Wagtail	I	1 (ev)	I	1 (ev)	II	2 (ev)	I	1 (lv)
Pheasant	-	0	II	20 (lv)	I	1 (ev)	I	11 (ev)
Pink-footed goose	-	0	-	0	-	0	I	c.250 (lv)
Red-legged partridge	-	0	I	3 (ev)	-	0	-	0
Redwing	I	1 (ev)	I	2 (lv)	I	2 (lv)	I	1 (lv)
Reed bunting	-	0	-	0	-	0	I	5 (ev)
Robin	II	12 (lv)	II	3 (ev)	II	9 (lv)	II	8 (ev)
Rook	-	0	I	c. 40 (lv)	I	10 (lv)		0
Song thrush	-	0	-	0	-	0	II	5 (lv)
Sparrowhawk	I	1 (ev)	-	0	-	0	-	0
Starling	I	16 (lv)	I	1 (lv)	II	12 (lv)	-	0
Tree Creeper	I	1 (ev)	-	0	-	0	-	0
Wood pigeon	II	12 (lv)	I	22 (ev)	I	13 (lv)	II	18 (lv)
Wren	I	2 (ev, lv)	I	1 (lv)	II	5 (ev)	II	7 (ev)
Yellowhammer	-	0	I	4 (ev)	-	0	I	26 (lv)
<b>Total = 50</b>	<b>28</b>		<b>32</b>		<b>30</b>		<b>30</b>	



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### Appendix A10.4: Detailed Terrestrial and Freshwater Ecological Baseline Data

Table 5.4: Breeding and Wintering Bird Scientific Names

English Name	Latin Name
Barn owl	<i>Tyto alba</i>
Blackbird	<i>Turdus merula</i>
Blackcap	<i>Sylvia atricapilla</i>
Black-headed gull	<i>Larus ridibundus</i>
Blue tit	<i>Parus caeruleus</i>
Bullfinch	<i>Pyrrhula pyrrhula</i>
Buzzard	<i>Buteo buteo</i>
Carrion crow	<i>Corvus corone</i>
Chaffinch	<i>Fringilla coelebs</i>
Chiffchaff	<i>Phylloscopus collybita</i>
Coal tit	<i>Parus ater</i>
Collared dove	<i>Streptopelia decaocto</i>
Common snipe	<i>Gallinago gallinago</i>
Common tern	<i>Sterna hirundo</i>
Coot	<i>Fulica atra</i>
Cormorant	<i>Phalacrocorax carbo</i>
Curlew	<i>Numenius arquata</i>
Dipper	<i>Cinclus cinclus</i>
Dunnock	<i>Prunella modularis</i>
Eider	<i>Somateria mollissima</i>
Feral pigeon	<i>Columba livia (domest.)</i>
Fieldfare	<i>Turdus pilaris</i>
Fulmar	<i>Fulmarus glacialis</i>

English Name	Latin Name
Gadwall	<i>Anas strepera</i>
Garden warbler	<i>Sylvia borin</i>
Goldcrest	<i>Regulus regulus</i>
Goldfinch	<i>Carduelis carduelis</i>
Grasshopper warbler	<i>Locustella naevia</i>
Great black-backed gull	<i>Larus marinus</i>
Great spotted woodpecker	<i>Dendrocopos major</i>
Great tit	<i>Parus major</i>
Green sandpiper	<i>Tringa ochropus</i>
Green woodpecker	<i>Picus viridis</i>
Greenfinch	<i>Carduelis chloris</i>
Grey heron	<i>Ardea cinerea</i>
Grey partridge	<i>Perdix perdix</i>
Grey wagtail	<i>Motacilla cinerea</i>
Greylag goose	<i>Anser anser</i>
Herring gull	<i>Larus argentatus</i>
House martin	<i>Delichon urbica</i>
House sparrow	<i>Passer domesticus</i>
Jackdaw	<i>Corvus monedula</i>
Jay	<i>Garrulus glandarius</i>
Kestrel	<i>Falco tinnunculus</i>
Lapwing	<i>Vanellus vanellus</i>

English Name	Latin Name
Lesser black-backed gull	<i>Larus fuscus</i>
Lesser whitethroat	<i>Sylvia curruca</i>
Linnet	<i>Carduelis cannabina</i>
Little grebe	<i>Tachybaptus ruficollis</i>
Long-tailed tit	<i>Aegithalos caudatus</i>
Magpie	<i>Pica pica</i>
Mallard	<i>Anas platyrhynchos</i>
Marsh harrier	<i>Circus aeruginosus</i>
Meadow pipit	<i>Anthus pratensis</i>
Mistle thrush	<i>Turdus viscivorus</i>
Moorhen	<i>Gallinula chloropus</i>
Mute swan	<i>Cygnus olor</i>
Oystercatcher	<i>Haematopus ostralegus</i>
Pheasant	<i>Phasianus colchicus</i>
Pied wagtail	<i>Motacilla alba</i>
Pink-footed goose	<i>Anser brachyrhynchus</i>
Raven	<i>Corvus corax</i>
Red-breasted merganser	<i>Mergus serrator</i>
Red-legged partridge	<i>Alectoris rufa</i>
Redshank	<i>Tringa totanus</i>
Redwing	<i>Turdus iliacus</i>
Reed bunting	<i>Emberiza schoeniclus</i>

English Name	Latin Name
Robin	<i>Erithacus rubecula</i>
Rook	<i>Corvus frugilegus</i>
Sand martin	<i>Riparia riparia</i>
Sedge warbler	<i>Acrocephalus schoenobaenus</i>
Shelduck	<i>Tadorna tadorna</i>
Siskin	<i>Carduelis spinus</i>
Skylark	<i>Alauda arvensis</i>
Song thrush	<i>Turdus philomelos</i>
Sparrowhawk	<i>Accipiter nisus</i>
Starling	<i>Sturnus vulgaris</i>
Stock dove	<i>Columba oenas</i>
Swallow	<i>Hirundo rustica</i>
Swift	<i>Apus apus</i>
Teal	<i>Anas crecca</i>
Treecreeper	<i>Certhia familiaris</i>
Tufted duck	<i>Aythya fuligula</i>
Water rail	<i>Rallus aquaticus</i>
Waxwing	<i>Bombycilla garrulous</i>
Whitethroat	<i>Sylvia communis</i>
Willow warbler	<i>Phylloscopus trochilus</i>
Woodpigeon	<i>Columba palumbus</i>
Wren	<i>Troglodytes troglodytes</i>
Yellowhammer	<i>Emberiza citrinella</i>

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## 6 Otter

6.1.1 Refer to Appendix A10.5 (Confidential Badger and Otter Information).

## 7 Water Vole

### 7.1 Consultation Information

7.1.1 NBN Gateway (2008) reports no recent records of water vole (*Arvicola terrestris*) within 500m of any of the proposed scheme (north and south). One old record dating from 1968 was recorded on NBN Gateway of water vole to the south of the Firth of Forth. Since an exact grid reference was not provided this record could potentially lie within the study area. The LBAP officer of the Fife Coast and Countryside Trust provided records of water vole just outside the northern boundary of the study area.

7.1.2 A review of the 1989-1990 survey of water vole in Britain (Strachan & Jefferies, 1993) shows that there is a low density of water vole and mink in the 10km grid square which includes the study area reported here, on the south side of the Firth of Forth (score 1 on a scale of 0 = no records to 5 = high density). The grid square 5km west and to the south of the proposed crossing shows a recorded water vole density of two and no mink records. A search for water voles by county (Strachan & Jefferies, 1993) identified water voles to be present in 2 out of 14 baseline sites (14.3%) in Lothian and four out of 17 baseline sites (23.5%) in Fife. The same report identifies the presence, in 1990, of water vole records in the wider area that includes the current study area but numbers are low and distribution is fragmented. Mink are also present which reduces the chances of water voles being present.

7.1.3 The Atlas of Mammals (Arnold, 1993) reports presence of water voles in Old Philipstoun (NT 07000 78000) which is just outside the southern study area however these records date back to 1967. The LWIC reports more recent sightings of water vole between October 1999 and March 2000 in Faucheldean, near Winchburgh (which is just southwest of the southern study area) (Jacobs Arup, 2008a).

### 7.2 Incidental Observations

7.2.1 Anecdotal evidence suggests water voles were present at Balbougie Glen several years ago (Game keeper, pers. comm. May 2008) and on a tributary of River Almond close to Breastmill House (Mrs. Maxwell, landowner, pers. comm. May 2008).

### 7.3 Water Vole Habitat

7.3.1 No confirmed evidence of water voles was recorded within the study area. However there is anecdotal evidence that a population of water vole live on a stretch of the River Almond at the confluence of Niddry Burn; in addition good water vole habitat was recorded along Swine Burn. Potential water vole signs were recorded at the River Almond and Jamestown Pond including small droppings up to 4mm long, and gnawed sections of reed and grass up to 5cm long. However, revisits to these watercourses could not confirm the presence of water voles, and it may be more likely that signs were made by field voles (*Microtus agrestis*) or rats (*Ratus* sp.).

7.3.2 Evidence of mink was found along the surveyed lengths of Swine Burn and Niddry Burn and it is considered likely that mink are present throughout the study area. Due to their predatory nature, the presence of mink reduces the suitability of an area for water voles.

7.3.3 Detailed results from the water vole surveys, and a description of habitat quality and food availability, are recorded in Table 7.1.

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## 7.4 Summary of Results

- 7.4.1 Waterbodies and watercourses which are considered to provide suitable bank and vegetation characteristics to support water vole populations include the Jamestown Pond, Ferry Loch, Swine Burn, Niddry Burn and River Almond (Table 7.1). A description of riparian habitat and water quality is provided in Table 7.1.
- 7.4.2 Field surveys did not record the presence of water voles or their signs within the study area despite areas of suitable habitat being present. Given water voles have previously been recorded in the Forth - Clyde area (WILDCRU, 2004) and close to the study area (Strachan & Jeffries, 1993) there is the potential for water voles to re-colonise suitable habitat present within the study area. However, the presence of mink in the wider area is likely to reduce the suitability of these habitats for water voles and therefore they are likely to remain absent from the study area. For these reasons they are assumed to be absent from the study area and are not considered further in this assessment.

Table 7.1: Results of Water Vole Survey

Water Feature	Grid Reference	Water Vole Habitat Suitability	Water Quality	Observations
Brankholm Burn, Rosyth	NT 12053 83861	Unsuitable	No water quality data available.	None.
Jamestown Pond	NT 12700 81900	Suitable	No water quality data available.	No evidence of water vole signs, however suitable habitat identified.
Ferry Loch	NT 12800 81000	Suitable	No water quality data available.	No water vole signs. Pond surrounded by excellent water vole habitat but is isolated from alternative habitats and dispersal routes (e.g. M90, mainline railway).
Linn Mill Burn	NT 10563 77326	Unsuitable	No water quality data available. Quality likely to be poor due to proximity to sewage works.	None.
Dolphington Burn	NT13500 76600	Unsuitable	No water quality data available.	None.
Dundas Loch	NT 11900 76000	Unsuitable	No water quality data available.	Loch surrounded by grass but low species diversity and no emergent vegetation; no signs of voles observed.
Swine Burn	NT1092675006	Suitable	A2 - Good (SEPA)	Wetland areas and soft banks at Humber Reservoir and Back Braes Weir (Kirkliston) are suitable for water vole.
Niddry Burn	NT10152 74501	Suitable	B - Moderate (SEPA).	Generally low levels of disturbance, especially in wooded areas, increase suitability for water vole.
River Almond	NT 12364 73866	Suitable	B - Moderate (SEPA).	No water vole signs. Bank includes soft areas and sandy banks with in-channel vegetation suitable for water voles burrowing.

## 8 Red Squirrel

### 8.1 Consultation Information

- 8.1.1 Consultation did not provide any records of red squirrels within the 1km wide study area. The absence of red squirrel (*Sciurus vulgaris*) from the study area was further confirmed by SNH in their consultation response. The nearest record of red squirrel to the proposed scheme is at

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Fordell Castle, which is approximately 2.5km northeast of the study area (NT 14300 85500). Red squirrels are regularly observed in this woodland area (Raymond Cunningham, Fordell Castle Estate, pers. comm. June 2008) and have been recorded as recently as 2006 by the Scottish Squirrel Survey (2007).

- 8.1.2 Following consultation on the proposed scheme, Fife Council requested that red squirrel surveys were to be undertaken within areas of woodland.

## 8.2 Initial Site Walkover/Identification of Survey Sites

- 8.2.1 Habitat suitable for red squirrels may comprise woodland areas with high connectivity, diverse age structure and a favourable species mix (e.g. Scots pine, spruce (*Picea* spp.), hawthorn, yew). An initial walkover survey of the current study area was undertaken in February 2008. Analysis of the results, combined with the known natural history of red squirrel, resulted in the identification of eight woodland areas providing potential to support populations of red squirrels.

- 8.2.2 Given the indication of red squirrel presence in woodland at Fordell Castle through consultation, and likely connectivity between this area of woodland and woodlands within the study area, it was considered prudent to undertake detailed red squirrel surveys within the eight identified woodlands.

## 8.3 Red Squirrel Survey

### Survey Sites

- 8.3.1 Table 8.1 presents a habitat description of the woodland areas surveyed and assesses their potential value to red squirrels. For full details regarding the habitat types and species composition of the woodlands refer to Chapter 10 (Terrestrial Habitats) Section 10.3 (Baseline Conditions) and Section 1 (Terrestrial Habitats) of this Appendix.

**Table 8.1: Habitat Description and Potential Value to Red Squirrels of Surveyed Woodland**

Woodland	Grid Reference	Value	Habitat Description
St Margaret's Hope Wood	NT 12400 81500	Low - medium	Mixed broad-leaved and coniferous plantation comprising sycamore, yew, Scots pine, lime, ash and elm. Despite potential foraging opportunities, woodland is considered of low potential for red squirrels due to its small size (approximately 7.5ha) and high degree of fragmentation. Presence of grey squirrels suggests potential for intra-specific competition.
North Cliff Wood	NT 12700 81800	Low	Broad-leaved plantation woodland with limited potential for red squirrels due to isolated nature, small size (approx. 4ha) and relatively poor foraging opportunities. Tree species present include sycamore, lime, horse chestnut and elm. Presence of grey squirrels suggests potential for intra-specific competition.
Castlandhill Wood	NT 12000 82100	Low	Small plantation woodland dominated by broad-leaved species such as sycamore, oak ( <i>Quercus</i> sp.) and elm. Limited potential for red squirrels due to lack of suitable foraging opportunities, small size (approx. 12ha) and high degree of isolation from surrounding woodland areas. Presence of grey squirrels suggests potential for intra-specific competition.
East Shore Wood	NT 10500 78800	Medium - high	Good potential foraging and breeding habitat due to prevalence of mature coniferous species such as Scots pine. Broad-leaved species also present, including sycamore, beech and elder. Woodland area is approximately 20ha and is well connected to surrounding woodland areas to the west. Presence of grey squirrels suggests potential for intra-specific competition.

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Woodland	Grid Reference	Value	Habitat Description
Dundas Estate	NT 11500 76500	Medium - high	Good potential foraging and breeding habitat due to mixture of tree species present and age structure. Tree species include Scots pine, Norway spruce, ash, sycamore, lime ( <i>Tilia</i> sp.). Woodland area is approximately 108ha and subject to low levels of disturbance. Presence of grey squirrels suggests potential for intra-specific competition.
Murie Hall Wood (and adjacent Swineburn and Carmelhill Woods)	NT 10100 75700	Medium	Mixed coniferous and broad-leaved woodland of varying age structure. Potential foraging opportunities for red squirrels provided by presence of tree species such as Scots pine, yew, larch, birch ( <i>Betula</i> sp.) and cherry. Large-masted broad-leaved species such as beech also present. Woodland area is subject to low levels of disturbance and is approximately 30ha, however, it is isolated from surrounding woodland habitats. Presence of grey squirrels suggests potential for intra-specific competition.
Ross's Plantation	NT 10500 74700	Low - medium	Immature mixed coniferous and broad-leaved plantation woodland comprising Norway spruce, ash, sycamore and rowan offers foraging potential and is subject to low levels of disturbance. Woodland area is small (approximately 8ha) and isolated and therefore of limited potential for red squirrels. Presence of grey squirrels suggests potential for intra-specific competition.
Lindsay's Craigs Wood	NT 11500 74200	Low - medium	Mixed woodland comprising coniferous species such as Scots pine, Norway spruce and broad-leaved tree species including sycamore, ash and elm ( <i>Ulmus</i> sp.). Woodland area is of limited potential to red squirrels due to its small size (10ha) and isolation from surrounding woodland areas.

## 8.4 Summary of Results

8.4.1 This section describes the results of the hair-tube and visual surveys that were carried out between June and August 2008.

8.4.2 The level of survey effort applied to each woodland area for both the hair-tube surveys and visual surveys is shown in Table A8.2.

**Table 8.2: Level of Survey Effort Applied to Each Woodland**

Woodland	Grid Reference	Number of Hair-Tubes Deployed	Dates Hair-Tubes Left In Situ ( Tubes Checked and Re-baited Weekly)	Number of Visual Surveys (Dates Conducted)
St Margaret's Hope Wood	NT 12400 81500	5	3/6/08 - 1/7/08	No visual surveys - access restricted from 9:30am to 5:30pm
North Cliff Wood	NT 12700 81800	4	3/6/08 - 2/7/08	3 (11/6/08, 26/6/08, 27/8/08)
Castlandhill Wood	NT 12000 82100	7	3/6/07 - 2/7/08	3 (11/6/08, 26/6/08, 28/8/08)
East Shore Wood	NT 10500 78800	8	5/6/08 - 3/7/08	3 (5/6/08, 20/6/08, 11/7/08)
Dundas Estate	NT 11500 76500	26	4/6/08 - 2/7/08	3 (5/6/08, 10/6/08, 4/7/08)
Murie Hall Wood (and adjacent Swineburn and	NT 10100 75700	14	4/6/08 - 2/7/08	3 (12/6/08, 25/6/08, 2/7/08)

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### Appendix A10.4: Detailed Terrestrial and Freshwater Ecological Baseline Data

Woodland	Grid Reference	Number of Hair-Tubes Deployed	Dates Hair-Tubes Left In Situ ( Tubes Checked and Re-baited Weekly)	Number of Visual Surveys (Dates Conducted)
Carmelhill Woods)				
Ross's Plantation	NT 10500 74700	5	6/6/08 - 3/7/08	3 (6/6/08, 13/6/08, 27/6/08)
Lindsay's Craigs Wood	NT 11500 74200	8	6/6/08 - 3/7/08	3 (6/6/08, 13/6/08, 27/6/08)

8.4.3 The results of the hair-tube and visual surveys are presented in Table 8.3 and on Figure 10.8.

8.4.4 Visual and hair-tube surveys provided no evidence of red squirrel presence within the eight woodlands surveyed within the study area. Grey squirrels were found to be present in seven of the surveyed woodland areas.

8.4.5 In light of these survey findings, the limited suitable woodland habitat available for red squirrel and prevalence of grey squirrels in the local area, red squirrels are not considered to be present within the study area.

**Table 8.3: Hair-Tube and Visual Survey Results**

Woodland with Grid Reference	No. of Hair-Tubes Deployed	Hair-Tubes with Red Squirrel Hair	Hair-Tubes with Grey Squirrel Hair	Visual Surveys (Squirrel Sightings and Signs of Squirrel Activity - Including Incidental Records)	Red Squirrel Present	Grey Squirrel Present
St Margaret's Hope Wood NT 12400 81500	5	0	2	None recorded - no visual surveys conducted due to restricted access.	None recorded	Yes
North Cliff Wood NT 12700 81800	4	0	3	Grey squirrel observed 11/6/08 (NT 12952 80689)	None recorded	Yes
Castlandhill Wood NT 12000 82100	7	0	1	None recorded	None recorded	Yes
East Shore Wood NT 10500 78800	8	0	1	Grey squirrel observed 12/6/08 (NT 10594 78709) Four potential dreys recorded (one at NT 10402 78763 and three at NT 10500 78700) Squirrel feeding stations recorded (NT 10420 78760; NT 10430, 78756)	None recorded	Yes
Dundas Estate NT 11500 76500	26	0	9	Five grey squirrels observed Four on 12/6/08 (NT 12171 75854; NT 11478 76499; NT 11363 76372; NT 11556 76208). One on 18/6/08 (NT 12117 76823) Potential drey recorded (NT 21138 75732)	None recorded	Yes
Murie Hall Wood (and adjacent Swineburn and Carmelhill Woods) NT 10100 75700	14	0	3	Grey squirrel observed 2/7/08 (NT 09897 76080) Three potential dreys recorded (NT 10834 75634; NT 10046 75932; NT 09685 75909)	None recorded	Yes

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Woodland with Grid Reference	No. of Hair-Tubes Deployed	Hair-Tubes with Red Squirrel Hair	Hair-Tubes with Grey Squirrel Hair	Visual Surveys (Squirrel Sightings and Signs of Squirrel Activity - Including Incidental Records)	Red Squirrel Present	Grey Squirrel Present
				Squirrel feeding signs recorded (NT 10046 75932; NT 10587 75748; NT 10557 75747; NT 09966 75977; NT 10046 75960; NT 10009 75954)		
Ross's Plantation NT 10500 74700	5	0	4	None recorded	None recorded	Yes
Lindsay's Craigs Wood NT 11500 74200	8	0	0	None recorded	None recorded	None recorded

## 9 Amphibians

### 9.1 Consultation Information

- 9.1.1 Consultation with SNH identified Dundas Estate as a historic breeding site for great crested newts (*Lissotriton cristatus*), naming 'The Old Curling Pond' as a breeding site.
- 9.1.2 The British Herpetological Society did not provide any records for the study area pertinent to amphibians. Lothian Amphibian and Reptile Group (LARG) reported that a series of new ponds had been created within the Dundas Estate.
- 9.1.3 Consultation with NBN Gateway did not provide any records within the 10km square (NT 17) pertinent to amphibians.
- 9.1.4 Records of great crested newts were provided by LWIC (Table 9.1).

**Table 9.1: LWIC Amphibian Records**

Location	Grid Reference	Date
Dundas Estate	NT 11300 76300	15/04/1999
Dundas Estate	NT 11300 76300	19/04/2000
South Queensferry	NT 12300 77300	1985
Dalmeny railway	NT 14100 77100	1855
Dundas Estate	NT 11300 76200	21/08/2005
Dundas Estate	NT 11300 76300	26/04/1999
Dundas Estate	NT 11300 76300	27/06/2000
Barrenraig Wood	NT 11300 76300	29/05/1996
Dalmeny railway (pond a)	NT 14200 77100	29/05/1996

- 9.1.5 Although the LWIC provided records that identify ponds at Dalmeny railway as breeding sites for great crested newts, reference to the Edinburgh Airport Rail Link (EARL) report produced by ERM Ltd (ERM, 2005), indicated that these ponds no longer supported great crested newt populations.

### 9.2 Incidental Observations

- 9.2.1 The presence of amphibian species was recorded during the course of other ecological surveys. Table 9.2 shows the species identified and location of these incidental observations obtained during the reptile survey (Refer to Figure 10.9).

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**Table 9.2: Incidental Observations of Amphibians**

Site Id.	Grid Reference	Date	Species
S13	NT 10100 75800	09/09/2008	1 adult common toad ( <i>Bufo bufo</i> )
		10/09/2008	2 juvenile common toad
		12/09/2008	4 juvenile common toad
		18/09/2008	1 juvenile common toad
S14	NT 10800 75800	09/09/2008	1 adult, 3 juvenile common toad
		10/09/2008	1 adult common toad
		12/09/2008	1 adult common toad
		17/09/2008	1 adult common toad
S17	NT 14200 76800	08/09/2008	2 juvenile common toad
		11/09/2008	4 juvenile common toad
S22	NT 07500 76800	17/09/2008	1 juvenile common toad
S23	NT 08000 76800	12/09/2008	3 juvenile common toad
S24	NT 09600 76100	09/09/2008	10 juvenile common toad
		10/09/2008	1 juvenile common toad
		12/09/2008	7 juvenile common toad
		17/09/2008	5 juvenile common toad
		18/09/2008	18 juvenile common toad
S25	NT 11400 77900	09/09/2008	1 adult common toad
		10/09/2008	1 adult, 2 juvenile common toad
		11/09/2008	1 adult common toad
S26	NT 11300 78700	09/09/2008	2 adult common toad
		11/09/2008	1 adult common toad
		17/09/2008	1 adult common toad
		18/09/2008	1 adult, 1 juvenile common toad

## 9.3 Amphibian Surveys

### Desk Study/Walkover Survey

9.3.1 Thirty-three ponds were identified by the desk study (Figure 10.9). During the walkover survey four of the ponds were found to no longer exist. The remaining 29 ponds were subject to a survey to collect habitat information to inform the selection process for presence/absence surveys.

9.3.2 Table 9.3 shows the name, location and gives a brief description of the identified ponds, together with their Habitat Suitability Index (HSI) score. Of the 29 ponds identified by the site walkover, seven ponds (Ferry Loch (N3), Balfour Beattie Factory Pond (S1), Cherrytree Cottage - Dundas Estate (S8), the Flight Pond - Dundas Estate (S9), Railway Pond (west) (S10) and Railway Pond (east) (S11 and S12)) were carried forward to the presence/absence survey based on the information presented in Table 9.4.

### Presence/Absence Surveys

9.3.3 Great crested newts were identified in Ferry Loch. Smooth newts (*Lissotriton vulgaris*) were recorded in Ferry Loch, Railway Pond (east) and Railway Pond (west). Palmate newts (*Lissotriton helveticus*) were recorded in the north of the study area at Ferry Loch. However, no palmate newts were recorded in the south of the study area.



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9.3.4 Newts were not recorded where the presence of three-spined stickleback (*Gasterosteus aculeatus*) was confirmed in the smaller of the two Railway Ponds (east).

9.3.5 Table 9.4 shows the maximum counts of each species obtained during the presence/absence surveys, together with the dates of each survey.

#### Summary of Presence/Absence Results

##### Pond N3 - Ferry Loch

9.3.6 A great crested newt adult and an eft (juvenile) were recorded in addition to male and female smooth newts, male and female palmate newts and one unidentified (smooth or palmate) newt eft. Common frog (*Rana temporaria*) and toad spawn were observed during the walkover survey.

##### Pond S1 - Balfour Beattie factory pond.

9.3.7 No signs of amphibians were recorded during the presence/absence survey or walkover survey in this pond.

##### Pond S10 - Railway pond (west)

9.3.8 Adult male and female smooth newts were recorded. Common frog was recorded during the walkover surveys.

##### Pond S11 - Railway pond (east)

9.3.9 One adult male smooth newt was identified. The presence of fish was also observed. Common frog spawn and adults, many in amplexus, were recorded during the walkover surveys.

##### Pond S12 - Railway pond (east)

9.3.10 No amphibians were recorded. A small number of fish were caught during the bottle trapping surveys.

##### Pond S18 - The Flight Pond, Dundas Estate

9.3.11 No amphibians were recorded. Survey results indicate the presence of fish in the pond.

##### Pond S19 - Cherrytree Cottage, Dundas Estate

9.3.12 Although no adult amphibians were observed, efts (palmate or smooth) were recorded during the surveys.

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### Appendix A10.4: Detailed Terrestrial and Freshwater Ecological Baseline Data

Table 9.3: Descriptions of Suitable Amphibian Waterbodies

Waterbody ID	Name	Grid Reference	HSI Score	Distance From Proposed Scheme	Description of Pond	Rational for Surveying	Surveyed
N1	Brankholm Boating Pond	NT 12100 83700	0.38	577m	Moderate sized rectangular man-made pond. Concrete sided within amenity grassland. Pond was dry at time of HSI assessment	Concrete sided man-made pond with no suitable habitat features. Obtained a low HSI score is isolated from other suitable ponds.	x
N2	Jamestown	NT 12700 81900	0.4	263m	Moderate sized pond surrounded by some scrub with industrial areas and housing beyond. Water quality low probably caused by proximity to scrap yard and active quarry.	Water quality low caused by pollution from the scrap yard and quarry. Pond is isolated from other suitable ponds. It has obtained a low HSI score.	x
N3	Ferry Loch	NT 12800 81000	0.64	135m	Elliptical large (100mx30m) pond. With a moderate level of water quality with frog and toad spawn observed. Some wildfowl noted. 10% of pond shaded. Emergent and aquatic vegetation present. Surrounded by dense gorse scrub. With amenity grassland beyond.	Many suitable aquatic and terrestrial habitat features. Presence of amphibians observed.	✓
S1	Balfour Beattie Factory Pond	NT 10600 78300	0.61	619m	Man-made pond used as water supply in case of fire at factory as such water levels can vary dependent on use. Some emergent vegetation. Small number of wildfowl present. No shading	Some suitable habitat parameters present. Obtained HSI score over 0.6	✓
S2	A904 Pond	NT 11700 77700	0.52	82m	Irregular shaped moderate sized pond (15mx5m) with moderate invertebrate diversity. 80% of pond covered in macrophytes (fools water cress and grasses) 70% of the pond shaded. Improved grassland. Pond isolated from any other suitable ponds.	The pond has high levels of shading, and is isolated from any other suitable pond with unsuitable terrestrial habitat surrounding. Therefore considered unsuitable for amphibians	x
S3	Lawflat	NT 10400 77700	0.51	395m	Large pond (200mx30m) in field exposed with 0% shaded a number of wildfowl recorded mallard ducks, swans and black headed gulls.	Presence of black headed gull and other wildfowl. The pond has a low HSI score and is isolated from any suitable ponds.	x
S4	Echline Strip, Dundas Estate	NT 11300 77200	0.52	306m	Within 1km of great crested newt site very shallow and rather ephemeral. Not considered a pond but rather the end of field drain. No standing water when surveys began.	The pond obtained a low HSI score and is isolated from suitable ponds. No standing water remained when surveys began.	x

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Waterbody ID	Name	Grid Reference	HSI Score	Distance From Proposed Scheme	Description of Pond	Rational for Surveying	Surveyed
S5	Dundas Home Farm, Dundas Estate	NT 12400 77300	0.53	0m	Very small, steep sided rectangular hole in ground, possibly the end of field drain. Moderate water quality but virtually no aquatic vegetation dominated by duckweed ( <i>Lemna minor</i> ). Broad-leaved plantation with arable field surrounding.	The pond does not appear on OS maps. It obtained a low HSI score and is isolated from suitable ponds. It is over 1.5km from the known great crested newt site. Presence of pipe in pond suggests it is the end of a field drain from the neighboring arable field. High possibility of run off from arable field.	x
S6	Golf Course Pond, Dundas Estate	NT 12500 76700	0.52	486m	A small ellipse shaped pond, low water quality with low invertebrate diversity, appears quiet deep with little or no aquatic vegetation. Some wildfowl noted. Broad-leaved plantation with amenity grassland beyond (golf course).	The pond has limited suitable features as well as poor water quality and therefore obtained a low HSI score. Pond is over 1km away from known great crested newt site.	x
S7	Dolphington Burn Wood Pond	NT 13400 76700	0.41	291m	Heavily shaded 75% pond. No aquatic or emergent vegetation. Broad-leaved plantation.	The pond is heavily shaded and aquatic vegetation is absent. The pond obtained a low HSI score and is isolated from other suitable ponds.	x
S8	Dolphington Burn/M9 Pond	NT 13900 76700	-	855m	Recently completed Sustainable Drainage System (SUDS) pond. No aquatic or emergent vegetation. Low water level.	Suitable habitat parameters are absence. Low water level at time of survey. Also high potential for run off from M9 leading to increased pollution	x
S9	Dolphington Burn/M9 Pond	NT 13900 76600	-	838m	Recently completed SUDS pond. No aquatic or emergent vegetation. Low water level.	Suitable habitat parameters are absence. Low water level at time of survey. Also high potential for run off from M9 leading to increased pollution.	x
S10	Railway Pond (west)	NT 14100 77000	0.67	832m	Moderate (50mx50m) irregular shaped pond with abundant and diverse invertebrate community and signs of amphibians. 5% of pond shaded. Mallard and swans seen. Poor semi improved grassland and scattered scrub	Suitable habitat features are present along with sightings of amphibians.	✓
S11	Railway Pond (east)	NT 14200 77000	0.61	1008m	Large (200mx30m) rectangular pond abundant and diverse invertebrate communities and other amphibians, dead toad found as well as live frogs some in amplexus. Frog spawn seen. 10% of pond shaded. Poor semi improved grassland with scattered scrub.	Suitable habitat features are present along with sightings of amphibians.	✓

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Waterbody ID	Name	Grid Reference	HSI Score	Distance From Proposed Scheme	Description of Pond	Rational for Surveying	Surveyed
S12	Railway Pond (east)	NT 14200 77000	0.61	1008m	Linked to s22 by very shallow water dominated by bull rush.	Considered to be linked to Railway pond (east) (s22).	✓
S13	Barrencraig Wood (SW), Dundas Estate	NT 11000 76200	-	1302m	Identified late on out with optimal egg search time. Uneven and swampy underfoot. Adjacent to Old Curling Pond. Broad-leaved wood and improved grassland surrounds.	Pond was not surveyed as it was identified out with optimal survey period. The pond does not appear on OS maps. Pond appears suitable for amphibians. The pond is 1302m from the proposed development and the terrestrial habitat within 500m of it will be unaffected.	x
S14	Old Curling Pond	NT 11200 726200	0.76	1080m	Long rectangular pond (100mx15m) with overhanging trees to the northern side and aquatic vegetation along the southern.	Known GCN breeding site and potential centre of a meta-population.	x
S15	New pond near Old Curling Pond	NT 11300 76200	0.66	1118m	New scrape adjacent to Old Curling Pond (s7) 20m x 7m in size. Low invertebrate diversity 5% of the pond in shade. No aquatic vegetation surrounded by broad-leaved plantation and improved grassland beyond. Pond liable to dry out predicted 4 years out of 10.	Although the pond obtained a high HSI score recent excavation means that suitable habitat features have not yet established. The pond was virtually dry by May 2008.	x
S16	New pond near Old Curling Pond	NT 11300 76200	0.65	1118m	New scrape adjacent to Old Curling Pond (s7) 15m x 15m in size. Low invertebrate diversity 5% of the pond in shade. No aquatic vegetation surrounded by broad-leaved plantation and improved grassland beyond. Pond liable to dry out predicted 4 years out of 10.	Although the pond obtained a high HSI score recent excavation means that suitable habitat features have not yet established. The pond was virtually dry by May 2008.	x
S17	Dundas Loch	NT 11900 75900	0	750m	Large loch (500mx25m) with abundant and diverse invertebrate communities, 10% of loch is shaded with number of wildfowl present including swans, heron, geese, mallard ducks and moorhen. Loch is known to contain fish.	The presence of fish is highly likely in the Loch. The Loch also obtained a HSI score of zero. There is a high presence of wildfowl on the Loch.	x
S18	Cherrytree Cottage, Dundas Estate	NT 12100 75800	0.76	415m	The pond in garden of cottage with aquatic and emergent vegetation. 40% bordered by rhododendran. Broad-leaved woodland surrounds. Within 1km of known great crested newt site.	The pond has suitable habitat parameters and is in close proximity to known a great crested newt site.	✓

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Waterbody ID	Name	Grid Reference	HSI Score	Distance From Proposed Scheme	Description of Pond	Rational for Surveying	Surveyed
S19	Flight Pond, Dundas Estate	NT 12300 75800	0.87	460m	Established pond with recent improvements for newts. Moderate water quality with moderate invertebrate diversity. 10% of pond surface area is shaded. Broad-leaved plantation surrounds with improved grassland beyond.	The pond has suitable habitat parameters and is in close proximity to known a great crested newt site.	✓
S20	Dundas Estate, New Pond	NT 12500 75600	0.56	360m	New pond less than 2 years old, evidence of recent excavation. Moderate irregular shaped pond with low invertebrate diversity this is probably due to recent excavation works. 20% of pond shaded no emergent plants. Thick with algae later in summer. Broad-leaved woodland with improved grassland beyond.	Ponds obtained low HSI score. Due to recent excavation suitable habitat features have not yet established. The pond is over 1km away from known great crested newt site.	✗
S21	Dundas Estate New Pond	NT 12500 75600	0.56	344m	New pond less than 2 years old, evidence of recent excavation. Moderate irregular shaped pond (15m x5m) with low invertebrate diversity this is probably due to recent excavation works. 30% of pond shaded no emergent plants broad-leaved woodland with poor semi improved grassland beyond.	Ponds obtained low HSI score. Due to recent excavation suitable habitat features have not yet established. The pond is over 1km away from known great crested newt site.	✗
S22	Hopetoun Fisheries	NT 09600 75900	0.58	164m	This pond is a stocked commercial fishery.	Despite the moderate HSI score the pond is a heavily stocked fishery.	✗
S23	Humbie Reservoir	NT 10900 75000	0	500m	Rectangular large (500mx20m) reservoir heavily stocked with fish. Improve grassland with some woodland surrounding.	The reservoir is heavily stocked with fish. The reservoir has a low HSI score.	✗
S24	Humbie Quarry (disused)	NT 10900 75600	0	915m	Large (300mx100m) disused quarry extremely deep with steep sides. Little to no aquatic vegetation. Not an officially stocked fishery but seems popular with anglers. 50% of quarry is shaded. Improved grassland with some woodland surrounding.	The pond is extremely deep has steep sides and has no suitable habitat features. The presence of fish is extremely likely. The HSI score is 0 and the quarry is isolated from ponds suitable for amphibians.	✗
S25	Back Braes Weir	NT 11800 74400	0.33	106m	Large man-made pond, part of active river system (Swineburn river system). Lots of wildfowl present.	This pond obtained a low HSI score. Significant numbers of water fowl were present.	✗
S26	Old Quarry, Milrig	NT 11900 73700	0.33	93m	Very deep waterbody, with extremely steep sides. Very polluted, remains of cars, tyres and other debris in water.	The pond obtained a low HSI score. It is heavily polluted and would be potentially dangerous to survey.	✗

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Table 9.4: Presence/Absence Survey Results

Pond Number	Survey Technique	Survey Number	Date	Common Toad	Common Frog	Palmate Newt	Smooth Newt	Great Crested Newt	Newt Eggs	Common Frog/toad Spawn	Others	
N3	Bottle trapping, egg search	1	23 - 24/04/08	1	0	3 male 1 female	4 male 1 female	0	0	0	2 eft (smooth or palmate)	
		2	8 - 9/05/08	0	0	1 male	1 male	1 male	0	0	2 eft (smooth or palamte)	
		3	21 - 22/05/08	0	0	1 female	0	0	0	0	1 GCN eft	
		4	27 - 28/05/08	0	0	2 male	1 female	0	0	0	0	
		5	5 - 6/06/08	0	0	9 male 1 female	1 male 1 female	0	0	0	0	0
		6	9 - 10/06/08	0	0	19 male 1 female	0	0	0	0	0	1 eft (smooth or palmate)
S1	Egg search	1	7 - 8/05/08	0	0	0	0	0	0	0	0	
		2	22/05/08	0	0	0	0	0	0	0	0	
		3	05/06/08	0	0	0	0	0	0	0	0	
		4	10/06/08	0	0	0	0	0	0	0	0	
S10	Bottle trapping, egg search	1	21 - 22/04/08	0	0	0	0	0	0	0	0	
		2	5 - 6/05/08	0	0	0	4 male 3 female	0	0	0	0	
		3	19 - 20/05/08	0	0	0	1 male	0	0	0	0	
		4	2 - 3/06/08	0	0	0	1 female	0	0	0	0	
S11	Bottle trapping, egg search	1	24 - 25/04/08	0	0	0	1 male	0	0	0	8 three-spined stickleback	
		2	5 - 6/05/08	0	0	0	0	0	0	0	22 three-spined stickleback	
		3	22 - 24/05/08	0	0	0	0	0	0	0	8 three-spined stickleback	
		4	2 - 3/06/08	0	0	0	0	0	0	0	3 three-spined stickleback	
S12	Bottle trapping, egg search	1	24 - 25/04/08	0	0	0	0	0	0	0	3 three spined stickleback	
		2	5 - 6/05/08	0	0	0	0	0	0	0	4 three spined stickleback	
		3	19 - 20/05/08	0	0	0	0	0	0	0	0	
		4	2 - 3/06/08	0	0	0	0	0	0	0	0	
S18	Bottle	1	21 - 22/04/08	0	0	0	0	0	0	0	20+ three-spined stickleback	

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Pond Number	Survey Technique	Survey Number	Date	Common Toad	Common Frog	Palmate Newt	Smooth Newt	Great Crested Newt	Newt Eggs	Common Frog/toad Spawn	Others
	trapping, egg search and torch search	2	5 - 6/05/08	0	0	0	0	0	0	0	
		3	19 - 20/05/08	0	0	0	0	0	0	0	11 three-spined stickleback
		4	27 - 28/05/08	0	0	0	0	0	0	0	2 three-spined stickleback
S19	Bottle trapping, egg search and torch search	1	21 - 22/07/08	0	0	0	0	0	0	0	1 eft (smooth or palamate)
		2	22 - 23/07/08	0	0	0	0	0	0	0	12 efts (smooth or palamate)
		3	23 - 24/07/08	0	0	0	0	0	0	0	8 efts (smooth or palamate)
		4	24 - 25/07/08	0	0	0	0	0	0	0	12 efts (smooth or palamate)

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### 10 Reptiles

#### 10.1 Consultation Information

- 10.1.1 The only source of historical records of reptiles was the Fife Biological Records Centre (Table 10.1), although all records are in excess of 10km from the proposed route option.
- 10.1.2 These records were supplemented by a search of the NBN Gateway for 10km<sup>2</sup> squares NT07, NT08, NT17, NT18, NT 27 and NT28. Although this search generated a number of historical records, the most recent is from 1991 and none are in close proximity to the proposed scheme (Table 9.1).
- 10.1.3 In addition to the formal request for information, the LARG were contacted directly. Verbal communications with LARG confirmed that they do not hold any records of reptiles in the study area but suggested that this animal group is under-recorded and that they have a restricted and highly localised distribution within the region.

#### 10.2 Incidental Observations

- 10.2.1 There were no incidental observations of live reptiles during the completion of other ecological surveys for the Main Crossing in 2008. A lizard skin was recorded within an otter spraint at NT 13426 87224. Although this site is located north of the proposed scheme alignment, otters have large home ranges and therefore it is not possible to confirm where the lizard may have been predated.

#### 10.3 Reptile Survey

- 10.3.1 Following the desk study and walkover survey, a total of 54 sites were identified as being representative of the study area and as having potential to support reptiles. The physical attributes of these sites were reviewed in order to describe their value for reptiles as high, medium or low. A statistically robust sample from each habitat value category was then targeted for detailed survey. A total of 11 sites north of the Firth of Forth and 10 sites south of the Firth of Forth were surveyed (Table 10.2 and Figure 10.9).
- 10.3.2 The refuge arrays within these sites were set at a minimum density of 10 per hectare and sampled key habitat areas that provided key attributes.

#### 10.4 Summary of Results

##### Reptiles Surveys

- 10.4.1 The study area of the proposed scheme is characterised by a predominantly lowland agricultural landscape which is intensively managed. The study area consequently has limited potential for reptiles. Favourable habitat for reptiles is largely restricted to extensive blocks of woodland, scrub, heathland and grassland and boundary features which offer suitable conditions and contribute towards habitat connectivity (e.g. road verges of A90 and M9).
- 10.4.2 In total 21 sites were targeted for survey within the optimal month of September. During the course of the survey no reptiles were recorded. The full survey results are presented in Table 10.2.



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**Table 10.1: Historical Records of Reptiles**

Source	Species	Location	Date	Additional Information
Fife Biological Records Centre	<i>Anguis fragilis</i>	Kinghorn (southeast Fife)	1998	Single specimen.
	<i>Anguis fragilis</i>	Cupar (Central Fife)	2001 and 2002	Apparently occasional records in southern Fife earlier this century.
	<i>Lacerta (Zootoca) vivipara</i>	Deville (southwest Fife)	2000 and 2003	Small isolated colonies.
	<i>Lacerta (Zootoca) vivipara</i>	Dunsmuir (northeast Fife)	2002	Small isolated colonies.
	<i>Natrix natrix</i>	Fife	Not provided	Occasional escapes.
	<i>Vipera berus</i>	South and east Fife	Not provided	No recent records and possible that adders are locally extinct.
National Biological Network	<i>Anguis fragilis</i>	Cairney Hill (NT0486)	1991	Source: Field observation
	<i>Lacerta (Zootoca) vivipara</i>	Dalmeny (NT 17)	1957	Source: Field observation
	<i>Natrix natrix</i>	Edinburgh, nr. (NT 17)	1874	Source: Literature
	<i>Anguis fragilis</i>	Edinburgh, East Princes Street Gardens (NT27)	1915	Source: Literature
	<i>Anguis fragilis</i>	Edinburgh (NT27)	1883	Source: Literature
	<i>Anguis fragilis</i>	Salisbury Craggs (NT27)	1915	Source: Literature
	<i>Anguis fragilis</i>	Blackford Hill (NT27)	1955	Source: Field observation
	<i>Anguis fragilis</i>	Blackford Hill (NT27)	1915	Source: Literature
	<i>Anguis fragilis</i>	Duddingston (NT27)	1960	Source: Field observation
	<i>Lacerta (Zootoca) vivipara</i>	Blackford Hill (NT27)	1874	Source: Literature
	<i>Lacerta (Zootoca) vivipara</i>	Edinburgh, Queens Park (NT27)	1874	Source: Literature
	<i>Lacerta (Zootoca) vivipara</i>	Salisbury Craggs (NT27)	1874	Source: Literature
	<i>Natrix natrix</i>	Edinburgh, nr (NT27)	1874	Source: Literature
	<i>Anguis fragilis</i>	Aberdour - Burntisland (NT28)	1915	Source: Literature

Note:

*Lacerta (Zootoca) vivipara* - Viviparous lizard

*Anguis fragilis* - Slow worm

*Vipera berus* - Adder

*Natrix natrix* - Grass snake

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Table 10.2: Habitat Descriptions for Reptile Survey Sites

Site	Grid Reference	Habitat Value	Habitat Description	Approximate Area (ha)	Number of Artificial Refuges
N1	NT 14400 89600	M	Semi-improved grassland adjacent to track.	0.7	10
N2	NT 13300 88200	M	Semi-improved grassland and gorse scrub with wetland habitat.	2.0	20
N3	NT 13000 83900	H	Semi-improved grassland with wetland. East of Inverkeithing railway junction.	1.5	20
N4	NT 12600 83300	H	Semi-improved grassland with tall ruderal vegetation, ephemeral/short perennial vegetation, bracken, scrub and secondary woodland.	1.8	30
N5	NT 12300 82600	L	Improved grassland and scattered scrub. Western embankment of B980.	1.1	20
N6	NT 12100 82200	M	Semi-improved grassland with gorse scrub and broad-leaved woodland boundary habitat.	0.8	15
N7	NT 12400 81400	H	Rank grassland with ruderal vegetation and scattered scrub.	1.6	30
N8	NT 12400 81500	L	Tall ruderal vegetation and scattered scrub. A90 roadside verge.	0.7	10
N9	NT 13100 81100	H	Semi-improved grassland with ephemeral/short perennial vegetation, bracken and gorse scrub.	1.4	20
N10	NT 12500 81000	M	Improved grassland with tall ruderal vegetation, scattered scrub and gorse adjacent to amenity grassland.	0.7	10
N11	NT 12500 80600	L	Semi-improved grassland with scattered scrub beneath M90.	0.7	10
S1	NT 11300 78700	M	Semi-improved grassland with ruderal vegetation, scattered scrub and watercourse.	1.0	10
S2	NT 11400 77900	L	Improved grassland adjacent to hedgerow.	0.7	15
S3	NT 07500 76800	H	Disused quarry with complex mosaic of ephemeral/short grazed perennial vegetation, scrub and regenerating birch woodland.	3.0	30
S4	NT 08000 76800	M	Semi-improved grassland with plantation woodland and scattered scrub. Northern embankment of M9 motorway.	1.0	10
S5	NT 142 76800	M	Semi-improved grassland with ruderal vegetation and wetland.	1.6	20
S6	NT 14300 76500	H	Semi-improved grassland with ruderal vegetation and scattered scrub and small area of broad-leaved woodland.	1.2	20
S7	NT 09600 76100	M	Tall ruderal and ephemeral vegetation with broad-leaved woodland and scrub. Hopetoun Fisheries access track.	0.7	10
S8	NT 10100 75800	H	Tall ruderal vegetation with scattered scrub within broad-leaved woodland.	1.8	20
S9	NT 10800 75800	M	Semi-improved grassland adjacent to broad-leaved woodland.	1.1	20
S10	NT 11600 74700	L	Improved grassland with plantation woodland and scattered scrub. Eastern embankment of M9 motorway.	0.8	10

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# 11 Terrestrial Invertebrates

## 11.1 Consultation Information

11.1.1 Several websites were accessed to determine current UKBAP species for terrestrial invertebrates and specifically for Scottish Local BAP species which may be present within the proposed scheme design, including:

- UKBAP species; and
- Scottish Biodiversity List.

11.1.2 The following documents were consulted for details of species or habitats that are locally rare or notable including;

- The Fife Biodiversity Action Plan;
- The Edinburgh Biodiversity Action Plan; and
- West Lothian Biodiversity Action Plan.

11.1.3 Table 11.1 lists the four terrestrial invertebrates which have been designated as LBAP species for Fife. It should be noted that all *Bombus* sp. are designated Fife LBAP species.

**Table 11.1: Fife LBAP Species**

Scientific Name	Common Name
<i>Helicella itala</i>	Heath snail
<i>Boloria selene</i>	Small pearl-bordered fritillary butterfly
<i>Cicindelidae</i> sp.	Tiger beetle
<i>Bombus</i> sp.	Bumble bee

11.1.4 Table 11.2 lists the 22 terrestrial invertebrates which have been designated as LBAP species for Edinburgh.

**Table 11.2: Edinburgh LBAP Species**

Scientific Names	Common Name
<i>Aelurillus v-insignitus</i>	Jumping spider
<i>Ampedus balteatus</i>	Click beetle sp.
<i>Boloria selene</i>	Small Pearl-bordered fritillary butterfly
<i>Capperia britannodactyla</i>	Plume moth
<i>Cecilioides acicula</i>	Blind white snail
<i>Coccinella hieroglyphica</i>	Hieroglyphica ladybird
<i>Criomorphus moestus</i>	Planthopper sp.
<i>Euheptaulacus sus</i>	Dung beetle sp.
<i>Glyphipterix minorella</i>	Micro-moth
<i>Hardya melanopsis</i>	Leafhopper sp.
<i>Lampronia fuscata</i>	Micro-moth sp.

Scientific Names	Common Name
<i>Longitarsus ganglbaueri</i>	Flea beetle sp.
<i>Pipiza luteitarsis</i>	Hoverfly sp.
<i>Pirata piraticus</i>	Wolf spider sp.
<i>Polyommatus icarus</i>	Common blue butterfly
<i>Psyllides hyoscyami</i>	Henbane flea beetle
<i>Pyrrhosoma nymphula</i>	Large red damselfly
<i>Stegana coleoprata</i>	Drosophilid fly sp.
<i>Tetramorium caespitum</i>	Ant sp.
<i>Tipula gimmerthali</i>	Crane fly sp.
<i>Truncatellina cylindrica</i>	Cylindrical whorl snail
<i>Zygaena filipendulae</i>	Six-spot burnet moth

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- 11.1.5 Table 11.3 lists the 26 terrestrial invertebrates have been designated as LBAP species for Midlothian area.

**Table 11.3: West Lothian LBAP Species**

Scientific Name	Common Name
<i>Atemelia torquatella</i>	Ermine moth
<i>Coenonympha tullia</i>	Large heath butterfly
<i>Lampronia fuscata</i>	Micro-moth sp.
<i>Phyllonorycter strigulatella</i>	Micro-moth sp.
<i>Xylena exsoleta</i>	Sword grass moth
<i>Acrotrichis lucidula</i>	Featherwing beetle
<i>Apteropeda globosa</i>	Leaf beetle sp.
<i>Curculio villiosus</i>	Weevil sp.
<i>Judolia sexmaculata</i>	Longhorn beetle sp.
<i>Luperus flavipes</i>	Leaf beetle sp.
<i>Sternus niveus</i>	Rove beetle sp.
<i>Tropiphorus terricola</i>	Weevil sp.
<i>Aphrodes albiger</i>	Leafhopper sp.
<i>Dicranotropis divergens</i>	Planthopper sp.
<i>Stiroma bicarinata</i>	Planthopper sp.
<i>Helius pallirostris</i>	Cranefly sp.
<i>Limnophila pulchella</i>	Cranefly sp.
<i>Limnophila verralli</i>	Cranefly sp.
<i>Limonia trivittata</i>	Cranefly sp.
<i>Molophilus corniger</i>	Cranefly sp.
<i>Neoascia geniculata</i>	Cranefly sp.
<i>Rhamphomyia obscura</i>	Dancefly sp.
<i>Tipula gimmerthali</i>	Cranefly sp.
<i>Tipula pseudovariipennis</i>	Cranefly sp.
<i>Dicrostema gracilicornis</i>	Sawfly sp.
<i>Phylloclpa excavate</i>	Snail sp.

- 11.1.6 TAPIF EIC and LWIC biodiversity record centres were contacted for information regarding statutory or locally designated sites, and for a rare species inventory search.
- 11.1.7 Notable species in Fife are those species which are either LBAP or UKBAP species, or those that appear on the Species of Conservation Concern (SoCC) list.
- 11.1.8 TAPIF EIC contained no records of statutorily protected species of terrestrial invertebrates and contained five records of notable species within the Fife area (Table 11.4).

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**Table 11.4: TAPIF EIC Notable Records of Terrestrial Invertebrates**

Scientific Name	Common Name	Location	International/National Status	Scottish Status	Fife Status
<i>Bombus terrestris</i>	Buff-tailed bumble bee	Fife	-	-	LBAP
<i>Bombus pratorum</i>	Early bumble bee	Fife	-	-	LBAP
<i>Bombus lapidarius</i>	Large red tailed bumble bee	Fife	-	-	LBAP
<i>Bombus sp.</i>	Bumble bee	Fife	-	-	LBAP
<i>Cupido minimus</i>	Small blue butterfly	Fife	-	-	LBAP

- 11.1.9 The LWIC holds data for statutory and notable species in the Lothian area (Table 11.6).
- 11.1.10 The LWIC contained no records of statutorily protected species of terrestrial invertebrates and contained 20 records of notable species within the Lothian area (Table 11.6).

#### Scottish Biodiversity List

- 11.1.11 The Scottish Biodiversity List is a list of flora, fauna and habitats considered by the Scottish Ministers to be of principal importance for biodiversity conservation. The publication of the SBL satisfies the requirements of Section 2(4) of The Nature Conservation (Scotland) Act 2004. Scottish Biodiversity List Section 4 (SLB S4) species are present in 5 or fewer 10km squares or sites in Scotland.
- 11.1.12 The data search showed that there was one record of a statutorily protected species under the WCA 1981 (as amended), that of northern brown Argus butterfly (*Aricia artaxerxes*) within NT17 in 1994. In addition, there were six records of LBAP terrestrial invertebrate species within the five 10km squares making up the study area and 22 other species with notable designations (Table 11.7).
- 11.1.13 The above data search was used to produce a table of potential invertebrates of significance. (Table 11.5). The known habitat requirements of these species were used to assess the potential importance of the habitats within the 500m study area, with particular reference to the eight specific survey sites (Appendix A10.3; Section 11.2 (Survey of Terrestrial Invertebrates) Table 11.1). Only those records made since 1987 of protected and notable species were used to evaluate sites.

#### Terrestrial Invertebrates Survey

##### Sites

- 11.1.14 Although the study area passes predominately through areas of intensive agricultural use, the area does contain a range of habitats that are potentially valuable for terrestrial invertebrates. The following section presents a description of the eight areas of habitat within the study area (Figure 10.10a-c) which, from the desk study, could be expected to support important invertebrate populations. These sites were each evaluated by a field visit to assess the quality of the habitats for invertebrate populations but no systematic recording of species took place. In the present study, a combination of both species and habitat assessment was employed to assess habitat value (Appendix A10.3: Section 11.3 (Terrestrial Invertebrate Habitat Assessment)). The criteria used to assess habitats are contained in Appendix A10.3, Section 11.2 (Survey of Terrestrial Invertebrates), Table 11.2).

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#### Site 1: St. Margaret's Hope Wood and St. Margaret's Marsh SSSI

- 11.1.15 The site (NT 12400 81000) consists of a mosaic of habitats including mixed plantation, semi-natural woodland with patches of relic woodland, maritime cliff rock, saltmarsh, mesotrophic grassland and reed bed.
- 11.1.16 St. Margaret's Hope Wood consists of mixed plantation and semi-natural woodland of sycamore, pedunculate oak and holly with acid ground flora including wavy hair grass and bluebell. The semi-natural woodland forms part of the grounds of an old house and contains significant exotic plantings.
- 11.1.17 The maritime cliff face consists of patches of calcareous grassland and rock habitats containing a range of species including wild onion, dropwort, wild thyme, oxeye daisy, heath grass, biting stonecrop, and bloody crane's-bill. A coastal fringe of pedunculate oak scrub with Scots lovage is found along the lowest rocks.
- 11.1.18 St. Margaret's Marsh SSSI consists of a species poor saltmarsh whose lower zones are dominated by common saltmarsh grass and glasswort, with red fescue and saltmarsh rush (*Juncus gerardii*) communities dominating the mid to upper marsh (SNH, 2008b).
- 11.1.19 The northern section of the site is dominated by a reedbed monoculture of *common reed* which contains a small area of open water. The reedbed is bordered to the east by a fringe of tall ruderals and scrub species of hawthorn, gorse, goat willow and bramble. The saltmarsh and reedbed habitats are separated from the sea wall by a thin strip of mesotrophic coastal grassland.
- 11.1.20 The mosaic of habitats has the potential to provide suitable conditions for a range of nationally and locally significant species. The Hymenopterans may be found throughout the woodland, scrub, grassland and marsh areas providing suitable habitats for buff tailed-bumble bee, common carder bee, early bumble bee, large red tailed bumble bee, small garden bee, Fabricius' nomad bee, and the wall mason wasp. The maritime cliff rock contains areas of bare soil and rock which provide potential suitable nesting habitat for *Evagetes crassicornis* and *Andrena helvola*.
- 11.1.21 The reedbed areas provide potentially suitable habitat for the large red damselfly with the sheltered moist scrub areas providing potential habitat for *Oxychilus helveticus*, the lunar hornet moth, the pyralid moth and a crane fly (*Limonia trivittata*).

#### Site 2: Ferry Hill SSSI

- 11.1.22 Ferry Hills (NT 12800 81100) is located to the north of North Queensferry. The site is bounded by the A90 to the west and comprises lowland calcareous grassland, secondary woodland, scrub, open water, pond, mire and marsh.
- 11.1.23 The Ferry Hills grasslands support a species-rich, unimproved calcicolous grassland habitat, on thin soils overlying base-rich igneous basalt rocks. The grasslands are dominated by red fescue, common bent and sweet vernal-grass, with the eastern section containing patches of semi-improved acid grassland.
- 11.1.24 The Ferry Loch pond forms part of a seasonally-flooded basin mire, dominated by marsh cinquefoil and bottle sedge along with lesser spearwort, marsh speedwell and small sweet-grass, with sphagnum towards the centre of the pond.
- 11.1.25 The area to the south of the pond is dominated by gorse interspersed with patches of herb-rich grassland, with the northern section of the site containing large patches of tall ruderals and scrub including gorse, holly, bramble and rosebay willowherb.
- 11.1.26 An old railway cutting bisects the SSSI, and is dominated by scrub including whitebeam, sycamore, hawthorn, rowan and tutsan. The ground layers provide a range of suitable food plants for

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terrestrial invertebrates including perforate St. John's-wort, pignut, foxglove, cowslip, devil's-bit scabious and common dog-violet, with bell heather found on rock faces.

- 11.1.27 This site provides potentially suitable habitats for several species of national and local significance. The grassland habitat may support several Hymenopterans including *Andrena alfkenella*, *Anthophora furcata*, buff tailed-bumble bee, common carder bee, early bumble bee, large red tailed bumble bee, small garden bee, and white-tailed bumble bee. Other species found within the grassland areas would include *Apteropeda globosa*, *Dicranotropis divergens* and the common blue butterfly.
- 11.1.28 The secondary woodland and small patches of scrub would provide suitable habitats for *Luperus flavipes*, *Tropiphorus terricola*, *Sesia bembeciformis* and *Udea prunalis*, while the large red damselfly and *Pirata piraticus* may be found in areas around the pool, marsh and mire.

#### Site 3: Dundas Wood North including Echline Strip

- 11.1.29 The north of the Dundas Estate (NT 12800 76900) is bordered by two mixed plantation shelter belts, interspersed with fields under intensive agricultural use. The Echline strip is a long established mixed plantation of conifer (10%) and broad-leaved (90%) trees, including ash and sycamore, occasional lime, horse chestnut, yew, beech and pedunculate oak. Elm, alder, wild cherry and silver birch are rare with dense stands of rhododendron found throughout. The ground flora is poor including common nettles, creeping buttercup, germander speedwell, and field forget-me-knot. Broad-leaved willowherb, dog's mercury, red campion, hedge woundwort are found throughout these areas. Throughout the woodland can be found standing and fallen dead timber with the remains of an old building to the southwest.
- 11.1.30 To the northwest of Dundas Home Farm, a mature shelter belt of broad-leaved plantation is located containing mainly ash and sycamore, with common lime, horse chestnut and Scots pine, pedunculate oak, beech and wild cherry. Several mature trees have standing dead timber, with fallen dead timber throughout the area. The poor shrub layer contains elder and bramble with the ground flora dominated by common nettle, with abundant cock's-foot, frequent false oat-grass and cleavers, and occasional curled dock (*Rumex crispus*), cow parsley, wood avens and broad-leaved dock.
- 11.1.31 A pond (Dundas Home Farm NT 12400 77300) was recorded in the section, 2.5mx2.5m, with steep sides and covered with duckweed.
- 11.1.32 Dundas Home Farm to the south is bordered by a large area of mixed plantation of sycamore, beech, pedunculate oak, and lime in addition to individuals of yew with small patches of rhododendron throughout. The canopy is closed with a poor shrub and field layer.
- 11.1.33 The plantation woodlands and scrub sections may provide potentially suitable habitat for national and locally significant species including Coleopterans *Luperus flavipes*, *Tropiphorus terricola* and the Lepidopteran lunar hornet moth. The Hymenopterans including buff tailed-bumble bee, common carder bee, early bumble bee, large red tailed bumble bee, small garden bee, white-tailed bumble bee, may use the woodland fringe, feeding on suitable food plants from scrub and ground flora. Several species may use the dead wood habitats for nesting including *Ancistrocerus parietum* and *Ectemnius continuus*. The Mollusc *Oxychilus helveticus* may inhabit the damp sheltered sections with *Judolia sexmaculata* using the dead wood within the plantation woodlands.

#### Site 4: Dolphington Burn Wood

- 11.1.34 The site (NT 13400 76400) consists of several habitats including mixed woodland, plantation, scrub, wet woodland, mature standard trees, marsh, pond, drainage ditch and Dolphington Burn and areas of tall ruderals and short ephemeral vegetation.

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- 11.1.35 The northern section contains mixed woodland of sycamore, Scots pine and beech, which form a dense canopy. The ground flora is poor and is dominated by common nettle and dog's mercury, with creeping buttercup, wood avens and broad buckler-fern. Some areas of the woodland contain plantations, which are old in origin and provide several mature ash trees. These sections contain significant amounts of standing and fallen dead timber. The Dolphington Burn passes west to east through the woodland, with steep sides and poor marginal vegetation. To the north of the burn, a single pond is found, surrounded by willow and alder scrub. The southern section of the woodland is coniferous plantation of Scots pine, other pine species and larch.
- 11.1.36 To the west of the broad-leaved woodland is a large section of marsh, formed from a drainage ditch which runs through the woodland from north to south. The area is bordered by scrub of willow, alder and silver birch with the field layer dominated by meadowsweet, jointed rush, hard rush and water forget-me-not. The wetter sections are dominated by bulrush with drier sections containing tall ruderals including willowherbs and umbellifers.
- 11.1.37 The woodland is bordered in the east by an area of tall ruderals and short ephemeral vegetation.
- 11.1.38 This site is connected in the north, through a mature shelter belt, to a small area of old plantation, adjacent to the site of a former old road. The woodland consists of mainly beech and sycamore, with several mature trees having standing dead timber and frequent fallen dead wood. The shrub layer contains elder and bramble with a ground flora of common nettle, rosebay willowherb, creeping buttercup, herb robert, field forget-me-not, ragwort, thyme-leaved speedwell, bluebell and broad-leaved helleborine.
- 11.1.39 The plantation woodlands and scrub sections may provide potentially suitable habitat for national and locally significant species including *Luperus flavipes*, *Tropiphorus terricola* and lunar hornet moth, with the wet woodland areas providing suitable habitat for the *Oxychilus helveticus* and *Limonia trivittata*. The marsh sections may provide suitable habitat conditions for large red damselfly, and food plants for buff tailed-bumble bee, common carder bee, early bumble bee, large red tailed bumble bee, small garden bee, white-tailed bumble bee.
- 11.1.40 These Hymenopterans may also use the woodland fringe, feeding on suitable food plants from scrub and ground flora. Several species may use the dead wood habitats for nesting including *Ancistrocerus parietum* and *Ectemnius continuus*. The Mollusc *Oxychilus helveticus* and wolf spider may inhabit the damp sheltered sections with *Judolia sexmaculata* using the dead wood within the plantation woodlands.
- 11.1.41 The semi improved grassland contains a range of tall ruderal and short ephemeral plant species which may provide suitable food plants for several Hymenopterans including buff tailed-bumble bee, common carder bee, early bumble bee, large red tailed bumble bee, small garden bee, white-tailed bumble bee, with areas of bare soil providing potential suitable nesting habitat for *Evagetes crassicornis*. The grassland and scrub fringe provides potential suitable habitat for common blue, lunar hornet moth and the pyralid moth.

#### Site 5: Ross's Plantation

- 11.1.42 Ross's plantation (NT 10500 74700) is a mixed plantation of mainly young structure. The canopy is dominated by Norway spruce with sections of broad-leaved woodland dominated by sycamore and ash, with elm, aspen and chestnut being rare. Sections of the plantation are planted up with young oak and ash with the poor scrub layer containing gorse, honeysuckle and hawthorn. The dense canopy generally provides a poor ground cover.
- 11.1.43 These habitats may be potentially suitable for national and locally significant species including the Coleopterans *Luperus flavipes* and *Apteropeda globosa*; Hemiptera *Stiroma bicarinata*, Lepidopterans lunar hornet moth *Sesia bembeciformis* and the pyralid moth *Udea prunalis*; Hymenopterans buff-tailed bumble bee, large red bumble bee, *Nomada leucophthalma* and red mason bee *Osmia rufa*.



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- 11.1.44 The Niddry Burn runs through the plantation in a southwest to east direction, with a channel width 1m-1.5m and slow flow rate. The area adjacent to the Burn is marshy and is dominated by tall ruderals including meadowsweet and hogweed with drier sections being dominated by false oat-grass, with wood avens, red campion, cleavers, and male fern.
- 11.1.45 The marsh and tall ruderals have the potential to support several national and locally significant species including the Coleopteran *Apteropeda globosa*, several *Bombus* species, the large red damselfly, the wolf spider and the Dipteran *Limonia trivittata*.

#### Site 6: Parkland, West Kirkliston

- 11.1.46 The site (NT 11800 74300) is predominately amenity parkland, located to the east of the M9. It contains a mosaic of habitats including amenity woodland, mesotrophic grassland, open water, wet grassland, marsh and the Swine Burn.
- 11.1.47 The amenity woodlands are of varied age and species composition including silver birch, rowan, beech, cherry, field maple and hawthorn. Several sections contain mature sycamore trees including sections of standing dead timber. The varied age and species composition provides a complex structural diversity. Each woodland compartment is bordered by a fringe of tall ruderal plants and short ephemeral vegetation, which extend into areas of amenity grassland.
- 11.1.48 The Swine Burn passes through the site from west to east. Its course is impounded forming a small lake with poor marginal vegetation, marsh and wet woodland. The marsh contains jointed rush, soft rush, meadow sweet with bulrush in the wetter sections. The marsh is bordered by alder/willow carr which grades into mature woodland of mainly pedunculate oak on the adjacent slopes.
- 11.1.49 The site is potentially suitable for a number of national and locally important Coleoptera including *Judolia sexmaculata*, *Luperus flavipes* and *Apteropeda globosa*, Lepidopterans lunar hornet moth, the pyralid moth (*Udea prunalis*) and Dipteran *Limonia trivittata* and *Dicranotropis divergens*.

#### Site 7: Lindsay's Craigs

- 11.1.50 Lindsay's Craigs (NT 11400 74300) is a mosaic of habitats comprising poor semi improved grassland, scrub, small sections of rocky outcrops, standard trees with standing dead timber, mixed woodland, wet woodland, and riparian woodland.
- 11.1.51 The northern section of the site consists of a poor semi-improved grassland dominated by perennial rye grass and annual meadow grass (*Poa annua*), with the field margins being locally dominated by false oat-grass, Yorkshire fog, cocks foot, and common nettle, with patches of tall ruderals including broad leaved willowherb. The central section of the field contains a small patch of scrub of gorse, bramble, hawthorn and elder.
- 11.1.52 The mixed plantation contains 85% broad-leaved species of a dense canopy of sycamore, ash and wych elm with beech being frequent throughout and 15% yew, Scots pine and rare coastal redwood. Several mature trees reveal dead standing timber. Throughout the northern boundary of the woodland occasional elder, snowberry and rhododendron are found. Within the woodland the ground cover is poor with broad buckler-fern, common nettle, wood avens and bluebells.
- 11.1.53 The Niddry Burn runs through the woodland from west to south, through a channel of 1.5m-4m in width, of a slow flow rate and substrate of cobbles and pebbles. The aquatic vegetation is poor consisting of green algae with marginal vegetation of mainly rosebay willowherb.
- 11.1.54 The poor semi-improved grassland and tall ruderal sections may provide suitable habitats for national and locally significant Hymenoptera including buff tailed-bumble bee, common carder bee (*B. Thoracombus pascuorum*), early bumble bee (*B. Pyrobombus pratorum*), large red tailed bumble bee (*B. Melanobombus lapidarius*), small garden bee (*B. Megabombus hortorum*), and

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white-tailed bumble bee (*B. Bombus lucorum*). Several small patches of bare soil and rocky outcrops have the potential to support *Andrena helvola* and *Nomada fabriciana*.

- 11.1.55 The mixed plantation could potentially provide suitable habitat for Coleoptera, Hymenoptera, Mollusca, Aranaea, Diplopoda, Dermaptera and Hemiptera. The damp woodlands and dead timber may provide suitable habitats for significant species including *Judolia sexmaculata*, and *Oxychilus helveticus*.

#### Site 8: River Almond to the south of Kirkliston

- 11.1.56 The site (NT 12700 74400) forms part of the riparian zone of the River Almond. It is bordered to the south by intensively farmed fields and to the north by the village of Kirkliston.
- 11.1.57 The river is approximately 15m wide and 30cm deep with a fast flow and a cobble substrate. The river banks are 3m-10m in width and are dominated by tall herbs including Russian comfrey (*Symphytum x uplandicum*), butterbur (*Petasites hybridus*), Himalayan balsam (*Impatiens glandulifera*), Japanese knotweed, cow parsley, hogweed, tansy (*Tanacetum vulgare*), red campion, meadow buttercup, dame's violet (*Hesperis matronalis*) and pink purslane (*Claytonia sibirica*) on the areas of sandy bank. There is no floating vegetation and marginal vegetation is fragmented with stands of common reed.
- 11.1.58 The sections of bank with tall herbs and ruderals may provide potentially suitable habitats for national and locally significant species including the Coleopterans *Luperus flavipes*, *Apteropeda globosa* and the Lepidopteran lunar hornet moth. These plants also offer suitable food plants for several Hymenopterans including buff tailed-bumble bee, common carder bee, early bumble bee, large red tailed bumble bee, small garden bee, and white-tailed bumble bee.

## 11.2 Summary of Results

### Habitats

- 11.2.1 Within the study area the dominant land use is for agriculture with relatively small amounts of semi-natural habitats. Mixed plantation woodlands of various ages and composition are found throughout the area and form the next dominant habitat, with areas of conifer plantation and broad-leaved plantation recorded frequently. Several small woodlands provided significant amounts of standing and fallen dead timber. St. Margaret's Hope Wood provides an example of long-established woodland of plantation origin with dwarf pedunculate oak.
- 11.2.2 Several watercourses including the Swine Burn, Niddry Burn, Dolphington Burn and various drainage ditches pass through the study area, in addition to several small pools and lakes which are often associated with small sections of wet grassland, marsh and alder/willow carr. The River Almond passes through the southern section of the study area and contains areas of riparian vegetation suitable for terrestrial invertebrates.
- 11.2.3 The grasslands are mainly semi-improved to poor semi-improved, although there are small patches of acid rich flora in fields on the west of Dundas Estate and Ferry Hill SSSI area. A section of coastal grassland on maritime cliff is found on the coast below St. Margaret's Hope Wood adjacent to a species poor saltmarsh with reed beds.

### Sites

- 11.2.4 Site 1 St. Margaret's Marsh was considered to provide habitat for large red damselfly and species from the Order Hymenoptera.
- 11.2.5 Site 2 Ferry Hills SSSI was considered to provide habitat for large red damselfly and species from the Orders Hymenoptera and Coleoptera.

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- 11.2.6 Site 3 Dundas Wood north including Echline Strip was considered to provide potential habitat for a number of nationally and locally significant species from the Orders Coleoptera, Lepidoptera, Hymenoptera and Mollusca.
- 11.2.7 Site 4 Dolphington Burn Wood was considered to provide habitat for the Wolf spider as well as species from the Orders Hymenoptera and Mollusca.
- 11.2.8 Site 5 Ross's Plantation was considered to provide potential habitat for a number nationally and locally significant species from the Orders Coleoptera, Hemiptera, Lepidoptera and Hymenoptera.
- 11.2.9 Site 6 Parkland, West of Kirkliston was considered to provide potential habitat for a number of nationally and locally significant species from the Orders Coleoptera and Diptera.
- 11.2.10 Site 7 Lindsay's Craigs was considered to provide potential habitat for a number of nationally and locally significant terrestrial invertebrate species from the Orders Hymenoptera, Coleoptera, Mollusca, Aranaea, Diplopoda, Dermaptera and Hemiptera.
- 11.2.11 Site 8 River Almond to the south of Kirkliston was considered to provide potential habitat for a number of nationally and locally significant species from the Orders Coleoptera and Lepidoptera. It was also considered to provide food plants for species from the order Hymenoptera.

**Table 11.5: Notable Species in the Lothians**

Category	Taxa	Species
Red Data Book Category 3 (RDB 3) - Rare	Small populations in Great Britain that are not at present endangered or vulnerable, but are at risk. Usually localized within restricted geographical areas or habitats or are thinly scattered over a more extensive range.	Estimated to exist in only fifteen or fewer 10km squares. Criteria may be more relaxed where populations are likely to exist in over fifteen 10km squares of the National Grid but occupy small areas of especially vulnerable habitat (Shirt, 1987).
Nationally Scarce Category A - Notable A (Na)	Do not fall within RDB categories but which are uncommon in Great Britain. Thought to occur in 30 or fewer 10km squares or, for less well recorded groups, within seven or fewer vice-counties (Eversham, 1983).	-
Nationally Scarce Category B - Notable B (Nb)	Do not fall within RDB categories but which are uncommon in Great Britain. Thought to occur in between 31 and 100 10km squares or for less well recorded groups, between eight and twenty vice-counties.	-
Nationally Scarce - Notable (N)	Do not fall within RDB categories but which are uncommon in Great Britain. Thought to occur in between 16 and 100 10km squares.	Often too poorly known for their status to be more precisely estimated.

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**Table 11.6: Lothian Wildlife Information Centre - Notable Records of Terrestrial Invertebrates**

Scientific Name	Common Name	Location	Grid Reference	Date	Conservation Status	Distance From Proposed Scheme
<i>Arion hortensis</i>	Roundback Slug	Hopetoun Estate	NT 08800 78900	06.07.79	SBL S4	2.55km
<i>Aphrodes albiger</i>	Leafhopper	Hopetoun Estate	NT 08800 78900	25.08.83	Nb	2.55km
<i>Stiroma bicarinata</i>	Planthopper	Faucheldean	NT 08100 74100	28.06.95	Nb, N	5.41km
<i>Dicranotropis divergens</i>	Planthopper	Faucheldean	NT 08100 74100	28.06.95	Nb, N	5.41km
<i>Judolia sexmaculata</i>	Longhorn Beetle	Hopetoun Estate	NT 08800 78900	Unknown	Na	2.55km
<i>Luperus flavipes</i>	Leaf Beetle	Hopetoun Estate	NT 08800 78900	Unknown	Nb	2.55km
<i>Apteropeda globosa</i>	Leaf Beetle	Hopetoun Estate	NT 08800 78900	Unknown	Nb	2.55km
<i>Tropiphorus terricola</i>	Weevil	Hopetoun Estate	NT 09800 79100	18.08.94	Nb	1.81km
<i>Sesia bembeciformis</i>	Lunar Hornet Moth	Philipstoun Muir Fawnspark	NT 06000 76000	20.08.88	Na	3.9km
<i>Xylena exsoleta</i>	Sword grass	Hopetoun Estate	NT 08800 78900	Unknown	Nb, PS, SBL	2.7km
<i>Syngrapha interrogationis</i>	Scarce Silver Y	Hopetoun Estate	NT 08800 78900	1977-1987	Nb	2.7km
<i>Xestia ditrapezium</i>	Triple-spotted Clay	Hopetoun Estate	NT 08800 78900	Unknown	-	2.7km
<i>Melanchnra persicariae</i>	Dot Moth	Hopetoun Estate	NT 08800 78900	1977-1987	-	2.7km
<i>Atethmia centrargo</i>	Centre-barred Sallow	Hopetoun Estate	NT 08800 78900	1977-1987	-	2.7km
<i>Mormo maura</i>	Old Lady	Hopetoun Estate	NT 08800 78900	1977-1987	-	2.7km
<i>Udea prunalis</i>	Pyralid Moth	Philipstoun Muir Fawnspark	NT 06000 76000	20.08.88	Na	3.94km
<i>Limonia trivittata</i>	Crane-fly	Faucheldean	NT 08100 74100	28.06.95	N	2.24km
<i>Steatoda bipunctata</i>	Comb-footed spider	Hopetoun Estate	NT 08500 79300	11.06.87	-	2.7km
<i>Theridion varians</i>	Comb-footed spider	-	NT 08000 78000	1905	-	2.85km
<i>Nuctenea umbratica</i>	Orb-weaver spider	Hopetoun Estate	NT 08000 79000	18.09.87	-	3.08km

PS-UK Biodiversity Action Plan Priority Species

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**Table 11.7: NBN Notable Records of Terrestrial Invertebrates**

Scientific Name	Common Names	NBN 10Km Square
<i>Judolia sexmaculata</i>	A longhorn beetle	NT08
<i>Luperus flavipes</i>	Leaf Beetle	NT08
<i>Apteropeda globosa</i>	Leaf Beetle	NT08
<i>Boloria selene</i>	Small Pearl Bordered Fritillary butterfly	NT18, NT19
<i>Polyommatus icarus</i>	Common Blue butterfly	NT07, NT17, NT19
<i>Sesia bembeciformis</i>	Lunar Hornet Moth	NT08
<i>Udea prunalis</i>	Pyralid Moth	NT08
<i>Bombus (Bombus) terrestris</i>	Buff-Tailed Bumble Bee	NT07, NT08, NT17, NT18, NT19
<i>Bombus (Thoracombus) pascuorum</i>	Common Carder Bee	NT08, NT17, NT18, NT19
<i>Bombus (Pyrobombus) pratorum</i>	Early Bumble Bee	NT17, NT19
<i>Bombus (Psithyrus) bohemicus</i>	Gipsy Cuckoo Bee	NT17, NT19
<i>Bombus (Melanobombus) lapidarius</i>	Large Red Tailed Bumble Bee	NT07, NT08, NT18
<i>Bombus (Megabombus) hortorum</i>	Small Garden Bumble Bee	NT17, NT18, NT19
<i>Bombus (Bombus) lucorum</i>	White-Tailed Bumble Bee	NT17, NT18, NT19
<i>Andrena (Andrena) helvola</i>	n/a	NT08, NT18
<i>Nomada fabriciana</i>	Fabricius' Nomad Bee	NT08, NT18
<i>Ancistrocerus parietum</i>	Wall Mason Wasp	NT08, NT18
<i>Andrena (Micrandrena) alfenella</i>	n/a	NT08
<i>Ectemnius (Hypocrabro) continuus</i>	n/a	NT08
<i>Ectemnius (Metacrabro) cephalotes</i>	n/a	NT08
<i>Anthophora (Clisodon) furcata</i>	Fork Tailed Flower Bee	NT08
<i>Nomada leucophthalma</i>	n/a	NT08
<i>Osmia (Osmia) rufa</i>	Red Mason Bee	NT08
<i>Lasioglossum (Evylaeus) villosulum</i>	Shaggy Mining Bee	NT08

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Scientific Name	Common Names	NBN 10Km Square
<i>Oxychilus (Oxychilus) helveticus</i>	Glossy Glass Snail	NT08
<i>Labia minor</i>	Lesser Earwig	NT07, NT08
<i>Limonia trivittata</i>	Cranefly	NT08
<i>Stiroma bicarinata</i>	Planthopper	NT08
<i>Dicranotropis divergens</i>	Planthopper	NT08

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Table 11.8: Potential Terrestrial Invertebrate Species of Significance

Species Name	Common Name	Conservation Status	Habitat Requirements
<b>Coleoptera</b>			
<i>Judolia sexmaculata</i>	Longhorn beetle	Na	Dead wood.
<i>Luperus flavipes</i>	Leaf beetle	Nb	Generalist found in broad-leaved woodland, scrub, parkland and heath
<i>Apteropeda globosa</i>	Leaf beetle	Nb	Generalist found in grassland, wetland and woodland
<i>Tropiphorus terricola</i>	Weevil	Nb	Woodland, associated with dog's mercury ( <i>Mercurialis perennis</i> )
<b>Lepidoptera</b>			
<i>Polyommatus icarus</i>	Common blue	Edinburgh LBAP	Generalist provided there is bird's-foot trefoil ( <i>Lotus corniculatus</i> ) for larvae to feed.
<i>Boloria selene</i>	Small Pearl-bordered fritillary	Edinburgh LBAP	Wet woodland and moorland. Larvae feed on marsh violet ( <i>Viola palustris</i> ).
<i>Sesia bembeciformis</i>	Lunar hornet moth	Na	Adults found in woodland and damp grassland. Larvae feed on willow and sallow ( <i>Salix</i> sp.).
<i>Udea prunalis</i>	Pyralid moth	Na	Associated with blackthorn ( <i>Prunus spinosa</i> ) but feeds on a wide range of plants
<b>Hymenoptera</b>			
<i>Bombus (Bombus) terrestris</i>	Buff-tailed bumble bee	Fife LBAP	Found in a range of habitats including grassland and woodland edge. Short tongued bees preferring shallow flowers.
<i>Bombus (Thoracombus) pascuorum</i>	Common carder bee	Fife LBAP	Found in a wide range of habitats, less common on marshes and bogs. Long tongued species that can feed on deep flowers.
<i>Bombus (Pyrobombus) pratorum</i>	Early bumble bee	Fife LBAP	Found in a wide range of habitats, less common on marshes and bogs. Short tongued bees preferring shallow flowers.
<i>Bombus (Psithyrus) bohemicus</i>	Gipsy cuckoo bee	Fife LBAP	Nest parasite of <i>B. lucorum</i> .
<i>Bombus (Melanobombus) lapidarius</i>	Large red-tailed bumble bee	Fife LBAP	Found in a wide range of habitats, less common on marshes and bogs. Restricted distribution in Scotland. Short tongued bees preferring shallow flowers.
<i>Bombus (Megabombus) hortorum</i>	Small garden bumble bee	Fife LBAP	Found in a wide range of habitats, less common on marshes and bogs and one of the most common species in woodland. Long tongued species that can feed on deep flowers.
<i>Bombus (Bombus) lucorum</i>	White-tailed bumble bee	Fife LBAP	Short tongued bees preferring shallow flowers. Found in a wide range of habitats.
<i>Andrena (Andrena) helvola</i>	n/a	SBL S4	Requires areas of bare soil for nesting.
<i>Nomada fabriciana</i>	Fabricius' nomad bee	SBL S4	Nest parasite of <i>Andrena</i> species.
<i>Ancistrocerus parietum</i>	Wall mason wasp	SBL S4	Generalist found in supra-littoral rock/sediment, bog, dwarf shrub heath, montane habitats, broad-leaved/mixed woodland, coniferous woodland, abandoned and derelict grassland, semi-natural grasslands and bracken, built-up areas and gardens. Nests in cavities.

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Species Name	Common Name	Conservation Status	Habitat Requirements
<i>Andrena (Micrandrena) alfenella</i>	n/a	RDB3	Associated with lowland grassland.
<i>Ectemnius (Hypocrabro) continuus</i>	n/a	SBL S4	Nests in rotten wood.
<i>Ectemnius (Metacrabro) cephalotes</i>	n/a	SBL S4	Generalist found in supra-littoral rock/sediment, bog, dwarf shrub heath, montane habitats, broad-leaved/mixed woodland, coniferous woodland, abandoned and derelict grassland, semi-natural grasslands and bracken, built-up areas and gardens. Nests in cavities.
<i>Evagetes crassicornis</i>	n/a	SBL S4	Nest in bare ground and soft rock/earth cliffs.
<i>Anthophora (Clisodon) furcata</i>	Fork-tailed flower bee	SBL S4	Nests in dead wood, feeds in meadows.
<i>Nomada leucophthalma</i>	n/a	SBL S4	Generalist found in broad-leaved woodland, abandoned grassland, semi-natural grassland, bracken.
<i>Osmia (Osmia) rufa</i>	Red mason bee	SBL S4	Generalist found in supra-littoral rock/sediment, bog, dwarf shrub heath, montane habitats, broad-leaved/mixed and coniferous woodland, arable and horticulture, improved grassland, abandoned and derelict grassland, semi-natural grasslands and bracken, fen, marsh and swamp, built-up areas, gardens.
<i>Lasioglossum (Evylaeus) villosulum</i>	Shaggy mining bee	SBL S4	Generalist found in supra-littoral rock/sediment, bog, dwarf shrub heath, montane habitats, broad-leaved/mixed and coniferous woodland, arable and horticulture, improved grassland, abandoned and derelict grassland, semi-natural grasslands and bracken, fen, marsh and swamp, built-up areas, gardens.
<i>Bombus (Pyrobombus) pratorum</i>	Early bumble bee	Fife LBAP	Generalist found in gardens, farmland and woodland edges. A short-tongued species preferring shallow flowers.
<b>Odonata</b>			
<i>Pyrrhosoma nymphula</i>	Large red damselfly	LBAP Edinburgh	Wetland, marsh areas.
<b>Aranea</b>			
<i>Pirata piraticus</i>	Wolf spider	Edinburgh LBAP	Damp habitats with mosses.
<b>Mollusca</b>			
<i>Oxychilus (Oxychilus) helveticus</i>	Glossy Glass Snail	SBL S4	Moist sheltered habitats.
<b>Dermaptera</b>			
<i>Labia minor</i>	Lesser earwig	SBL S4	Requires decaying compost or dung.
<b>Diptera</b>			
<i>Limonia trivittata</i>	craneflyCrane fly	N	Wet woodland.
<b>Hemiptera</b>			
<i>Stiroma bicarinata</i>	Planthopper	N, Nb	Woodland specialist.
<i>Dicranotropis divergens</i>	Planthopper	N, Nb	Grassland.



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## 11.3 River Habitat

### Consultation Information

- 11.3.1 No consultation information on river habitat features/characteristics/quality was provided for any of the watercourses identified in the study area. There are no reaches of conservation significance in the Swine Burn. The Niddry Burn runs through a SINC, with adjacent habitats designated as an LWS. The River Almond is a designated SINC (for its adjacent habitat mosaic and sand martin breeding) and a LWS, designated for the river, banks and surrounding habitat.
- 11.3.2 In terms of SEPA's water quality classifications (based on the most recent available data (SEPA, 2006), Swine Burn is A2 (good) (Table 11.9 with SEPA criteria shown in Table 11.15). Figures for the water classification of Niddry Burn in 2006 are unavailable. The River Almond is classified as B (fair). This classification has been assigned based on water biology, chemistry, aesthetics and toxicity assessments and are explained further in Chapter 9 (Water Environment).
- 11.3.3 Although water quality does not directly impact on physical features such as bed and bank material, bank top land use and structure, it does influence in-channel fauna and flora. In addition to water quality, there is likely to be some correlation between channel morphology and aesthetics.
- 11.3.4 The Water Framework Directive (WFD) classifications vary between sites (Table 11.9). Swine Burn has been provisionally designated a heavily modified waterbody (HMWB) which infers that good ecological potential (GEP) has to be achieved by 2015 rather than good ecological status (GES).
- 11.3.5 The Niddry Burn and the River Almond have been classified as more natural and therefore will have to achieve GES. This classification is based on waterbodies at risk of failing to achieve objectives for the waters and habitats to which the objectives apply. The level of risk reflects the sensitivity of the waterbody to pressures and the magnitude of the pressure. Anthropogenic pressures include point/diffuse pollution, abstraction, morphology and alien species. Depending on SEPA's objectives, rivers at no risk from failing to meet GES may have the capacity to absorb some further modification, but alternatively preservation may be a priority.

**Table 11.9: SEPA Water Quality Class and WFD Overall Status Classification ([www.sepa.org.uk](http://www.sepa.org.uk))**

Watercourse	Site Reference	Description	SEPA Water Quality Classification (2006) <sup>a</sup>	WFD Overall Status (classified 2007) <sup>b</sup>
Swine Burn	JA08	Downstream of Humble Reservoir	A2 good	Not available
Swine Burn	JA09	Adjacent to M9 Junction 1A	A2 good	Not available
Niddry Burn	JA12	South of Lindsay's Craigs	Not available	Moderate
River Almond	JA14	Downstream of Maitland Bridge	B fair (rated C in 2005)	Poor
<sup>a</sup> SEPA (2006)				
<sup>b</sup> SEPA (published 2008)				

### Survey Results

- 11.3.6 The following section presents the field survey findings for each of the four sites (Figure 10.11), two along the Swine Burn, one along the Niddry Burn and one along the River Almond and the associated habitat modification scores (HMS).

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- 11.3.7 The River Habitat Survey (RHS) results and associated HMS have been assessed in terms of habitat value (Table 11.10).

**Table 11.10: Habitat Descriptions for RHS Sites**

Site	Represented Habitat Area	Value	Habitat Description
JA08	Swine Burn	Low	Significantly Modified (HMS 810) but exhibiting moderate morphological diversity and a variety of in-channel vegetation. Naturally constrained (bedrock) and artificially constrained (culverts) channel so limiting lateral adjustment.
JA09	Swine Burn	Low	Severely Modified (HMS 2145) with resectioned banks and an over-deepened channel in parts which reduces lateral connectivity. The Burn has been extensively realigned alongside the M9. Extensive shading of the channel.
JA12	Niddry Burn	Medium	Obviously Modified (HMS 250) with some toe reinforcements and a minor bridge and intensively managed adjacent land use. Overall, a fairly natural river displaying natural width-depth ratio and morphology, good floodplain connectivity and longitudinal continuity. Lack of trees on left bank but shading and overhanging boughs present.
JA14	River Almond	Low	Significantly Modified (HMS 720). Large river with historic modification but re-naturalising. Vegetated bars and good flow diversity evident. Alien species present.

#### **Swine Burn (JA08)**

- 11.3.8 The watercourse is fairly small (1m water width) and exhibits a relatively straight planform. The flow is regulated from the Humbie Reservoir upstream and the channel is narrowing through deposition of side bars creating a sinuous low flow channel.
- 11.3.9 The changes in substrate and local variations in gradient promote good flow diversity. There was limited channel shading from trees but substantial marginal and submerged channel vegetation.
- 11.3.10 Artificial features impacting this RHS site include roads and a railway and there were two culverts present. These short culverts under the railway and B9080 are unlikely to restrict migration routes of aquatic species. There were few other bed or bank modifications or protection, although a small area of cattle poaching was evident at the time of survey. An HMS of 810 reflects a significantly modified system (Environment Agency, 2003).
- 11.3.11 More detail of the RHS results and HMS for Swine Burn (JA08) are provided in Table 11.11.

#### **Swine Burn (JA09)**

- 11.3.12 Swine Burn has been extensively realigned alongside the M9 and partly over-deepened. The banks have been resectioned and reinforced in places and one culvert and one outfall are present. The Overton Road crossing is unlikely to limit the movement of aquatic species. Downstream of the RHS site is a 140m long, twin concrete box culvert under the M9 spur, which is known to be used by otters and is large enough not to restrict migratory aquatic species. In addition to the road, other identified include fly tipping. The HMS for this site is 2145 which infers a severely modified watercourse (Environment Agency, 2003).
- 11.3.13 The river flows through broad-leaved woodland which provides extensive shading to the channel and a complex vegetation structure on the banktop and bankface. On the right bank where suburban/urban land use is evident (M9 motorway) there is very limited vegetation on the banktop.
- 11.3.14 The bed appears armoured (consolidated) with gravels and cobbles but riffles are present providing shallower, faster flow amongst the slower, deeper flow. Exposed boulders and bedrock also promote a diverse flow. Bullheads were present at the time of survey.

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11.3.15 More detail of the RHS results and HMS for Swine Burn (JA09) are provided in Table 11.12.

#### **Niddry Burn (JA12)**

11.3.16 Niddry Burn has a fairly straight planform but exhibited a sinuous wetted channel with side bars, side channels and diverse flow types creating a variety of habitats. Discrete gravel deposits (shingle/shale) were also evident at the time of survey.

11.3.17 Land use comprised improved grassland on the left bank with isolated/scattered trees along the bank top. Tilled land dominated the land use on the right bank with some scrub and shrubs and occasional clumps of trees. There was some evidence of diseased alders.

11.3.18 The burn showed relatively few signs of modification; bank reinforcements were evident only adjacent to bridges and outfalls. Poached banks caused by livestock were recorded. The HMS score of 250 suggests the Burn is Obviously Modified (Environment Agency, 2003).

11.3.19 More detail of the RHS results and HMS for Niddry Burn (JA12) are provided in Table 11.13

#### **River Almond (JA14)**

11.3.20 The River Almond is a relatively large cobble bed river which has been resectioned and realigned in the past but is showing signs of re-naturalising. There are vegetated mid channel bars and point bars present and the flow type is varied.

11.3.21 The historic reprofiling of the banks and minor bank toe reinforcements adjacent to a road bridge result in a HMS of 720 which reflects a Significantly Modified watercourse.

11.3.22 Tall herbs/rank vegetation was abundant alongside the river amongst which Himalayan balsam and Japanese knotweed were identified. Tree-lining varied between semi-continuous on the right and occasional clumps on the left. Overhanging boughs, fallen trees and large woody debris were present.

11.3.23 More detail of the RHS results and HMS for River Almond is provided in Table 11.11.

## **11.4 Incidental Observations**

11.4.1 Otter spraints were recorded at all four sites suggesting that the rivers provide an important habitat to such wildlife. Bullhead was also identified in Swine Burn (JA9).

11.4.2 Himalayan balsam and Japanese knotweed were evident at the River Almond site and diseased alders were present along Niddry Burn.

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Table 11.11: RHS for Swine Burn (JA08)

Parameters	Description
Valley Form, Channel Dimensions, Bank Profile and Type and Artificial Features	Shallow vee valley with no flat valley bottom. Channel bankful width ave. 3m with water width of 1m. Banktop height 1.5m for left and right banks and bank material predominantly earth. Banks generally exhibited fairly steep profile with short lengths of gently sloping banks. Minor poaching on the left bank. Two culverts present and a minor pipe crossing. No other bank modification or protection evident.
Substrate, Channel Features and Flow	Channel substrate broadly comprised bedrock in the upstream section, cobbles in the middle and gravel and pebbles in the downstream section. Flow varies between rippled and smooth with occasional chute flow over the bedrock, 8 riffles and 7 pools and marginal deadwater observed. Side bars evident, mainly on left channel margin but occasionally on right margin. One vegetated mid channel bar evident in the uppermost spot check. Exposed boulders present.
Vegetation	Banktop and bank face vegetation structure predominantly simple along both banks. Isolated/scattered trees along the reach provided some overhanging boughs and channel shading. Riparian land use on the left bank comprised predominantly tilled land (50%) with improved/semi-improved grazing and tall herbs also present. Riparian vegetation on the right bank consisted of mainly tilled land (80%) with short lengths of tall herbs and broad-leaved woodland. Extensive in-channel vegetation included liverworts/mosses/lichens, emergent plants and filamentous algae. Submerged broad-leaved and fine leaved herbs present in one spot check.
Surrounding Land Use	Tilled land was extensive along the reach on both banks within 50m of banktop. Broad-leaved/mixed woodland, scrub and shrubs and tall herb/rank vegetation present on both banks, whilst improved/semi-improved grassland was only present on the left bank.
Features of Special Interest and Overall Characteristics	Side channel present. Potential road and rail impacts on the watercourse. Evidence of otters.
Habitat Modification Score	HMS 810 reflecting 2 culverts and minor poaching. Significantly Modified.

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### Appendix A10.4: Detailed Terrestrial and Freshwater Ecological Baseline Data

**Table 11.12: RHS for Swine Burn (JA09)**

Parameters	Description
Valley Form, Channel Dimensions, Bank Profile and Type and Artificial Features	Shallow vee valley with no flat valley bottom. Channel bank full width 2m on average with banktop heights of 2m and 2.5m on the left and right banks respectively. Both banks have been resectioned along the lower half of the site and comprise mostly earth. Reinforcements (whole bank and toe of bank) present but only recorded in two spot checks on right bank. One culvert present and an outfall/intake.
Substrate, Channel Features and Flow	Channel substrate was consolidated and consisted of mostly gravel with a third of the reach comprising a cobble bed. A bedrock bed was also present in two spot checks with a boulder substrate also evident in parts. Resectioning of the channel has been recorded in 60% of the spot checks. Smooth flow present within 70% of the spot checks whilst unbroken waves and rippled flow comprise the remainder. Chute flow was also recorded within the 500m reach and seven riffles and seven pools. Unvegetated side bars were present and also exposed boulders and vegetated bedrock/boulders.
Vegetation	Riparian land use on left bank comprised predominantly broad-leaved/mixed woodland (80%) with tall herbs and tilled land present. Bank top structure was complex with bank face structure exhibiting half complex and half simple structure. Right bank riparian land use of broad-leaved/mixed woodland in the upper section (40%) and suburban/urban in the lower section. Complex banktop and bankface structure were present within the broad-leaved/mixed woodland but a bare banktop and simple bankface structure evident where suburban/urban land use. Shading of channel and overhanging boughs were extensive throughout the reach with underwater trees, fallen trees and large woody debris present. Extensive in-channel vegetation included liverworts/mosses/lichens and filamentous algae.
Surrounding Land Use	Tall herb/rank vegetation was extensive within 50m of both bank tops with tilled land also extensive on the left bank and suburban/urban on the right bank. Natural broad-leaved/mixed woodland was present on both sides of the channel with a broad-leaved mixed plantation also evident on the left bank.
Features of Special Interest and Overall Characteristics	Debris dam present. Evidence of otters and bullhead observed. Major impacts include the road and fly tipped material.
Habitat Modification Score	HMS 2145 reflecting one culvert and outfall/intake and extensive resectioning and some bank reinforcements. Severely Modified.

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### Appendix A10.4: Detailed Terrestrial and Freshwater Ecological Baseline Data

**Table 11.13: RHS for Niddry Burn (JA12)**

Parameters	Description
Valley Form, Channel Dimensions, Bank Profile and Type and Artificial Features	Shallow vee valley with no flat valley bottom but fragmented natural terraces evident. Channel bank full width was 3m on average with water width of approximately 1.5m. Banktop heights of 0.75m for both banks. Both right and left banks were predominantly unmodified, comprising earth. An eroding cliff was present within one spot check on the right bank; stable cliffs were also observed. Reinforcements (rip rap or laid stone) only present in two spot checks and some cattle poaching evident along the reach. Bank profiles were primarily steep, but both banks exhibit vertical/undercut banks. There was a natural berm on the right bank. There was one minor bridge.
Substrate, Channel Features and Flow	There was a cobble bed along the majority of the reach with short lengths of predominantly bedrock, gravel and boulder bed. Channel features include exposed boulders and bedrock and a vegetated mid channel bar. Unvegetated side bars were recorded in two spot checks on both the right and left channel margins but vegetated side bars were observed as was one unvegetated point bar. Discrete unvegetated gravel deposits were also present. Rippled flow predominates at spot checks (60%) whilst smooth flow and unbroken standing waves are also present. Chute flow, broken standing waves, marginal deadwater were also present along the reach and 16 riffles and 20 pools were recorded.
Vegetation	Riparian land use on the left bank is continuously improved/semi-improved grassland resulting in a uniform bank top vegetation structure. The left bank face had mostly a uniform or simple structure; there were isolated/scattered trees. On the right bank, tilled land was predominantly present (90%) within 5m of the bank top with a short section of scrub/shrubs and occasional clumps of trees. There was a mixture of uniform, simple and complex vegetation structure for both the bank top and bank face. Shading of channel and overhanging boughs were present throughout the reach together with exposed bankside roots and fallen trees. Extensive in channel vegetation included liverworts/mosses/lichens and filamentous algae.
Surrounding Land Use	Improved/semi-improved grassland was extensive on the left bank and tilled land extensive on the right bank. Tall herb/rank vegetation was present on both banks and scrub/shrubs on the right bank.
Features of Special Interest and Overall Characteristics	Side channels were present and evidence of otters was observed in the area. Diseased alders were present along the reach.
Habitat Modification Score	HMS 250 reflecting minor bank reinforcement, a minor bridge and two outfalls/intakes. Obviously Modified.

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### Appendix A10.4: Detailed Terrestrial and Freshwater Ecological Baseline Data

**Table 11.14: RHS for River Almond (JA14)**

Parameters	Description
Valley Form, Channel Dimensions, Bank Profile and Type and Artificial Features	Shallow vee valley with no flat valley. Channel bank full width 30m on average with water width of approximately 15m. Banktop heights of 3m and 5m for left and right banks respectively. Both right and left banks comprised earth and are predominantly resectioned. There were limited bank toe reinforcements which appear to be associated with Maitland Bridge.
Substrate, Channel Features and Flow	A predominantly cobble-bed substrate existed with some sections exhibiting pebble/ gravel material. A boulder substrate as well as exposed boulders were also present, including very large boulders (>1m). A vegetated mid channel bar and a vegetated point bar were recorded in addition to a mature island. 80% of the spot checks displayed smooth flow, but unbroken standing waves and rippled flow were also present. Throughout the reach, broken standing waves and marginal deadwater were present and 8 riffles and 5 pools were recorded.
Vegetation	Riparian land use on the left bank was improved/semi-improved grassland with a very short length of rough pasture. Occasional clumps of trees were observed on the left and the banktop and bankface vegetation structures were predominantly simple with a very occasional complex structure. On the right bank, semi-continuous trees were evident and tall herb/rank vegetation was prevalent. The banktop and bankface structure varied between simple and complex. Shading of channel and overhanging boughs were present throughout the reach in addition to fallen trees and large woody debris. In-channel vegetation includes filamentous algae (extensive in all spot checks) and occasional liverworts/mosses/lichens.
Surrounding Land Use	Tall herb/rank vegetation was extensive on both banks with tilled land also extensive on the right bank and improved/semi-improved grassland on the left bank. Broad-leaved/mixed woodland was present on both banks. Improved/semi-improved grassland was extensive on the left bank and tilled land extensive on the right bank. Tall herb/rank vegetation was present on both banks and scrub/shrubs on the right bank.
Features of Special Interest and Overall Characteristics	Very large boulders (>1m) within the channel. Evidence of otters. Major impacts include roads.
Habitat Modification Score	HMS 720 reflecting bank resectioning and minor bank reinforcement. Significantly Modified.

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Table 11.15: Criteria for the Classification of Rivers as amended from SEPA Table River Classification Scheme for Scotland (SEPA, 2006)

Class	Description	Biology				Nutrients	Water Chemistry					Toxic substances	Contaminates (Aesthetic condition)	Observations
		Lab Analysed		Bankside			SRP	DO	BOD	NH4-N	Fe			
		ASPT EQI	TAXA EQI	ASPT	Field Score									
A1	Excellent	≥1.0	≥0.85	≥6.0	≥85	≤20	≥80	≤2.5	≤0.25	≤1	5%ile≥6 95%ile≤9	No A Minor B	Complies with Dangerous Substances EQS's	Contains a sustainable salmonid fish population. Natural Ecosystem.
A2	Good	≥0.9	≥0.70	≥5.0	≥70	≤100	≥70	≤4	≤0.6	≤1	10%ile≥5.2	Trace/ Occasional A or B	Complies with Dangerous Substances EQS's	Contains a sustainable salmonid fish population. Ecosystem may be modified by human activity.
B	Fair	≥0.77	≥0.55	≥4.2	≥50	>100	≥60	≤6	≤1.3	≤2	10%ile<5.2	-	Complies with Dangerous Substances EQS's	Contains a sustainable coarse fish population. Salmonids may be present. Impacted ecosystem.
C	Poor	≥0.50	≥0.30	≥3.0	≥15	-	≥20	≤15	≤9.0	>2	-	Gross A or B	>EQS for dangerous substance	Fish sporadically present. Impoverished ecosystem.
D	Seriously Polluted	<0.50	<0.30	<0.30	<15	-	<20	>15	>9.0	-	-	-	>10xEQS for dangerous substance	Fish absent or seriously restricted.

#### List of contaminants for determination of aesthetic conditions

List A contaminants	List B contaminants
Oils. Non natural foam, scum or colour. Sewage fungus. Sewage or oily smells. Sewage derived litter and solids	General non sewage derived litter. Gross litter. Builders waste.



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### Appendix A10.4: Detailed Terrestrial and Freshwater Ecological Baseline Data

## 12 Aquatic Macroinvertebrates

### 12.1 Consultation Information

- 12.1.1 Freshwater macroinvertebrate survey data provided by SEPA incorporated Biological Monitoring Working Party (BMWP) and Average Score per Taxon (ASPT) monitoring results from the Dolphington Burn, Niddry Burn and River Almond (Table 12.1).
- 12.1.2 River classifications were provided by SEPA (Tim Foster, Fife Area Ecologist for SEPA, pers. comm. March 2008) covering the Brankholm Burn and Swine Burn from monitoring in 2006, although no specific survey data was provided.
- 12.1.3 Although consulted TAPIF EIC did not provide any records for aquatic macroinvertebrates.

**Table 12.1: River Invertebrate Classification Data Provided by SEPA (River Classification (Class) calculated using ASPT)**

Watercourse name	Site name	Grid reference	Year	Season	BMWP (average)	ASPT (average)	River Class
Brankholm Burn	At Bois Bridge	None provided	2006	n/a	n/a	n/a	C - Poor
Dolphington Burn	Near A90 at Dalmeny/up stream tank farm (R2487)	NT 14300 76791	2006	Spring	58	4.1	B - Fair
				Autumn	59	3.9	B - Fair
Niddry Burn	Unknown location		2006	Spring	176	6.5	A1 - Excellent
				Autumn	164	6.1	A1 - Excellent
Swine Burn	Upstream of Scotmalt complex	None provided	2006	n/a	n/a	n/a	A2 - Good
River Almond	River Almond at Kirkliston	NT 12607 74256	2005/6	Spring	65	5.0	B - Fair
				Autumn	92	5.1	B - Fair

### 12.2 Habitat Assessment

- 12.2.1 Table 12.2 presents a description of the habitats surveyed within 500m of the current route alignment. These data help to describe the presence, characteristics and diversity of habitats available in the watercourse at each sampling point and aid interpretation of aquatic macroinvertebrate results represented in Table 12.4.

**Table 12.2: Habitat Descriptions for Aquatic Macroinvertebrates**

Site	Grid Reference	Represented Habitat Area	Habitat Description
JA01	NT 12084 8377	Brankholm Burn	2.5m wide, 30cm deep Cobble, gravel and silt Flow features: run and glides
JA02	NT 12284 81337	Unnamed tributary	30m wide, 10cm deep Still Flow features: run, glide and slack
JA03	NT 12259 81312	Unnamed pond	Pond 15mx5m, 10cm deep Still Flow features: pool
JA04	NT 11439 78712	Linn Mill Burn	0.6m wide, 10cm deep Cobble, gravel and silt

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Site	Grid Reference	Represented Habitat Area	Habitat Description
			Flow feature: riffle, run and glide
JA05	NT 14184 76745	Dolphington Burn	1.4m wide, 15cm deep Gravel and silt Flow features: run, glide and slack
JA06	NT 12807 76567	Dolphington Burn	1.2m wide, 10cm deep Gravel and silt Flow features: run, glide, slack and ditch
JA08	NT 10926 75006	Swine Burn	1.5m wide, 30cm deep Cobble, gravel and silt Flow features: run
JA09	NT 11134 74669	Swine Burn	3m wide, 10cm deep Boulder, cobble, gravel and silt Flow features: riffle, run and slack
JA10	NT 10676 74674	Niddry Burn	0.7m wide, 10cm deep Sand and silt Flow features: run, glide and slack
JA11	NT 10948 74182	Niddry Burn	1.8m wide, 35cm deep Cobble, gravel and silt Flow features: riffle and run
JA13	NT 12237 73909	Niddry Burn	3m wide, 15cm deep Cobble, gravel and silt Flow features: torrent, riffle and run
JA14	NT 12364 73866	River Almond	4m wide, 25cm deep Cobble and gravel Flow features: riffle and run

## 12.3 Aquatic Macroinvertebrate Survey Results

### Key species

- 12.3.1 *Simulium morsitans* is a blackfly larvae and only found in four rivers in the UK, including the Forth. Although the current restricted distribution may in part be due to under-recording in samples (the species group is generally only taken to family level), this is a notable find (Sites JA09, JA11 and JA13 in spring and Sites JA08 and JA09 in autumn). *Simulium noelleri* was found at site JA08 in large numbers and, although it is not particularly rare, it is habitat specific, preferring watercourses within 100m or so of artificial lakes and reservoirs.
- 12.3.2 Samples from Site JA13 on the lower Niddry Burn were found to include a species listed as nationally scarce (present in between 16 and 100 hectads in the UK) namely the true fly *Dixa maculata*.

### Biological water quality

- 12.3.3 Biological surveys were conducted on the 29 - 30<sup>th</sup> April and 16 - 18<sup>th</sup> September 2008. Results of surveys carried out during 2008 suggest watercourses in the area of the proposed scheme are generally of Fair quality (Grade B), with the exception of the lower Niddry Burn (A2 - Good), the Brankholm Burn (C - Poor), the Dolphington Burn (C - B, Poor to Fair) and the Swine Burn (C - B, Poor to Fair) (Table A10.4.51).

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**Table 12.3: Aquatic Macroinvertebrate BMWP, ASPT & Taxon Richness Results (2008 surveys)**

Site	Waterbody	Number of Scoring Taxa		BMWP		ASPT		Calculated River Quality Grade**
		Spring	Autumn	Spring	Autumn	Spring	Autumn	
JA01	Brankholm Burn	14	12	53	46	3.79	3.8	C - Poor
JA02	Estuarine tributary	5	9	n/a*	n/a*	n/a*	n/a*	Brackish
JA03	Unnamed pond	n/a	4	N/A*	N/A*	N/A*	N/A*	Brackish
JA04	Linn Mill Burn	19	14	102	65	5.4	4.6	B - Fair
JA05	Dolphington Burn	13	16	50	66	3.9	4.1	C - Poor
JA06	Dolphington Burn	12	16	52	72	4.3	4.5	B - Fair
JA08	Swine Burn	19	20	89	94	4.7	4.7	B - Fair
JA09	Swine Burn	16	14	67	53	4.2	3.8	C - Poor
JA10	Niddry Burn	13	12	53	49	4.1	4.1	B - Fair
JA11	Niddry Burn	16	14	73	66	4.6	4.7	B - Fair
JA13	Niddry Burn	21	19	110	108	5.2	5.7	A2 - Good
JA14	River Almond	16	14	77	65	4.8	4.6	B - Fair

\*BMWP and ASPT compiled using freshwater data from and therefore not directly applicable to estuarine conditions.

\*\*Assigned to surveyed data using SEPA river health classification (SEPA, 2006).

### Summary of Results

- 12.3.4 The full list of macroinvertebrate identified from field surveys is presented in Table 12.4 and Table 12.5.
- 12.3.5 Brankholm Burn supports good taxon richness (14 taxa in spring and 12 in autumn). BMWP scores indicate some variation between seasons and ASPT scores lead to poor biological water quality.
- 12.3.6 The unnamed tributary (JA02) sampled alongside St. Margaret's Marsh showed variation in taxon richness between seasons, ranging from nine taxa in autumn to five in spring. JA03 is an unnamed pond alongside St. Margaret's Marsh that is exposed to saline intrusion. The four taxa found in samples from the pond are representative of such a brackish environment and include Corophiidae and Nereididae.
- 12.3.7 Linn Mill Burn is a small watercourse with riffle, run and glide features present during surveys. Biological quality is classified as fair and supports between 14 and 19 taxa. Dolphington Burn supports between 12 and 16 taxa through the year and demonstrates poor to fair biological quality, as demonstrated in the results of monitoring by SEPA in 2006. Swine Burn supports between 12 and 20 taxa across the year with biological water quality (ASPT) showing only minimal variation at each sampling point between seasons.
- 12.3.8 Niddry Burn (Sites JA10, JA11 and JA13) supports from 12 to 21 taxa, with the greatest taxon richness at Site JA13 (21 taxa in spring, 19 in autumn). Biological water quality has consistently reached at least fair during surveys in 2008 at three sites on the burn. Peak quality (A2 - Good) was recorded on the lower Niddry Burn at Site JA13, which is supported by the results of monitoring by SEPA in 2006 (Table A10.4.49).
- 12.3.9 The River Almond (Site JA14) is of consistently fair biological quality and supports between 14 and 16 species through the year.

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Table 12.4: Invertebrate Taxa from Spring Sampling

Taxa	JA01	JA02	JA03	JA04	JA05	JA06	JA08	JA09	JA10	JA11	JA13	JA14
<b>Oligochaeta</b>	1480	203		219	735	380	300	130	55	175	140	1921
<i>Gammarus duebeni</i>		5										
<i>Gammarus pulex</i>	30			41	35	10				6	9	2
<i>Crangonyx pseudogracilis</i>	1											
<i>Corophium volutator</i>		1										
<i>Asellus meridianus</i>					3							
<i>Asellus aquaticus</i>	21			4	50	60	24	1	41	13	3	2
<i>Hediste diversicolor</i>		77										
<i>Potamopyrgus jenkinsii</i>	10			117	15		300	343	300	2	1	
<i>Lymnea peregra</i>	2				7	2	1		6			2
<i>Lymnea palustris</i>									1			
<b>Physidae</b>												
<i>Physa fontinalis</i>							1					
<i>Ancylus fluviatilis</i>				2						1		1
<b>Sphaeriidae</b>	168			20	4		1		2	1	1	5
<i>Habrophlebia fusca</i>											3	
<i>Rhithrogena semicolorata</i>												1
<i>Ecdyonurus torrentis</i>										4	7	13
<i>Baetis rhodani</i>	5			390	29	21	216	273	1	321	207	650
<i>Baetis</i> spp.	11									37		
<i>Velia caprai</i>									1			
<b>Ceratopogonidae</b>				2	1	8	7	9		1	29	10
<b>Muscidae</b>										5		
<b>Empididae</b>					3	28	1	2	1	1		
<b>Psychodidae</b>	1			2		1				1		

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Taxa	JA01	JA02	JA03	JA04	JA05	JA06	JA08	JA09	JA10	JA11	JA13	JA14
<b>Nemouridae</b>											1	
<i>Nemoura cambrica</i>				2							1	
<b>Culicidae</b>										1		
<b>Pediciidae</b>	1			8							1	
<b>Limoniidae</b>							4		1			
<b>Chironomidae</b>	102			16	756	1697	129	258	115	65	130	46
<b>Tabanidae</b>									1			
<i>Simulium</i> spp.						15		5				
<i>Simulium lundstrom</i>				1								
<i>Simulium ornatum</i>										3	1	
<i>Simulium morsitans</i>								2		1	1	
<i>Simulium noelleri</i>							26					
<b>Tipulidae</b>	3				1							1
<i>Polycelis</i> spp.	6					26						
<i>Polycelis felina</i>				117			2			38	2	
<i>Dendrocoelum lacteum</i>										1		
<i>Dugesia tigrinus</i>										1		
<i>Dugesia polychroa</i>					17	17	1	1				
<i>Amphinemura sulicollis</i>												1
<i>Erpobdella octoculata</i>											1	3
<i>Erpobdella testacea</i>	2											
<i>Helobdella stagnalis</i>					1	1	2					
<i>Glossiphonia complanata</i>	1									2	1	
<b>Dytiscidae</b>						8						
<i>Oreodytes</i> spp.										1		
<i>Agabus</i> spp.						2			1			

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Taxa	JA01	JA02	JA03	JA04	JA05	JA06	JA08	JA09	JA10	JA11	JA13	JA14
<i>Agabus paludosus</i>	1					2						
<i>Hydroporus</i> spp.	1											
<i>Halplus lineatocollis</i>							2					
Scirtidae				1					13			
Elmidae											4	
<i>Limnius volkmari</i>											3	17
<i>Oulimnius tuberculata</i>							2	4		7	6	
<i>Elmis aenia</i>				6			28	20		22	21	
<i>Hydropsyche siltalai</i>					1		2	5		22	13	5
<i>Hydropsyche pellucidula</i>							2					
<i>Plectrocnemia conspersa</i>				4					1			
<i>Polycentropus flavomaculatus</i>										1	2	
<i>Agapetus fuscipes</i>				2			1					
<i>Rhyacophila dorsalis</i>											12	10
<i>Tinoides waeneri</i>				1								
<i>Lype reducta</i>							2					
<i>Beraea maurus</i>				1								
<i>Sericostoma personatum</i>							2	1			2	
<i>Mystacides</i> spp.							1					
<i>Athripsodes</i> spp.								7				
<i>Athripsodes cinereus</i>							28					
<i>Glyphotaelius pellucidus</i>									2			
<i>Potamophylax latipennis</i>											2	
<i>Potamophylax rotundipennis</i>												3
<i>Limnephilus</i> spp.				1	13	9	13					

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Taxa	JA01	JA02	JA03	JA04	JA05	JA06	JA08	JA09	JA10	JA11	JA13	JA14
<i>Micropterna sequax</i>									12			
<i>Halesus radiatus</i>							4	3				
<i>Limnephilus lunatus</i>	2			7	8	9	12		2			
<i>Drusus annulatus</i>											7	
<i>Hydroptila</i> spp.											1	
<b>Collembola</b>					1			1	1	4		
<b>Total BMWP</b>	<b>53</b>	<b>n/a**</b>		<b>102</b>	<b>50</b>	<b>52</b>	<b>89</b>	<b>60</b>	<b>53</b>	<b>73</b>	<b>110</b>	<b>77</b>
<b>No. of scoring Taxa</b>	<b>14</b>	<b>5*</b>		<b>19</b>	<b>13</b>	<b>12</b>	<b>19</b>	<b>12</b>	<b>13</b>	<b>16</b>	<b>21</b>	<b>16</b>
<b>ASPT score</b>	<b>3.79</b>	<b>n/a**</b>		<b>5.37</b>	<b>3.85</b>	<b>4.33</b>	<b>4.68</b>	<b>5.00</b>	<b>4.08</b>	<b>4.56</b>	<b>5.24</b>	<b>4.81</b>
<b>CCI</b>	<b>7.00</b>	<b>8.00</b>		<b>8.21</b>	<b>1.11</b>	<b>4.00</b>	<b>4.42</b>	<b>13.30</b>	<b>3.75</b>	<b>8.75</b>	<b>12.00</b>	<b>9.23</b>

\* Figure represents total number of taxa (scoring and non-scoring) sampled. \*\* Brackish environment prevents a meaningful score.

**Table 12.5: Invertebrate Taxa from Autumn Sampling**

Taxa	JA01	JA02	JA03	JA04	JA05	JA06	JA08	JA09	JA10	JA11	JA13	JA14
<b>Oligochaeta</b>	245	119		138	200	75	100	220	30	25	200	1790
<i>Gammarus duebeni</i>		2	30									
<i>Gammarus pulex</i>	10			85	2	42				7	5	1
<b>Talitridae</b>		1										
<i>Crangonyx pseudogracilis</i>							3					
<b>Corophiidae</b>		1										
<i>Corophium volutator</i>		8	151									
<i>Corophium arenarium</i>		2	17									
<i>Asellus meridianus</i>										1		
<i>Asellus aquaticus</i>	16	1			85	86	40	20	65	12	4	2
<b>Ostracoda</b>			3			1						
<i>Hediste diversicolor</i>		104	168									
<b>Hydracarina (water mite)</b>						1				6		

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Taxa	JA01	JA02	JA03	JA04	JA05	JA06	JA08	JA09	JA10	JA11	JA13	JA14
<b>Hydrobiidae</b>			1									
<i>Potamopyrgus jenkinsii</i>				370	50		2050	65	100		9	39
<i>Lymnea peregra</i>	8				20	7			3			
<b>Succineidae</b>							8		3		2	
<i>Physa heterostropha</i>	1											
<i>Physa fontinalis</i>												
<b>Acroloxidae</b>											2	
<i>Ancylus fluviatilis</i>				32		1						13
<b>Sphaeriidae</b>	35			7			7	20	40		5	3
<i>Serratella ignita</i>											1	
<i>Paraleptophlebia</i> spp.											1	
<i>Rhithrogena semicolorata</i>												1
<i>Ecdyonurus</i> spp.												1
<i>Baetis rhodani</i>				23	9		48	3		120	35	23
<i>Baetis</i> spp.						1	30	3		80	35	7
<i>Baetis buceratus</i>						2						
<i>Sigara dorsalis</i>						1						
<b>Veliidae</b>					2						1	
<i>Velia</i> spp.					1	1			2	1		
<i>Siallis lutaria</i>					4		1	1				
<b>Muscidae</b>							2			8		1
<b>Empididae</b>						1						
<b>Psychodidae</b>				1			27	1	3	6	16	
<i>Dixa maculata</i>											1	
<i>Dixa nebulosa</i>				2							3	
<b>Fanniidae</b>												



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Taxa	JA01	JA02	JA03	JA04	JA05	JA06	JA08	JA09	JA10	JA11	JA13	JA14
<b>Pediciidae</b>				5	3			7	13		4	
<b>Ephydriidae</b>											1	
<b>Limoniidae</b>						1			2			
<b>Stratiomyiidae</b>								1				
<b>Chironomidae</b>	93		2	9	80	35	50	4	40	100		1
<b>Simuliidae</b>									2			
<i>Prosimulium</i> spp.					1							
<i>Simulium</i> spp.				12	2		125	25				2
<i>Simulium vernum</i>						2						
<i>Simulium angustipes</i>							1					
<i>Simulium ornatum</i>										41	29	
<i>Simulium tuberosum</i>											2	
<i>Simulium morsitans</i>							1	5				
<i>Simulium noelleri</i>							12					
<b>Tipulidae</b>					2	4	4		11	2	1	
<b>Tricladida</b>												
<i>Polycelis</i> spp.						11						
<i>Polycelis felina</i>				7								
<i>Polycelis nigra</i>												
<i>Dendrocoelum lacteum</i>						2	1					
<b>Dugesiiidae</b>												
<i>Dugesia polychroa</i>					4	13	1			1		
<i>Nemurella pictetii</i>												
<i>Leuctra fusca</i>											1	
<i>Erpobdella octoculata</i>												3
<b>Glossiphonidae</b>												

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Taxa	JA01	JA02	JA03	JA04	JA05	JA06	JA08	JA09	JA10	JA11	JA13	JA14
<i>Helobdella stagnalis</i>					15		2				1	
<i>Glossiphonia complanata</i>	5						1	1				
<b>Gyrinidae</b>												
<i>Gyrinus substriatus</i>	1											
<b>Dytiscidae</b>												
<i>Platambus</i> spp.										1		
<i>Oreodytes</i> spp.											1	
<i>Agabus</i> spp.	5				4	1			1			
<i>Agabus paludosus</i>									1			
<i>Helophorus</i> spp.						1						
<i>Helophorus grandis</i>												
<i>Anacaena globulus</i>											2	
<i>Hydraena gracilis</i>										1		
<b>Scirtidae</b>				3			15		35			
<b>Dryopidae</b>	1											
<b>Elmidae</b>												11
<i>Oulimnius</i> spp.							38	20				
<i>Oulimnius tuberculata</i>							8	2		8	9	
<i>Elmis aenia</i>				80	1	19	57	24		35	17	
<b>Coenagriidae</b>												
<i>Hydropsyche</i> spp.								12				
<i>Hydropsyche siltalai</i>								4		17		
<i>Hydropsyche pellucidula</i>					2							
<i>Hydropsyche angustipennis</i>							14			1		
<b>Polycentropodidae</b>									2			

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Taxa	JA01	JA02	JA03	JA04	JA05	JA06	JA08	JA09	JA10	JA11	JA13	JA14
<i>Plectrocnemia conspersa</i>									8			
<i>Polycentropus flavomaculatus</i>										3	2	
<i>Agapetus fuscipes</i>								3				
<i>Rhyacophila dorsalis</i>							1			13	4	1
<i>Tinoides waeneri</i>				4								
<i>Lype reducta</i>												
<i>Silo pallipes</i>											2	
<i>Athripsodes</i> spp.							18	4				
<i>Athripsodes cinereus</i>							3					
<b>Limnephilidae</b>	5	1		9	4	50	1	1	16			1
<i>Mesophylax impunctatus</i>												
<i>Micropterna sequax</i>				12		3						
<i>Halesus</i> spp.						2						
<i>Halesus radiatus</i>								1	15			
<i>Limnephilus extricatus</i>					2							
<i>Hydroptila</i> spp.							2	1		1		
<b>Collembola</b>											10	
<b>Total BMWP</b>	<b>46</b>	<b>n/a**</b>	<b>n/a**</b>	<b>65</b>	<b>66</b>	<b>72</b>	<b>94</b>	<b>73</b>	<b>49</b>	<b>66</b>	<b>108</b>	<b>65</b>
<b>No. of scoring Taxa</b>	<b>12</b>	<b>9*</b>	<b>7*</b>	<b>14</b>	<b>16</b>	<b>16</b>	<b>20</b>	<b>16</b>	<b>12</b>	<b>14</b>	<b>19</b>	<b>14</b>
<b>ASPT score</b>	<b>3.83</b>	<b>n/a**</b>	<b>n/a**</b>	<b>4.64</b>	<b>4.13</b>	<b>4.50</b>	<b>4.70</b>	<b>4.56</b>	<b>4.08</b>	<b>4.71</b>	<b>5.68</b>	<b>4.64</b>
<b>CCI</b>	<b>1</b>	<b>16.25</b>	<b>23.33</b>	<b>4.50</b>	<b>3.75</b>	<b>10.80</b>	<b>12.44</b>	<b>11.67</b>	<b>1.29</b>	<b>4.15</b>	<b>13.30</b>	<b>3.33</b>

\* Figures show the total number of taxa (both scoring and non-scoring) sampled. \*\* Brackish environment, prevents a meaningful score.

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## 13 Freshwater Macrophytes

### 13.1 Consultation Information

- 13.1.1 Consultation with the SEPA, SNH and SWT produced limited data as few surveys have been carried out in the rivers and lochs under assessment and data from those that had been undertaken were still being processed. Sites of local interest for macrophytes in the general area of the proposed development were identified from the SWT website.
- 13.1.2 Bawsinch and Duddingston Loch is a SSSI designated for its loch and fringing aquatic vegetation. It is the only remaining natural freshwater loch in the city of Edinburgh and supports the largest reedbed in the city.
- 13.1.3 Although consulted TAPIF EIC did not provide any records for freshwater macrophytes.
- 13.1.4 Literature searches revealed the survey area falls under the Edinburgh Wetland and Watercourse Habitat Action Plan (HAP). The merger of a number of waterbodies into a single plan emphasizes the connectivity of watercourses and waterbodies and the need to protect them throughout their length. Rare/priority aquatic plant species are listed in the HAP.

### 13.2 Survey of Freshwater Macrophytes

#### Sites

- 13.2.1 A total of seven waterbodies were encompassed within the survey area; one permanent still water, Humble Reservoir and six flowing watercourses, Brankholm Burn, Linn Mill Burn, Dolphington Burn, Swine Burn, Niddry Burn and River Almond.
- 13.2.2 The standing waterbody surveyed was large with varied depths throughout. The chemical status can generally be described as eutrophic/productive with a diverse macrophyte flora present. Watercourses generally consisted of heavily shaded channels dominated by bryophyte communities. Habitat diversity was generally more diverse in the standing waterbody, but high diversity was also noted in the Swine Burn and the River Almond. Of the latter two surveyed watercourses, the River Almond contained the highest number of species recorded. A summary of the freshwater macrophyte habitat is given in Table 13.1.

**Table 13.1: Habitat Descriptions for Freshwater Macrophytes**

Site	Habitat Description		
	Channel Dimensions (width x depth)	Flow Type	Notes
JA01 Brankholm Burn (upstream of M90)	2.5mx30cm	Riffle/run/glide	No shading Local detritus Suburban/urban development Substrate predominantly silt with gravel and cobbles
JA04 Linn Mill Burn (northeast Hedrig Hill)	0.6mx10cm	Glide/run/riffle	No shading Tall herbs and rough/unimproved pasture Substrate predominantly cobbles with gravel and silt
JA06 Dolphington Burn (downstream of oil storage depot)	2.2mx10cm	Slack/riffle	Moderate shading Coniferous plantation with arable land Substrate predominantly cobbles with boulders and gravel
JA07 Humble Reservoir	60mx600m long	Stillwater	Light shading Inflow present

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Site	Habitat Description		
	Channel Dimensions (width x depth)	Flow Type	Notes
JA08 Swine Burn	2mx30cm	Run	Online with Swine Burn 100% of water margin grazed Riparian margins acting as buffer Silt/clay substrate
JA09 Swine Burn	3mx10cm	Run	Moderate shading Widespread detritus Substrate comprising cobbles, gravel, silt substrate
JA10 Niddry Burn (Ross's Plantation)	0.7mx10cm	Riffle/run	Moderate shading Local detritus Predominantly soft silt substrate
JA12 Niddry Burn (South of Lindsay's Craigs)	1.8mx35cm	Riffle/run	No shading Cobble & gravel substrate with little silt Arable land and improved pasture
JA13 Niddry Burn (upstream of Newliston road bridge)	3mx15cm	Riffle/run	Light shading Local detritus Suburban/urban development with scrub and improved pasture Substrate comprising cobbles with gravel and silt.
JA14 River Almond (Sample from small left channel only)	4mx25cm	Riffle/run-fast flowing	Light shading Local detritus Suburban/urban development Scrub & rank vegetation Substrate comprising cobbles and gravel

#### Macrophyte communities

- 13.2.3 Surveys identified a range of macrophyte species across the survey area, with habitat values ranging from low to medium across the sites. The still waterbody that was surveyed (Humbie Reservoir) was more diverse than any of the running water sites. A total of ten macrophyte species were identified at Humbie Reservoir, with high cover values for species recorded.
- 13.2.4 Other sites including the Swine Burn JA08 (12 species), Niddry Burn JA12 (9 species) and the River Almond JA14 (16 species), were more diverse in taxon category and included higher aquatic plant species.
- 13.2.5 Watercourses in the survey area were generally dominated by bryophyte and algae communities, including Linn Mill Burn JA04 (1 species), Dolphington Burn JA06 (6 species), Swine Burn JA09 (6 species) and Niddry Burn JA10 (3 species) and JA13 (5 species). Table A10.4.55 provides details of the surveyed sites.

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**Table 13.2: Descriptions for Macrophyte Communities**

Site	Species Recorded	
JA01 Brankholm Burn (upstream of M90)	Canadian waterweed ( <i>Elodea canadensis</i> ) Water forget-me-not Amphibious bistort ( <i>Persicaria amphibia</i> ) Reed canary-grass Curled pondweed ( <i>Potamogeton crispus</i> )	Broad-leaved pondweed ( <i>Potamogeton natans</i> ) Celery-leaved buttercup ( <i>Ranunculus sceleratus</i> ) Water-cress Branched bur-reed Brooklime
JA04 Linn Mill Burn (northeast of Hedrig Hill)	Endive Pellia ( <i>Pellia endiviifolia</i> ) Yellow iris	Hard rush
JA06 Dolphington Burn (downstream of oil storage depot)	Blanketweed ( <i>Cladophora glomerata</i> agg.) Brook-side feather-moss ( <i>Hygroamblystegium fluviatile</i> ) Musgo ( <i>Amblystegium riparium</i> )	River feather-moss ( <i>Brachythecium rivulare</i> ) Endive Pellia Fox-tail feather-moss ( <i>Thamnobryum alopecurum</i> )
JA07 Humbie Reservoir	Blanketweed Creeping bent Great willowherb Reed sweet-grass ( <i>Glyceria maxima</i> ) Mare's-tail	Yellow iris Hard rush Water mint Water-cress Brooklime
JA08 Swine Burn	Blanketweed Creeping bent Wild angelica ( <i>Angelica sylvestris</i> ) Rosebay willowherb Great willowherb Marsh horsetail ( <i>Equisetum palustre</i> )	Meadowsweet Soft-rush Hard rush Reed canary-grass Water-cress Branched bur-reed
JA09 Swine Burn	Blanketweed Brook-side feather-moss Rough-stalked feather-moss ( <i>Brachythecium rutabulum</i> )	Willow moss Endive Pellia Fox-tail feather-moss
JA10 Niddy Burn (Ross's Plantation)	Blanketweed Brook-side feather-moss	Endive Pellia
JA12 Niddy Burn (South of Lindsay's Craigs)	Blanketweed Brook-side feather-moss Willow moss Musgo Lesser pond-sedge ( <i>Carex acutiformis</i> )	Reed sweet-grass Water-pepper ( <i>Persicaria hydropiper</i> ) Curled pondweed Branched bur-reed

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Site	Species Recorded
JA13 Niddry Burn (upstream Newliston road bridge)	Blanketweed Brook-side feather-moss River feather-moss Willow moss Endive Pellia
JA14 River Almond (Sample from small left channel only)	Blanketweed Gut weed ( <i>Enteromorpha intestinalis</i> ) Brook-side feather-moss Musgo Endive Pellia Fox-tail feather-moss Greater water Plantain Lesser pond-sedge Marsh horsetail Common spike-rush ( <i>Eleocharis palustris</i> ) Reed canary-grass Curled Pondweed Bog pondweed ( <i>Potamogeton polygonifolius</i> ) Celery-leaved Buttercup Great yellow-cress ( <i>Rorippa amphibian</i> ) Branched bur-reed

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## 13.3 Summary of Results

- 13.3.1 A total of seven waterbodies were encompassed within the survey area; one still water and six flowing watercourses.
- 13.3.2 Humbie Reservoir, Swine Burn and the River Almond contained the most diverse macrophyte communities of the sites surveyed with higher plants as well as algae and/or bryophytes being recorded. Brankholm Burn had a high number of higher plants and the remaining watercourses were generally dominated by algae and bryophytes. Table 13.3 summarises the number of plant taxa and classification type (i.e. algae, bryophyte etc) that were recorded at each site, providing an overall picture of diversity at each site. However, no species of conservation importance were recorded.

Table 13.3: Summary of plant number and classification type, identified at each survey site

Watercourse/standing water site	Number of species recorded	Species type recorded - algae (A)/ bryophytes (B)/ Higher Plants (H)
JA01 Brankholm Burn	10	H
JA04 Linn Mill Burn	3	B,H
JA06 Dolphington Burn	6	A,B
JA07 Humbie Reservoir	10	A,H
JA08 Swine Burn	12	A,H
JA09 Swine Burn	6	A,B
JA10 Niddry Burn	3	A,B
JA12 Niddry Burn	9	A,B,H
JA13 Niddry Burn	5	A,B
JA14 River Almond	16	A,B,H

## 14 Freshwater Fish

### 14.1 Consultation Information

- 14.1.1 Consultation with statutory and non-statutory organisations (SEPA, Federation of Fly Fishers (FFF), the Association of Scottish River and Fishery Management Trusts (RAFTS), University of Stirling and the Forth District Salmon Fisheries Board (FDSFB) and TAPIF EIC) did not provide, any freshwater fisheries data relating specifically to the River Almond catchment, with the exception of the Cramond Angling Club, which provided rod return information for 2007 and 2008 (Table 14.1).
- 14.1.2 Data from the NBN Gateway (National Biodiversity Network, 2008) drawn from the Biological Records Centre (BRC) and Davies et al. (2004) indicates the presence of 23 fish species including Atlantic salmon (*Salmo salar*), brown trout (*Salmo trutta*), European eel (*Anguilla anguilla*), allis shad (*Alosa alosa*) and bullhead (*Cottus gobio*) within the Forth catchment. Furthermore the River Teith Special Area of Conservation (SAC) also within the Forth catchment, is designated for river lamprey (*Lampetra fluviatilis*), brook lamprey (*Lampetra planeri*) and sea lamprey (*Petromyzon marinus*), in addition to Atlantic salmon. Fish species recorded from Humbie Reservoir and Hopetoun Fishery (which feed the Swine Burn) include tench (*Tinca tinca*), roach (*Rutilus rutilus*), perch (*Perca fluviatilis*), pike (*Esox lucius*), European eel, rainbow trout (*Oncorhynchus mykiss*) and brown trout.
- 14.1.3 The Forth catchment supports a significant population of migratory salmonids (Atlantic salmon and sea trout) on the Scottish east coast. In 2007, 1775 Atlantic salmon, and 1501 sea trout were caught by rod and line in the Forth catchment, compared to 1815 Atlantic salmon, and 909 sea trout in 2001 (Fisheries Research Services, 2008). These figures show that 2001 and 2007 rod



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and line catches of Atlantic salmon have remained stable and captures of sea trout have increased. The main recreational fisheries within the catchment are found upon the Rivers Teith, Forth, Allan, Almond, Esk and Tyne. Only the Almond falls within the current study area.

- 14.1.4 The River Almond is designated as a 'salmonid water' under the EC Freshwater Fish Directive (2006/44/EC) and through the Surface Waters (Fishlife) (Classification) (Scotland) Amendment Regulations 2007. The presence of migratory species is important to the Almond and its receiving tributaries. Atlantic salmon is an important commercial and recreational species throughout the wider Forth catchment.
- 14.1.5 A desktop assessment and correspondence from Cramond Angling Club (A. Lindsay, Cramond Angling Club, pers. comm. November 2008) has confirmed the presence of salmon and trout in both the migratory and non-migratory forms.

**Table 14.1: Cramond Angling Club Angler Rod Return Data (2007 - 2008)**

Month	Salmon and Grilse			Sea Trout and Finnock			Brown Trout		
	2007	2008	Average	2007	2008	Average	2007	2008	Average
February	0	0	0.0	0	1	0.5	0	0	0.0
March	0	0	0.0	0	2	1.0	0	10	5.0
April	0	0	0.0	0	5	2.5	11	25	18.0
May	0	0	0.0	3	4	3.5	6	31	18.5
June	0	0	0.0	23	9	16.0	8	32	20.0
July	1	0	0.5	37	14	25.5	6	19	12.5
August	2	3	2.5	37	30	33.5	8	31	19.5
September	5	4	4.5	8	21	14.5	55	37	46.0
October	3	17	10.0	6	14	10.0	5	5	5.0
<b>TOTAL</b>	<b>11</b>	<b>24</b>	<b>17.5</b>	<b>114</b>	<b>100</b>	<b>107</b>	<b>99</b>	<b>190</b>	<b>144.5</b>

- 14.1.6 In consultation with SNH, it was established that surveys of the large standing waterbodies (see Table 14.2) were not required. SNH stated that unless European protected species/sites or particularly rare species are impacted (directly or indirectly) then detailed surveys will not be required (Niall Corbet, SNH, pers. comm. March 2008).

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**Table 14.2: Large Standing Waterbodies**

Waterbody	Site Code	National Grid Reference (Mid Point)	SEPA Water Quality Classification (2006) <sup>a</sup>	WFD Overall Status (2007) <sup>b</sup>
Unnamed Standing Water (Jamestown)	JA15	NT 12800 81900	Not monitored	Not monitored
Ferry Loch	JA16	NT 12750 81100	Not monitored	Not monitored
Unnamed Standing Water (South B9080 adjacent to Swine Burn)	JA17	NT 11800 74400	Not monitored	Not monitored
<sup>a</sup> SEPA (2006) <sup>b</sup> SEPA (2008)				

## 14.2 Survey Results

### Fisheries Habitat

14.2.1 Three watercourses (four survey sites) (Table 14.3) were classified using the fisheries habitat assessment criteria described in Appendix A10.3, Section 15.4.1 (Habitat Importance) Table 15.1. Fisheries habitat quality and utilisation potential ranged from moderate to good (Table 14.4), in comparison with the RHS findings that observed generally low habitat quality (with the exception of the Niddry Burn). All sites exhibited diverse habitat characteristics (flow type, substrate, channel structure and bankside cover). Fisheries habitat assessment, using a higher resolution assessment of potential habitats classified Swine Burn (downstream of Humble Reservoir) habitats as moderate as a result of sparse bankside cover for fish.

**Table 14.3: Running Water Sites**

Waterbody	Site Code	National Grid Reference (Upstream - Downstream)	SEPA Water Quality Classification (2006)*	WFD Overall Status (2007)**
Swine Burn (Downstream Humble Reservoir)	JA08	NT 10910 75010 - NT 10990 75110	A2 - Good	n/a
Swine Burn (adjacent to M9 Junction 1A)	JA09	NT 11100 74690 - NT 11210 74650	A2 - Good	n/a
Niddry Burn (South of Lindsay's Craigs)	JA12	NT 11700 74070 - NT 11800 74080	Not available	Moderate
River Almond	JA14	NT 12380 73880 - NT 12420 73970	B (rated C in 2005)	Poor

\* SEPA (2006) National Water Quality Classification 2006.

\*\* [http://www.sepa.org.uk/water/river\\_basin\\_planning.aspx](http://www.sepa.org.uk/water/river_basin_planning.aspx)

**Table 14.4: Habitat Descriptions for Freshwater Fish**

Watercourse and site code	Habitat Area (m <sup>2</sup> )	Spawning Substrate Present	Bankside Cover	Flow Type Diversity	Habitat Value	Habitat Description
Swine Burn JA08	54	Y	Y (limited to RH bank)	Y	Moderate	A small stream, with diverse substrate characteristics, instream vegetation, channel structure, flow type, and sparse bankside cover for fish (predominantly on the RH bank facing downstream).
Swine Burn JA09	55.25	Y	Y	Y	Good	A small stream, with diverse substrate characteristics, instream vegetation, channel structure, flow type, and significant cover for fish

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Watercourse and site code	Habitat Area (m <sup>2</sup> )	Spawning Substrate Present	Bankside Cover	Flow Type Diversity	Habitat Value	Habitat Description
						on both banks. Channel obscured with fly tipped rubbish (tyres/furniture etc).
Niddry Burn JA12	146.6	Y	Y	Y	Good	A small stream, with diverse substrate characteristics, channel structure, and flow type. Instream vegetation is minimal in both abundance and diversity, and bankside cover for fish is limited. The existing culvert to the east of the site (~120m in length) may be acting as an obstacle/barrier for migratory fish moving up through the River Almond system to access suitable spawning areas.
River Almond JA14	1110	Y (largely cobble based)	Y	Y	Good	A large river, with diverse substrate characteristics (contaminated with hydrocarbons/oils), channel structure, and flow type. Instream vegetation abundance and diversity is minimal and bankside cover for fish is limited. Both banksides are lined Himalayan balsam ( <i>Impatiens glandulifera</i> ), and are re-sectioned/re-profiled (most likely for flood defence).

- 14.2.2 Swine Burn (Site JA08) is a stream of channel dimensions 1.6m to 3.2m wide and a depth range of 0.1 to 0.3m, with a substrate matrix of silt, pebble, cobble and boulder. There is abundant in-stream vegetation, good riffle/pool structure and sparse bankside cover for fish. The surrounding land-use comprises arable, broad-leaved woodland, improved and semi-improved grassland. An existing road (B9080) runs perpendicular to the burn at the downstream end of the site, at which point there is a small crossing. An assessment of fisheries habitat, using professional judgement of potential habitats, classified this site as moderate as a result of sparse bankside cover for fish.
- 14.2.3 Further downstream, Swine Burn (Site JA09) is a stream of channel dimension 1.6m to 2.7m wide and a depth range of 10cm to 30cm deep, with a diverse substrate matrix. In-stream vegetation is less abundant and diverse than the site situated downstream of Humber Reservoir however, good riffle/pool structure and good bankside cover for fish remains. The surrounding land-use comprises arable, broad-leaved woodland and improved or semi-improved grassland. An existing road (M9) is situated to the south of the site. The channel is partially obscured with fly-tipped debris (such as car tyres and furniture). An assessment of fisheries habitat, using professional judgement of potential habitats, classified this site as good as a result of the degree of bankside cover for fish.
- 14.2.4 The presence of obstacles to fish migration further downstream on Swine Burn (e.g. where water is culverted under a building), an existing culvert at M9 Junction 1A (~150m in length) and a waterfall (NT 11900 74400), may limit ingress by all species of fish including Atlantic salmon, trout, lamprey and European eel as well as the free movement of non-migratory fish between spawning, refuge and feeding grounds. In the absence of an effective fish pass, in-stream obstructions are potentially a naturally limiting barrier to fish migration (specifically migratory species such as Atlantic salmon or European eel).
- 14.2.5 Niddry Burn (Site JA12) is a stream of channel dimensions 3.8m to 4.8m wide and a depth range of 10 to 40cm deep, with a substrate matrix of gravel, pebble, cobble and boulder. There is little to no in-stream vegetation, good riffle/pool structure and poor bankside cover for fish. The surrounding land-use comprises arable, broad-leaved woodland and improved or semi-improved grassland. An existing road (M9) is situated to the east of the site. An assessment of fisheries habitat, using

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professional judgement of potential habitats, classified this site as good as a result of complex substrate diversity.

- 14.2.6 The River Almond is a river of channel dimensions 20m to 30m wide and a depth range of 10 to 50cm, with a substrate matrix of gravel, pebble, cobble and boulder. Signs of historic contamination within the matrix (such as hydrocarbons/oils) were observed at the time of the fisheries survey. In-stream vegetation and bankside cover for fish was limited. The non-native and highly invasive Himalayan balsam was recorded on both banks. The river offered a good riffle/pool structure and was divided by a mature island and the confluence with the Niddry Burn. The surrounding land-use comprises broad-leaved woodland and improved or semi-improved grassland. An existing road (B800) and major bridge crossing (Maitland Bridge) are situated to the west of the site. An assessment of fisheries habitat, using professional judgement of potential habitats, classified this site as good as a result of complex substrate diversity.
- 14.2.7 Angler catch data for 2007 and 2008 were supplied by Cramond Angling Club covered three beats on the River Almond up to, and including, Maitland Bridge. Beat one extends from the Cramond foreshore to Cramond Bridge, within which stretch there are three documented weirs. A collapsed weir, closest to the foreshore, at the mouth of the river (NT 18738 76573), is expected to be passable at most states of tide and is unlikely to impact fish migration. Further upstream is Cramond falls (NT 18394 76389), which is approximately 2.5m in height and 861m from the foreshore. A fully operational salmon ladder (containing four pools) is situated next to the weir. A keystone is missing from the crest of the weir which is creating an attraction flow and potentially attracting migratory fish away from the salmon ladder (A. Lindsay, Cramond Angling Club, pers. comm. October, 2008).
- 14.2.8 Beyond Cramond falls is Dowies Mill weir (NT 17934 75663) which is 1505m from the foreshore, smaller in magnitude than Cramond falls and also has a fully operational salmon ladder (containing four pools).
- 14.2.9 Whilst the effectiveness of the fish passes at Cramond fall and Dowies Mill has not been determined, Atlantic salmon and sea trout have been recorded upstream of both, suggesting these species are able to negotiate both weirs.

#### Fish Survey

- 14.2.10 Bullhead, listed in Annex II of the Habitats Directive (92/43/EEC), was the dominant species recorded across all four study sites (198 individuals), with the highest total number recorded at Swine Burn (Site JA09) (121 individuals). Table 14.5 lists a total of six fish species that were recorded within the three watercourses (four study sites).
- 14.2.11 Two UKBAP priority species, European eel and brown trout, were recorded (from one and three sites respectively) across the study area. Important migratory species expected to be present (Atlantic salmon, sea trout and lamprey) were not recorded during the fisheries surveys. A single European eel was recorded in the marine intertidal fisheries surveys see Chapter 11 (Estuarine Ecology) Section 11.3 (Baseline Conditions) and as such was expected within the study area.
- 14.2.12 European eel was recorded from the River Almond during the surveys in 2008. Data from the NBN Gateway (NBN, 2008), drawn from the Biological Records Centre (BRC) and Davies et al. (2004) indicates the presence of European eel in the River Almond. As part of the Appropriate Assessment for the Edinburgh Airport Rail Link (EARL) route, SEPA carried out electrofishing surveys for eel on the River Almond at Cramond Brig in 2004. The survey identified brown trout, stone loach, bullhead and minnows, but noted that eels dominated the fish fauna at that site. EC Council resolution 1100/2007 now requires Member States to provide eel management plans to establish measures for the recovery of eel stocks. European eel stocks have declined dramatically over their entire range due to water pollution, increased barriers to migration and exploitation.

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14.2.13 Brown trout were recorded at Swine Burn (Site JA09), length range 135-204mm, Niddry Burn (Site JA12) 185mm and the River Almond, length range 150-237mm. Tables 14.5 and 14.6 list fish density (per m<sup>2</sup> wetted area based on an estimated population) and catch efficiency between electrofishing runs. Fish density was highest at Swine Burn (adjacent to M9 Junction 1A) (4.49 per m<sup>2</sup> wetted area) and lowest at the River Almond (0.02 per m<sup>2</sup> wetted area). There is a correlation between low catch efficiency at sites where a comparatively higher number of bullhead was recorded. Low catch efficiency can be attributed to the cryptic nature of bullhead and the reduced susceptibility of smaller individuals to electrofishing methods.

**Table 14.5: Fish Species (at each study site)**

Freshwater Fish Species	Swine Burn JA08	Swine Burn 1a) JA09	Niddry Burn JA12	River Almond JA14	Total
Brown trout	0	2	1	4	7
Bullhead	7	121	38	32	198
Stone loach	0	0	15	2	17
Minnow	3	16	1	0	20
Three-spined stickleback	0	2	3	0	5
European eel	0	0	0	1	1

**Table 14.6: Fish Density (per m<sup>2</sup> wetted area based on an estimated population\*) at Each Study Site**

Parameter	Swine Burn JA08	Swine Burn JA09	Niddry Burn JA12	River Almond JA14
Average wet width (m)	2.16	2.21	4.19	22.2
Site length (m)	25	25	35	50
Density (fish no. per m2 wetted area)	0.38	4.49	1.69	0.02

\*Junge and Libosvsky (1965), Zippin (1956).

**Table 14.7: Catch Efficiency between Electrofishing Runs at Each Study Site**

Electrofishing run	Swine Burn JA08	Swine Burn JA09	Niddry Burn JA12	River Almond JA14
Run 1 - 2	0.57	-0.1	0.06	0.40
Run 2 - 3	1.00	0.44	0.07	0.42
Run 3 - 4	n/a	n/a	1.00	n/a

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#### 14.3 References

Appropriate Assessment for Edinburgh Airport Rail Link (EARL) route. [online]. Accessed June 2008 - March 2009. Available at:  
[http://www.earlproject.com/new\\_downloads/information/effects/3\\_baseline.pdf](http://www.earlproject.com/new_downloads/information/effects/3_baseline.pdf)

Arnold, H.R. (1993) The Atlas of British Mammals. HMSO, London.

Bats and the Millennium Link (2004). [online]. Accessed June 2008 - March 2009. Available at:  
<http://www.batml.org.uk/publications/publications.php>

Botanical Society of the British Isles (BSBI). Records [online]. Accessed June 2008 - March 2009. Available at: [www.bsbi.org.uk/](http://www.bsbi.org.uk/)

Chanin, P.R.F. (2003) Ecology of the European Otter *Lutra lutra*. Conserving Natura 2000 Rivers Ecology Series No.10. English Nature, Peterborough.

Davies, C.E., Shelley, J., Harding, P.T., McLean, I.F.G., Gardiner, R. and Peirson, G., eds. (2004) Freshwater fishes in Britain - the species and their distribution. Harley Books, Colchester.

Edinburgh Biodiversity Action Plan 2004-2009. [online]. Accessed June 2008 - March 2009. Available at:  
[http://www.edinburgh.gov.uk/internet/Environment/Land\\_and\\_premises/Natural\\_heritage/CEC\\_biodiversity\\_action\\_plan\\_2004\\_-\\_2009](http://www.edinburgh.gov.uk/internet/Environment/Land_and_premises/Natural_heritage/CEC_biodiversity_action_plan_2004_-_2009)

Environment Agency (2003) Habitat Modification Score Rules version 2003. Environment Agency, Bristol.

ERM (1996) Setting Forth: Environmental Statement. Draft 1 - 04 March 1996 on behalf of the Scottish Office Development Department.

ERM (2005) Edinburgh Airport Rail Link, Environmental Statement Volume 1. ERM Ltd.

European Commission (1992) Council Directive (92/43/EEC) on the Conservation of natural habitats and wild flora and fauna (Habitats Directive). [online]. Accessed June 2008 - March 2009. Available at:  
<http://www.eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992L0043:EN:HTML>

European Commission (2000) Water Framework Directive (2000/60/EC). [online]. Accessed June 2008 - March 2009. Available at: <http://www.defra.gov.uk/environment/water/wfd>

European Commission (2006) Freshwater Fish Directive (2006/44/EC). [online]. Accessed June 2008 - March 2009. Available at:  
<http://www.defra.gov.uk/environment/water/quality/fwfish/index.htm>

European Commission (2007) Council Regulation (1100/2007/EC) Establishing measures for the recovery of the stock of European eel.

Eversham, B. (1983) Defining Rare and Notable species - a discussion document. Invertebrate Site Register Report No. 49. Nature Conservation Committee, Peterborough, England.

Fife Council (2008) Fife Biodiversity Action Plan. [online]. Accessed June 2008 - March 2009. Available at: <http://www.ukbap.org.uk/lbap.aspx?id=391>

Fife Environmental Recording Network (FERN). [online]. Accessed June 2008 - March 2009. Available at: <http://www.swt-fife.org.uk/morefnat.htm>

## Forth Replacement Crossing

DMRB Stage 3 Environmental Statement

### Appendix A10.4: Detailed Terrestrial and Freshwater Ecological Baseline Data

---

Fisheries Research Services (2008) Statistical Bulletin: Scottish Salmon and Sea Trout Catches, 2007. Fisheries Series No. Fis/2008/1. Pitlochry.

Haddow, J. F. and Herman, J. S. (2001) Aberdeen University. Recorded distribution of bats in Scotland. Scottish Bats. [online]. Available at: [www.scotbats.org.uk](http://www.scotbats.org.uk).

Joint Nature Conservancy Council (2008) Species of Conservation Concern, Hierarchy of Lists. [online]. Accessed June 2008 - March 2009. Available at: <http://www.jncc.gov.uk/default.aspx?page=1775>

Jacobs Arup (2008a). Forth Replacement Crossing: Stage 2 Environmental Assessment Report on behalf of Transport Scotland.

Jacobs Arup (2008b). Forth Replacement Crossing: Ecological Scoping Report. Transport Scotland.

Jacobs and Faber Maunsell | AECOM (2007a) Transport Scotland, Forth Replacement Crossing Study, St. Margaret's Marsh SSSI Breeding Bird Survey Report. Jacobs U.K. Ltd., Glasgow.

Jacobs and Faber Maunsell | AECOM (2007b). Forth Replacement Crossing Study: Strategic Environmental Assessment Environmental Report. Jacobs U.K. Ltd., Glasgow.

Joint Nature Conservancy Council (2008). Species of Conservation Concern, Hierarchy of Lists. [online]. Accessed June 2008 - March 2009. Available at: <http://www.jncc.gov.uk/default.aspx?page=1775>.

Junge, C.O. and Libosvsky, J. (1965) Effects of size selectivity on population estimates based on successive removals with electrofishing gear. *Zoologiske Listy*, 14:171-178.

Liles, G. (2003) Otter Breeding Sites:- Conservation And Management. *Conserving Natura 2000. Rivers Conservation Techniques*, Series No. 5. English Nature, Peterborough.

Lothian Wildlife Information Centre (LWIC). [online]. Accessed June 2008 - March 2009 Available at: <http://www.lothianwildlife.co.uk/>

Middleton, N. (2006). A five year study into the distribution and abundance of *Myotis daubentonii* along the canal network of Central Scotland. BaTML Publications.

National Biodiversity Network Gateway. [online]. Accessed June 2008 - March 2009 Available at: <http://data.nbn.org.uk/>

Nature Conservation (Scotland) Act (2004) HMSO, London.

Preston, C.D., Pearman D.A., and T.D. Dimes, T.D. (2002) *New Atlas of the British Flora and Irish Flora*. Oxford University Press.

Richardson, P. (2000) *Distribution Atlas of Bats in Britain and Ireland 1980 - 1999*. The Bat Conservation Trust, London, UK.

Rodwell, J.S. (ed.) (1991) *British Plant Communities Vol. 1. Woodlands and scrub*. Cambridge University Press, Cambridge.

Rodwell, J.S. (ed.) (1992) *British Plant Communities Vol. 3. Grasslands and montane communities*. Cambridge University Press, Cambridge.

Rodwell, J.S. (ed.) (1995) *British Plant Communities Vol 4. Aquatic communities, swamps and tall-herb fens*. Cambridge University Press, Cambridge.

## Forth Replacement Crossing

DMRB Stage 3 Environmental Statement

### Appendix A10.4: Detailed Terrestrial and Freshwater Ecological Baseline Data

---

Rodwell, J.S. (ed.) (2000) British Plant Communities Vol 5. Maritime communities and vegetation of open habitats. Cambridge University Press, Cambridge.

Scottish Biodiversity List. [online]. Accessed June 2008 - March 2009. Available at: <http://www.biodiversityscotland.gov.uk/pageType2.php?id=38&type=2&nav10=92>

Scottish Natural Heritage (Undated). Otters and Development. Scottish Wildlife Series. [online]. Accessed 14 November 2008. Available at: <http://www.snh.org.uk/publications/online/wildlife/otters/default.asp>

Scottish Natural Heritage (2008a). Ancient Woodland Inventory.

Scottish Natural Heritage (2008b). Site Citation: St. Margaret's Marsh SSSI. [online]. Accessed December 2008. Available at: <http://www.snh.org.uk>

Scottish Squirrel Survey (2007) Current Map of Red and Grey Squirrel Distribution. [online]. Accessed 19 February 2008. Available at: <http://www.scottishsquirrelsurvey.co.uk/map.html>

SEPA (2006) National Water Quality Classification. SEPA. Stirling. [online]. Accessed June 2008 - March 2009. Available at: [http://www.sepa.org.uk/water/monitoring\\_and\\_classification/idoc.ashx?docid=6386db11-7a65-4277-a1e2-e5e4dbfda040&version=-1](http://www.sepa.org.uk/water/monitoring_and_classification/idoc.ashx?docid=6386db11-7a65-4277-a1e2-e5e4dbfda040&version=-1)

SEPA (2008) Forth Draft Area Management Plan 2009-2015. [online]. Accessed June 2008 - March 2009. Available at: [http://www.sepa.org.uk/water/river\\_basin\\_planning.aspx](http://www.sepa.org.uk/water/river_basin_planning.aspx)

Shirt, D. B. (Ed.), (1987) British Red Data Books: 2 : Insects. Nature Conservation Council, Peterborough, England.

Strachan, R. and Jefferies, D.J. (1993) The Water Vole *Arvicola terrestris* in Britain 1989-1990. Vincent Wildlife Trust.

Surface Waters (Fishlife) (Classification) (Scotland) Amendment Regulations (2007) ISBN 0110620518, The Stationery Office Limited.

Take a Pride in Fife Environment Information Centre (TAPIF EIC). [online]. Accessed June 2008 - March 2009. Available at: <http://www.fifedirect.org.uk>

Transport Scotland (2007) Strategic Transport Projects Review, Report 4, Appendix D - Environment. Jacobs UK Ltd.

UK Biodiversity Action Plan. [online]. Accessed June 2008 - March 2009. Available at: <http://www.ukbap.org>

UK Biodiversity Action Plan Species. [online]. Accessed June 2008 - March 2009. Available at: <http://www.ukbap.org.uk/PrioritySpecies.aspx?group=7>

West Lothian Biodiversity Action Plan. [online]. Accessed June 2008 - March 2009. Available at: <http://www.ukbap.org.uk/lbap.aspx?ID=489>

WILDCRU, Oxford University (2004) Water Vole Surveys in Fife and Central Cairngorms. SNH Commissioned Report No. 058.

Wildlife and Countryside Act (1981) (as amended). HMSO, London.

Zippin, C. (1956) An evaluation of the removal method of estimating animal populations. Biometrics 12:163-189.